CAPITAL UNIVERSITY OF SCIENCE AND TECHNOLOGY, ISLAMABAD

Bank Competition, Financial Stability, and Economic Growth Links: A Micro and Macro Level Study of Selected Asian and European Economies

by

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to my dearest mother & father,

the reason behind what I became today.

I humbly profess, without them,

I would have been stumbled

a long time ago,

&

to my

brother & sisters.

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Abstract

This study investigates the impact of bank competition and financial stability on economic growth in Asian and European economies using the bank level and country-level panel data over 2001 to 2017. It employs a fixed-effect estimator, as well as a system generalized method of moment (GMM) estimator to control unobserved heterogeneity, endogeneity, the dynamic effect of economic growth and bank stability, and reverse causality in its estimation.

In bank-level analysis, this study uses the panel data of fourteen emerging Asian and European countries and investigates the impact of bank competition, bank size, and regulations on the financial stability of emerging Asian and European economies. It also investigates the non-linear relationship of bank competition and size of bank on financial stability of the banking system. The results of this analysis show that bank competition negatively affects the financial stability of banks and non-linear relationship is not observed. However, bank size affects the stability of the banks in a non-linear way. Regulatory factors are also identified which are important for the stability of banks in emerging economies.

In country-level analysis, this study investigates the effect of bank competition and financial stability on economic growth by examining panel-data from thirty-eight European and thirty-three Asian countries over 2001 to 2017. Bank competition is measured with the Boone indicator, and bank stability with Z-scores and non-performing loan ratio, at the country level. Results show that bank stability significantly contributes to economic growth in Asia and Europe with different effect size. Economic growth falls during crisis periods (both the global financial crisis and the local banking crisis), highlighting the importance of a resilient banking system during crisis periods. Moreover, empirical outcomes show that lower banking competition supports economic growth and increases financial stability. This study provides a framework for banks and regulators to boost economic growth through the channel of banking stability.

Key words: bank stability, credit risk, bank competition, economic growth, bank size, regulations, system GMM, global financial crisis, local banking crisis, bank Z-score, and non-performing loans

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Abbreviations

BIS	Bank of International Settlements
CAR	Capital Adequacy Requirement
CRn	n Concentration Ratios
ECB	European Central Bank
ES	Efficient Structure
EU	European Union
FDIC	Federal Deposit Insurance Corporation
GMM	Generalized Method of Moment
HHI	Herfindahl-Hirschman Index
LLPs	Loan-loss Provisions
M&As	Mergers and Acquisitions
NPLs	Non-performing Loans
OLS	Ordinary Least Squares
PE	Profit Elasticity
RPD	Relative Profit Differences
SCP	Structure-Conduct-Performance
SMEs	Small and Medium Enterprises
WEO	World Economic Outlook

Chapter 1

Introduction

Financial stability plays a vital role for the proper functioning of the economy. In an efficient economy, everyone is getting benefits from a sound and efficient banking system. Major portion of transaction in an economy occur through banking system. Considering the importance of the banking system, this study analyses bank competition, bank size, and regulation for the financial stability of banks. Competition is seen as an essential factor that matters for the financial stability of banks. The measurement of competition has remained an important area in banking literature. Different measures have evolved over time to study competition in the theoretical and empirical literature. However, concentration ratios and Herfindahl-Hirschman index have been criticized for their inability to capture competition. Other measures like Lerner index and Boone indicator are considered better measure to capture the bank competition (Zigraiova and Havranek, 2016).

An increase in competition decreases or increases bank stability; is an open debate in economic research. The theoretical literature gives conflicting predictions on how bank competition should affect bank stability. This conflict on the direction of the relationship between competition and stability leads to two hypotheses, i.e. competition-stability and competition-fragility (Keeley, 1990; Boyd and De Nicolo, 2005). Studies have attempted to evaluate the relationship empirically and found mixed results (Jiménez et al., 2013; Ariss, 2010; Schaeck et al., 2009; Uhde and Heimeshoff, 2009; Yeyati and Micco, 2007). Furthermore, these opposite views suggest that a non-linear relationship may exist between competition and stability.

Therefore, this study analyzes the impact of bank competition and stability in linear and non-linear ways.

Bank size is the second variable of interest which is important for bank stability and has remained a part of discussions regarding bank supervision and regulation for bank stability. This phenomenon attracted much importance after the financial crisis of 2008 because large banks severely affected the economies of countries. Recent literature suggests that bank stability increases when bank size goes beyond a certain threshold. After the global financial crisis, prudential regulations including capital requirement have been increased. However, in emerging economies bank size may be beneficial due to economies of scales. This study investigates the bank size and its non-linear effect on bank stability.

Bank regulatory environment is important along with competition policy. Along with examining the competition stability relationship in emerging Asian and European economies, this study analyzes the role of regulation for bank stability. Historically, banking regulation has witnessed a stabilizing effect on the banks and economic growth. Enactment of the Glass-Stegall Act in 1933, along with the establishment of FDIC, imposed various restrictions on the business and activities of banks. Commercial and investment banking was also separated.

Apart from bank-level analysis, this study investigates the effects of competition at macro level by analyzing the competition-stability-growth relationship. It also studies how growth is effected during global financial crisis and systemic bank crisis and highlights the importance of the stable financial system during the crisis. This macro analysis is conducted for Asian and European economies in order to assess the competition-stability-growth relationship in a comparative way.

1.1 Theoretical Background

Competition fragility assumption (Keeley, 1990) considers that competition erodes stability. Fierce competition in the banking sector forces banks to take excessive risks in search of return, resulting in a fragile financial system as a whole. On the contrary, competition stability assumption, (Boyd and De Nicolo, 2005) argue

that intensified competition makes the financial system more flexible. The high competitive banking sector has led to declines in lending rates and support for the profitability of enterprises, resulting in lower bank risk. Moreover, in a non-competitive environment, banks are more likely to engage in moral hazard based on their own too-big to fail positions (Mishkin, 1999). Various researchers have reported their findings for stability-competition relationship (Jiménez et al., 2013; Ariss, 2010; Schaeck et al., 2009) but the results have varied.

The traditional view is that bank competition is harmful to financial stability. This view has been supported by many theoretical contributions (Matutes and Vives, 2000; Hellmann et al., 2000; Smith, 1984) and has undermined the notion of reduced bank profits and bank charter value due to competition. Resultantly, incentives of risk-taking of banks upturn as the opportunity cost of shareholder bankruptcy declines. Other theoretical work argued that the relationship between competition and stability can be explained by the capacity of banks to oversee borrowers when they earn a return (Allen and Gale, 2000b; Boot and Thakor, 2000) and higher diversification (Beck, 2008) and enhanced monitoring of regulator in a concentrated market. Keeley (1990) has proved this fatality perspective of competition, empirically pointing out that the intensification of competition in the U.S. banking sector has led to a decline in the value of charter and higher risk. Empirical work has witnessed the trade-off between stability and competition (Fungáčová and Weill, 2013; Berger et al., 2009).

In contradiction to the notion of competition fragility, Boyd and De Nicolo (2005) have shown that market forces increase the risk of banks. Stiglitz and Weiss (1981) suggest that borrowers tend to shift to higher-risk projects because lower competition raises lending rates. The "too big to fail" assumption allows the rejection of competition stability by assuming implicit or explicit government bailout insurance (Acharya et al., 2016; Demirgüç-Kunt and Kane, 2002) or the absence of a diversified portfolio of banks (Wagner, 2010). Recent empirical work supports this view (Pawlowska, 2016; Schaeck and Cihák, 2014; Boyd et al., 2006).

Therefore, both views of competition fragility (or market power stability) and competition stability (or market power fragility) can be discussed with respect to

either increase or decrease in competition intensity. Under competition fragility view, when competition decreases, banks exercise greater market power in collusive (or concentrated) markets and are able to charge higher loan rents (interest rate on loan) from its borrowers that increases the profit margin for banks. Due to higher profit margins, banks are able to constitute a buffer, in terms of higher charter (or firm) value, to mitigate crisis periods which makes them more stable. This reduces the instability of the banking system. On the other hand, when competition intensity increases, banks are not able to charge premium monopoly rents (high-interest rates) in less collusive (or less concentrated) banking systems due to loss of market power. Reduction in profit due to lower loan rent reduces the charter value (also called franchise value) of banks, making them more vulnerable in the time of crisis which in turn increases the risk-taking incentive for banks to search high profits by investing in risky portfolios. This makes the bank unstable and reduces the stability of the banking system. This view is also known as interest rate effect and charter value hypothesis due to exacerbation or reduction of loan rent and bank charter values respectively as competition intensity changes. This view is also supported by the bank's moral hazard problem (increase in risk-taking incentives for banks by investing in risky assets). It occurs when too-big-to-fail banks receive state guarantees (to large banks in the concentrated or collusive market) in the form of bank bail-out which increases the risk-taking incentives for banks due presence of state guarantee at the time of financial turmoil.

Competition stability view postulates that the borrower side of the relationship must be taken into consideration. In less competitive banking systems (collusive market), the market power of the banks increases (more concentration). This increases the lending opportunity as the banks are able to charge a high-interest rate. But this increases the borrowing cost for entrepreneurs. Payment higher cost of credit increases the entrepreneurial moral hazard and they increase their risk-taking incentive by inventing into the risky project to pay increased interest payment which increases the default rate of the loan. It reduces the stability of banks and makes the banking system unstable. This is also called the risk-shifting effect as the risk of borrowers is shifted to the bank due to moral hazard problem.

On the other hand, when competition increases, it reduces the loan rate due to loss of market power, and lower interest rates. This reduces the risk-taking incentive of the borrower and chances of loan default are reduced and increase the stability of the bank which reduces the instability of the banking system.

The assumption of competitive-stability argues that the big banks in competitive banking industry have reduced financial fragility through at least five channels (Adusei, 2015). First, Mirzaei et al. (2013) state that it is possible for large banks to effectively diversify the loan portfolio geographically in an efficient manner through cross-border operations as larger banks enjoy economies of scope and scale. However, there are two perspectives. The first perspective is that size promotes better diversification, reduces risk and allows banks to support their operations with less stable funds and capital. The second perspective focuses on the ability of large banks to operate in different segments of the market. Laeven et al. (2014) state that big banks may have a comparative advantage in marketing activities, which requires high fixed costs and economies of scale. Therefore, the prediction of the competition stability hypothesis is that there is a positive correlation between bank size and bank stability. The second channel is that big banks tend to provide credit regulatory / monitoring services. Third, supervisory bodies and regulators consider large scale, but lesser, banks easier to monitor. Hence, effective supervision of the concentrated banking system decreases the risk of contagion i.e. system-wide spread. Forth, bigger banks may enhance their profits and increase "capital buffer" making them less affected by macroeconomic shocks or liquidity problems. Fifth, bigger banks may raise their franchise value and prevent bank managers' excessive risk-taking behaviors. (Boot and Thakor, 2000; Boot, 2000) argued that is that bigger banks tend to choose credit rationing; so they earn less but higher quality credit investments, thereby increasing their financial stability.

Adusei (2015) discuss the bank size from competition fragility view and suggest that the bigger banks in competitive markets reduce their stability through three channels. First, diversification of assets and liabilities according to their riskiness

in a less competitive banking market may worsen stability, resulting in high operational risk (Mirzaei et al., 2013). Hence, it is expected that bank size negatively affects bank stability. Second, as large banks tend to increase lending rates and charge higher loan interest due to market power, the borrower may be forced to take on risky projects to repay the loan, which may increase the risk of default. Third, the important channel is too big to fail subsidies by the government through the central bank which is created due to worsened moral hazard problems because bigger banks are perceived as too big to fail institutions and receive government bailouts.

Mishkin (1999) argue that as the size of the bank expands, the moral hazard of managers, or risk-taking behavior, magnifies with the manager's awareness about the safety from the government. Laeven et al. (2014) posit that the notion of government bailouts saves the creditor of bigger banks in case of bank failure. Hence, larger banks bear lower costs of debt and are encouraged to use leverage and propensity to use volatile capital and involve in risky activities.

The noteworthy contribution of Keeley (1990) put forward the discussion about bank regulation in relation to stability. The study provide the theoretical framework as well as empirical evidence that easing the controls on U.S. banking lead to the loss of the market power of the banks, leading to the loss of their equity capital. This, in turn, adds to the incentive for banks to take extra risk increases the risk of failure. The current discussion in the literature about regulation is present in the context of capital supervisory power, restriction activities and capital requirements. It is noteworthy that most of the research related to the impact of regulations on risk is conducted with market power is theoretical in nature, and the empirical evidence is limited (Dell'Ariccia et al., 2017).

Accordingly, stringent capital regulation can affect bank stability and competition in a variety of ways. Strict capital requirements in the shape of higher capital may bring barriers to entry for new entrants. This limits competition and allows existing banks to accumulate power and to adopt less risky behavior. Next, the higher the overall capital requirement leads to the higher the fixed costs of managing banks, and the small number of banks are able to afford these costs.

Bolt and Tieman (2004), thorough a dynamic theoretical framework, state that stricter capital adequacy requirements lead to setting stricter acceptance criteria for allowing new loans. Repullo (2004) and Matutes and Vives (2000) state that capital requirements may not be sufficient and that supplementary regulations such as asset restrictions and deposit rate controls may help to reduce the risk in a competitive environment. In the framework of restriction on bank activities, the theoretical model of Matutes and Vives (2000) shows that in the presence of fierce competition, restrictions on assets may supplement stringent capital requirement and deposit insurance to limit risk-taking. Branch and activities restrictions implemented after the 1930s are aimed to limit competition and enhance stability (Beck, 2008).

Claessens and Laeven (2004) conclude that lower activity limits result in higher competition. In response, such intensification of competition may have an adverse impact on bank franchise value, bank profits and boosts risk-taking. On the contrary, lesser restrictions may allow the creation of huge financial groups, thereby reducing bank competition. Beck et al. (2004) find a positive relation between banking competition and restrictions. In addition, evidence from studies examining the diversification opportunities of banks in several market segments shows that activity restrictions affect competition and banking behavior. Lepetit et al. (2008a) found that greater dependence on fee-based activities leads to the underestimation of the default risk of borrowers. Lepetit et al. (2008b) find that the increase in activities related to non-interest income increases the risk of bankruptcy. Levine (2003) argues that, in general, strong regulators can improve bank governance and encourage competition. In fact, Agoraki et al. (2011) argue that as banks compete more, they assume additional risk. In this regard, a strong and independent regulator is able to prevent managers from taking extreme risk-taking.

Yet, the stance on competition growth relationship is mixed in literature. Two opposing hypothesis explains this view theoretically; first is the perfect information view and second is the asymmetric information view. Both views of perfect information hypothesis and asymmetric information hypothesis can be discussed with

respect to either increase or decrease in competition intensity. Both views link the bank competition with economic growth from the perspective of the bank-firm relationship. Perfect information hypothesis affirms a positive relationship between bank competition and economic growth whereas asymmetric information hypothesis postulates a negative relationship between bank competition and economic growth. The argument of both views is based on the availability of credit to the firms in the specific economy that increases productivity and in turn boost economic growth. Under perfect information hypothesis, a decrease in the competition (higher market power) causes the loan rates to rise in the concentrated market when complete information is available to all agents which reduces the financial intermediation activity and in turn harms the growth. It is also called the lending channel which affirms that increased financial intermediation activity boosts growth in the presence of high competition by providing lower loan rates that spurs loan growth and increased access to finance. However, asymmetric information hypothesis postulates that banks with high market power in collusive markets (less-competitive markets) are able to reduce information asymmetries by relationship lending as higher costs are associated with information acquisition. It eliminates the financing constraints and increases loan groan (higher financial intermediation) which increases economic growth.

1.2 Problem Identification

In recent years, the topic of financial stability of banks in relation to bank competition has gained momentous academic and policy maker's attention. This greater interest in the area of competition in banks is not only due to financial crisis. Along with the key purpose of attaining effective market competition, this issue has importance due to the crucial role of the banking sector in allocation of credit in the economy and intermediation services. Financial intermediation services are the basis for development in the economy which link users, who need funds for their needs, with capital providers and permit consumption decision to be smoothed across time.

Reduced competition in banking may be desirable according to the policymakers, because of the widely held view that higher stability of the system can be achieved because of softening competition. Charter value hypothesis can be the basis for such a widely held view, which postulates that competitive systems are more susceptible to instability and a higher rate of failures. The theoretical work is not in harmony regarding the impact of competition on bank stability. Prior work finishes up with the conclusion that due to the higher level of competition, moral hazard is intensified and banks deliberately take more risk (Allen and Gale, 2000a,b, 2004). However, recent theoretical work centered on optimal contracting theory purpose inverse relationship. Boyd and De Nicolo (2005) exhibit moral hazard framework in which the danger of bank failure significantly decreases as competition in the banking sector increases.

The conventional philosophy known as charter value assumption contends that gains of banks earned with expanded risk-taking are offset by the loss of franchise value. Banks may charge higher rates when they exercise more market power. Bank franchise value is reduced when competition increases which consequently boosts bank risk-taking (Repullo, 2004; Hellmann et al., 2000; Allen and Gale, 2000a; Keeley, 1990). On the contrary, Boyd and De Nicolo (2005) suggested that a reduced level of competition results in lesser stability in banking. As the loan market turns out to be concentrated more, banks charge increase rates on loans using their increase market power. Due to charging these higher rates chances of insolvency increase for borrowers, who consequently tend to opt for riskier projects as a response (Stiglitz and Weiss, 1981). This reaction of a borrower is not considered by the charter value assumption. Hence, higher chances of default of borrowers alter stability.

This work gives the idea that empirical investigations made in single countries are unable to provide conclusive and final evidence for competition fragility or competition stability assumption Fernández and Garza-García (2015); Liu et al. (2013); Fungacova et al. (2009). Some cross-country studies (Beck et al., 2006; Schaeck et al., 2009) reveal that banking systems with a higher degree of competition are less likely to face systemic turmoil. On the contrary, some studies

(Uhde and Heimeshoff, 2009; Yeyati and Micco, 2007; Boyd et al., 2006) support the view that high competitive banking systems usually experience a greater risk of failure. Hence, it is worthwhile to reexamine the link between competition and bank stability.

Moving away from competition-fragility / stability assumption, a third view reconciles these two strands of the existing literature. This suggests the presence of a U shaped relationship between competition and bank stability in a purely theoretical way. Hence, this study investigates the possible non-linear (U-shape) relationship between competition and banking stability. Based on too small to have scale economies and too big to fail assumption, Ibrahim and Rizvi (2017) investigates the non-linear effect of bank size on bank stability. This study identifies the bi-directional relationship as a hint on a possible non-linear effect. Hence, competition-fragility and competition-stability hypotheses also assert the presence of the non-linear relationships between competition and bank stability. The existence of a non-linear relationship between competition and bank stability is expected by Martinez-Miera and Repullo (2010) in a purely theoretical way. Their study shows the theoretical existence of this U-shape relationship in the loan market.

Banking stability has been studied in the context of financial stability before and after the happening of the credit crisis. Some experts consider these too big to fail banks one of the causes of the global financial crisis of 2008. As they take more risk and their moral hazard activities alter the stability and experts suggest that these banks must be divided into small banks along with stricter regulation. Other experts conclude that limiting bank size and the existence of small banks do not necessarily prevent banking system from a crisis. If small banks do behave in the same way, they may lead to systemic failure. The size restriction on banks may loss powers of having scale economies, improved monitoring, reduced borrowing cost, and effective intermediating function.

Bigger banks might get profit from economies of scale and are better able to achieve the benefit of diversification and improved monitoring. These strengths may be counterbalanced by too big to fail assumption which postulates that huge

banks take more risk. Assumption of too big to fail argues that in other words that there is binding on bank size. On the contrary, banks must reach some specific benchmark to reap the benefits of economies of scale. Therefore, this study considers the possible non-linear relationship between size and stability.

Increase the requirement of capital as described in the agreements of Base III is one of the significant responses against the financial crisis of 2008 for the betterment of justified regulations. However, these regulations may also include aspects of competition policy. Pragmatically, competition can be weakened directly through the implementation of several regulations on barriers on financial institutions, bank operations, scope, and space on restrictions on activities and indirectly due to incentives for merging with poorly formulated schemes of regulation.

Efficient regulation is important to improve competition stability trade-off. To make this possible, the degree of competition must be considered for the optimal design of regulation. For instance, in banking environment, capital charges must consider competition with more emphasis on stricter restriction in case of higher competition. Practically, the implementation of optimal regulations is difficult; this might be an understatement due to regulatory failure uncovered by the global financial crisis. Hence, due to the presence of competition stability trade-off, parallel coordination between competition policy and regulation is crucial in the banking environment.

This study examines the strength of stability-competition and size-stability relationships in emerging economies. After the global financial crisis, the impact of regulation on bank stability is still a considerably important issue for its effectiveness and its appropriate nature that can work in terms of risk-taking behavior Triki et al. (2017). Many studies admit that national governance Williams (2014), degree of concentrated control Haw et al. (2010), multiple supervisors, and external governance systems (Beck et al., 2006) can affect bank stability along with bank competition and bank size (Triki et al., 2017; Agoraki et al., 2011). In the same way, the present study aims to analyze a comprehensive set of these regulations like private monitoring, supervisory power, activity restrictions, and minimum capital requirement, and external governance.

Olivero et al. (2011a,b) argue that the Asian banking sector experienced a major improvement in competition, especially since the 1997-1998's Asian financial crisis and 2008's global crisis. The post-crisis era has seen a deliberate shift in the market structure in banking such as foreign bank entries, financial reform, mergers and acquisitions, deregulation, privatization, and financial integration. Besides, insurance companies, mutual funds and investment banks are competing with the core businesses of commercial banks (Yokoi-Arai and Kawana, 2007; Olivero et al., 2011a,b). The key role of these deliberate activities was to make financial institutions stronger against economic recessions. Hence, the Asian focus of banking stability is of great importance.

From the macro viewpoint, financial markets play a vibrant role in economic activities (Schumpeter, 1912). In particular, a wide range of research in recent years analyzes the character of financial markets in the context of economic activity, enriching early empirical work such as Gurley and Shaw (1955) and McKinnon (1973). Notable among these findings is that a stable financial sector is one of five key components affecting sustainable economic growth; the other four are inequality, structural transformation, underinvestment by government, and political motives (Stiglitz, 2016). This highlights how an unstable financial sector negatively affects sustainable economic growth (Owusu and Odhiambo, 2014).

Several papers study the relationship between financial development and economic growth in recent years (Craigwell et al., 2001; Khalifa Al-Yousif, 2002; Levine, 2005; Wolde-Rufael, 2009; Ngare et al., 2014; Pradhan et al., 2019; Creel et al., 2015). Most conclude that the development of the financial system positively affects economic growth. In contrast, researchers have given much less attention to how resilience and competition affect the banking sector, despite the fact that these characteristics can affect innovation, efficiency, and the quality of services offered in the economy. Additionally, more research is needed to elucidate that how the financial system affects economic growth, given that financial and economic theories suggest that the financial tasks executed by banking and non-banking firms play a vital role in promoting economic growth (Levine, 2005; Cole et al., 2008; Moshirian and Wu, 2012; Pradhan et al., 2017).

Further, Coccorese (2008) states that market power (which is linked to bank size and information asymmetries) has a positive impact on financial stability, which in turn positively affects economic growth. In the banking sector, competition is associated with capital allocation, access to finance, and economic growth. Competition drives companies to innovate, reduce product/services prices, and increase quality, which in turn increases choice and enhances growth (Amidu and Wilson, 2014; Rakshit and Bardhan, 2019). However, in a less competitive environment, borrowers are reluctant to borrow due to hold-up problems which, in turn, lowers the demand for loan financing. Also, in a less competitive environment, prices are usually higher and service quality is lower, which ultimately leads to lower demand and affects growth (Claessens, 2009). Similarly, one can justify the positive effects of bank competition on economic growth and financial stability (Fernández et al., 2016). However, international evidence in this context is missing in the literature. Any crisis in the banking sector also affects economic growth negatively, after all, as it affects the stability of the financial sector (Fernández et al., 2013). Hence, this study investigates how bank competition and financial stability affect economic growth.

Previous studies on the relationship between bank competition and economic growth show conflicting results. Conventional economic theories, for example, explain that market power provides an equilibrium between high interest rates and lower demand for financing (de Guevara et al., 2005). Any inefficient monopoly causes fewer investment projects to be financed, which in turn lowers economic growth when economic agents have perfect information. Accordingly, banks with market power will lower the incentives for customers who are interested in investing in sectors that need loans; this, in turn, reduces economic growth (de Guevara and Maudos, 2011). On the other hand, an higher market power leads to higher financing costs. Therefore, due to imperfect or asymmetric information, market power may incentivize banks to nurture relationships with their customers (relationship lending), which increases credit availability, reduces financial limits, and contributes to economic growth (Dell'Ariccia et al., 1999; Fernández et al., 2016).

The theory of industrial organization, for instance, shows that market structure

indicators alone (such as the Herfindahl index or other concentration indexes, and the number of institutions) cannot measure competition. Studying effective competition requires structural models but, to date, most research does not study banking competition using any specific structural model. Therefore, the results of those studies regarding the impact of market structure on the performance of the banking system, firm financing, and growth could reflect factors other than banking competition.

The economic and banking literature has yet to examine empirically how bank competition and stability shape economic growth, especially in a crisis period. Along with the direct effect that bank competition and stability have on economic growth, this study investigates the indirect effect that competition has on economic growth. Such an analysis of banking competition, financial stability, and economic growth has significant policy implications for bank regulators and governments, which motivates us to investigate this nexus. More specifically, this study shows how competition affects economic growth by influencing the stability of the banking sector.

1.3 Problem Statement

Bank stability is crucial for the smooth functioning of the financial system and economic growth. Competition within banks, bank size, and regulatory environment are important aspects that affect bank stability. Like other economic problems, literature has no consensus on the competition-stability-growth relationship. The studies of (Keeley, 1990) and (Boyd and De Nicolo, 2005) provide conflicting augment for competition stability relationship. This conflict is known as charter value paradigm (competition fragility hypothesis) and risk shifting paradigm (competition stability hypothesis). This bidirectional relationship leads to the investigation of competition stability relationship using multiple proxies and in a non-linear way. Furthermore, the measurement of competition has remained a controversial issue. This issue is addressed by using non-structural measures of competition. The size of the bank and financial stability relationship is also considered as controversial

stemming from the global financial crisis. The so-called too-big-to-fail hypothesis and too-small-to-have-scale-economies view are the theoretical basis of this controversy. Thus, as emerging economies have received extreme attention after the rise of the East (China), this relationship needs to be tested in emerging economies for linear as well as in a non-linear way.

Yet, finance growth literature provides significant evidence about the positive association of bank and economic growth. However, competition within the banking sector has not been explored much in the existing literature. Theoretical predictions about this relationship are based on perfect information hypothesis and asymmetric information hypothesis which describe negative and positive relationships, respectively. Beltratti and Stulz (2012) and Bostandzic and Weiß (2018) finds that some regional banking systems contribute more to global financial instability by comparing European and US banks and finds bank competition as one of its reason among others. Such a comparison is missing about Asian and European banks. So, there remains a gap for the comparative evaluation of competition-stability-growth relationships in regional banking systems of Asia and Europe.

1.4 Contributions of the Study

Banks are the key provider of financial intermediation services that smoothens the flow of funds between borrowers and savers, which ultimately leads to the well-being of the whole economy. This study provides significant insights into banking system stability. This study facilitates the banks in emerging Asian and European economies to know their degree of competition. Finding the effect of competition on bank stability provides guidelines to the central bank to formulate the competition policy to increase the stability of financial sector. Finding related to the bank provides the guidelines to executives of individual banks that they shall care about the size of their bank. The regulator is able to know about the more effective regulations for the financial system. This study contributes to the banking literature in the following ways. First, it investigates the relationship between competition and stability along with a relatively new idea of presence of

non-linear relationship, known as U-shape relationship, between competition and stability in emerging markets. Second, it analyzes the relationship between bank size and stability as well and its non-linear effects. Third, this study considers a comprehensive set of variables related to the regulatory environment, including the frequently used capital adequacy ratio to study its association with stability in emerging markets.

This study also contributes to the global economic and banking literature in the following ways. First, economic literature pays little attention to the role of structure in the banking market, and also mixed evidence is found in the research literature. So, this study adds to this end by directly analyzing the effect of bank competition on economic growth. Second, rather using a market structure measure based on industrial organization, such as the Herfindahl index or concentration ratios, this study uses a non-structural measure of competition in banking, i.e., the Boone indicator, which is a stronger proxy of bank competition (Van Leuvensteijn et al., 2011).

From the econometric viewpoint, this study uses various specifications of econometric models to increase confidence in the results. It estimates the results with a fixed-effect estimator to control for cross-sectional heterogeneity and a system generalized method of moment estimator to control the problem of endogeneity. This study also estimates the econometric model in static as well as dynamic specifications. Besides, this study also uses country-level bank stability measures rather than using bank-level measures as in Fernandez et al., (2016) and believes that the use of country-level measures is more appropriate as this study analyzes the link between country-level competition in banking and economic growth. Last, using an interactive term, this study focuses on how financial crises are associated with economic growth and to what extent stable banking sector supports during the crisis. As a further contribution, this study estimates the indirect effect of bank competition on economic growth due to stable banking sector which is not studied in the extant literature, to our best knowledge, so this study fills this gap. The empirical outcomes of this study are useful for policy-makers because banking

system plays a crucial role in the allocation of resources and ultimately enhances economic growth.

1.5 Research Questions

The following are the key questions of interest in the theoretical and empirical banking literature.

1. Does bank competition influence the financial stability of banks in Asian and European economies?
    (a) Is link between bank competition and stability of banks non-linear in emerging Asian economies?
    (b) Is link between bank competition and stability of banks non-linear in emerging European economies?
2. Does bank size influence the financial stability of banks?
    (a) Is link between size and bank stability non-linear in emerging Asian economies?
    (b) Is link between size and bank stability non-linear in emerging European economies?
3. Does bank regulatory and supervisory environment affects the stability of banking in emerging economies?
    (a) Does capital adequacy ratio affect bank stability?
    (b) Does the presence of explicit deposit insurance guarantee in the country affect the financial stability of bank?
    (c) Whether restrictions on the activities of banks affect financial stability of bank?
    (d) Whether capital stringency regulations influence financial stability?

(e) Does private monitoring is associated with the financial stability of banks?

(f) Do official powers of supervisory institutions determine the stability of banks?

(g) Does external governance have a stabilizing effect on banks?

4. Does financial stability affect economic growth in the geographically and economically connected Eurasian continent?

   (a) Does financial stability of banks affect economic growth in Asian countries?

   (b) Does financial stability of banks affect economic growth in European countries?

   (c) Is the connection between financial stability and economic growth different in Asia and Europe?

5. Do financial crises influence economic growth?

   (a) Does global financial crisis influence economic growth in Asian and European countries?

   (b) Does systemic banking crisis influence economic growth in Asian and European countries?

6. Does bank competition affect economic growth in the geographically and economically connected Eurasian continent?

   (a) Does bank competition of banks affect economic growth in Asian countries?

   (b) Does bank competition of banks affect economic growth in European countries?

   (c) Is connection between bank competition and economic growth different in Asia and Europe?

7. Does link between bank competition and financial stability different in Asia and Europe?

8. Does bank stability mediate the relationship between competition and economic growth?

   (a) Does the channeling effect of bank competition and economic growth exist in the Asian region?

   (b) Does the channeling effect of bank competition and economic growth exist in the European region?

1.6 Objectives of the study

Following are the specific objectives of this study: -

1. To assess the linear relationship between competition and financial stability in banking systems of emerging Asian and European countries.

2. To analyze the non-linear relationship between competition and financial stability in banking systems of emerging Asian and European countries.

3. To identify the linear and non-linear relationship between bank size and financial stability in banking systems of emerging Asian and European countries

4. To analyses the role of bank regulator and supervisory environment for the financial stability of banks in emerging economies.

5. To assess the competition intensity, strengths of banking systems and level of economic growth in Asian and European economies.

6. To identify the impact of bank competition on economic growth through the channel of financial stability in Asia and Europe.

7. To provide insights into bank competition, stability, and growth relationship for regulator and government.

1.7 Significance of the Study

Financial system crisis in the recent past has raised the concerns for the financial stability. Its effect on the economy has become an eye opener for financial system regulators and financial managers across the globe. Developed economies possess the resilience to withstand the adverse effect of disruption of financial systems (Ferry and Sapir, 2010). However, developing and emerging economies, are more vulnerable and has to focus on it and tries to detecting weakness well in time and take corrective measures. In emerging economies, banks are the major provider of financing and intermediates the flow of funds between borrowers and savers, which is crucial for the growth of whole economy. This study provides significant insights to the bank management, government, and regulator in Asian and European economies. This study enables the regulator to know about the specific regulatory and supervisory measures for banks in emerging economies. It also signifies the importance of Basel capital requirements for bank management. Both regulator and bank management are able to know the importance of bank size with reference to financial stability. Moreover, this study highlights the formulation of formal competition policies in the emerging economies to boost the stability of banks. It has the implication for the policy makers as it highlights the importance of bank competition and financial stability to increase economic growth.

1.8 Research Philosophy and Approach of the Study

In social sciences, it is worthwhile to know about the philosophical view point of the research study. Initially, this section discusses the basic concept of these philosophies. Based on this introduction, it is easy to relate the appropriate philosophical approach behind the present study. Basically, ontology and epistemology together forms a research paradigm which are related to what is knowledge and the way it can be discovered is subjective or not, respectively. The fundamental assumptions behind the research in the social science address these two important

questions. The first is that knowledge in the social sciences exists external of social actor second is that what should be the acceptable knowledge in social sciences and how it can be unraveled. Therefore, ontology refers to the examination of the nature of being (or reality). It is interested to answer the question that what actual the reality is? Does any reality exist? On the other hand, epistemology refers to the how can we know about the reality which already exists?

As mentioned earlier that ontology and epistemology leads to the origination of research paradigm. The present study built upon the objectivist approach of ontology and positivist approach of epistemology constituting the research paradigm. The present study uses the deductive reasoning approach because the hypotheses are being tested based on existing theories. The rationale of this approach is the testing of existing theories i.e., charter value hypothesis and asymmetric information hypothesis. More specifically, this study investigates the relationship of bank competition and financial stability on economic growth by testing these two theories in Asian and European context and supports the existence of reality independent of social actors. It is believed that the growth of the economy can be associated with bank competition and financial stability of the banking system of Asian and European economies. On the other hand, the epistemological stance of positivism in the current study is use of quantitative method and secondary data for obtaining the results i.e., the use of objective and statistical method to create scientific knowledge.

The axiological stance of the study states that fixed-effect estimator, as well as a system generalized method of moment (GMM) estimator to control unobserved heterogeneity, endogeneity, the dynamic effect, and reverse causality. By this means, this study tries to avoid biasness in the obtained results.

This study is structured as follows. Chapter 2 briefly the related literature. Chapter 3 presents the details of data, variables, and methodology. Chapter 4 presents results and discussions. The conclusion and policy implications are presented in the end.

Chapter 2

Literature Review

2.1 Competition in Banking

The banking sector has been experiencing concentration and competition as early as in 1990s as previous studies report frequently. Structure-conduct-performance (SCP) hypothesis can be used to explain this competition because this hypothesis argues that marketing saturation as well as bank competition and concentration negatively affect the structure, conduct, and performance of banks in negative ways from a social point of view. A simple measure of concentration is used by researchers to test the SCP hypothesis and this measure is known as: n-firm concentration ratio (CRn) or Herfindahl-Hirschman Index (HHI). Both HHI and CRn are inverse indicator of intensity of competition that indicates market power exogenously. In this competition measure, all banks in terms of their size and type are treated equally. There are several research studies in 1990s that treated bank profitability and prices as an endogenous measure of SCP but they are limited to or focused to the local U.S banking. But, in the current research environment, several evolutions have occurred and studies are now investigating and exploring the above elements as exogenously.

Research in current literature is advanced relative to simple approaches of the past. In todays research, generalizations are being made beyond the SCP hypothesis and different models of competition in the banking industry are being tested

innovatively. Research studies have also found loopholes in HHI and CRn and suggested more advanced methods to be used for the measures of competition, including indicators that consider the size and type of banking corporations as an important variable affecting competition unlike traditional methods that treated them equally. Research methods recommend to include service quality, efficiency, and risk as indicators of banking competition and concentration. In simple words, researchers are focusing on expanding the focus of their studies from mere local US markets to other US banking markets and across other countries.

A large number of research studies have indicated that growth is the outcome of financial development of an economy, but financial development is dependent upon the strength of the legal framework as well as institutional characteristics of an economy (Levine, 2003). This dependence of financial development on legal framework and institutional characteristics can be noticed at both the microeconomic and macroeconomic levels. In some studies, such as the study of (Beck et al., 2004), researchers even have noticed sustainable financial development in economies that have a strong legal framework. Such financial development and growth further promote foreign and local direct investments (Rajan and Zingales, 1998).

2.2 Bank Concentration and Competition: Evolution of Research After US Deregulation

Early studies of 1990 argued that the US banking market was concentrated (measured though HHI and CRn) and that is why they charged relatively higher rates while providing loans to SMEs and retail deposits received the lowest rates from these banks (Berger et al., 1998). According to some studies (Neumark and Sharpe, 1992; Hannan, 1991), deposit rates of such banks are relatively lesser responsive to fluctuations in interest rates of open market. Findings of these studies confirmed the SCP hypothesis. This is because, as per SCP hypothesis, bank concentration and competition have negative impact on bank conduct and performance. It is also

interesting to note that previous literature has an agreement that these concentration measures did not have a strong relationship with stability and profitability especially when market share is taken into consideration while studying such relationship. This raised a debate that whether market powers should be exercised or alternative, efficient structure (ES) hypothesis should be endorsed according to the above stated findings. ES hypothesis states that market share gains of efficient firms are endogenously affected and reflected by high concentration (Shepherd, 1986; Smirlock, 1985). A weakness in SCP hypothesis was found by Bresnahan (1989) and some other studies that it considered concentration, profitability, and prices are endogenous.

The research literature has evolved significantly after 1990s. Other methods have been used as an alternative to SCP hypothesis. For instance, studies tried different improved versions of SCP and ES hypothesis and found better results regarding the impact of efficient and market power on profitability, but they could not be generalized as the studies conducted in different markets with numerous varying variables and dynamics.

There are cases when researchers suggested the use of alternative indicators of competition that had fewer problems related to endogeneity. For example, some studies use the variable number of firms in the market (as market exit and entry of firms take a long time in the banking industry due to extreme levels of commitment and investment) while some studies also distinguish between competitive powers of market leaders and competition marginality in the US banking industry (Dick et al., 2003). More direct measures of competition such as oligopoly and contestability are explored by some research studies (Shaffer, 2001).

Some studies even include indicators related to restrictions on entry, regulation, and other legal barriers to competition in the banking industry. Some studies even include indicators such as rights of creditors and shareholders, openness of trade and entry, and financial regulations. All these studies report that these indicators have a significant impact on intensity of banking competition and also have significances for economic growth due to the banks (Porta et al., 1998).

Later studies also find that size of the banks might affect the competition in the banking industry. More interestingly, it is found that small banks might enjoy more benefits relative to large banks because they are considered as community banks. It is because these small banks are supposed to directly support the small and local customers and they are more flexible in providing retail-based banking services relative wholesale-based banking services that directly support the common man (DeYoung et al., 2004).

Technologies are also considered as an important variable that can shape the competition intensifies in the banking industry. Large banks have large pockets and, thus, have more access to advanced technologies that may affect the customer satisfaction and banking operations. On the other hand, small banks have little reliance on technology and they might be at some competitive disadvantage as they rely mainly on relationship skills to enhance customer satisfaction (Berger et al., 2005). Also, small banks have more agency problems relative to large banks as information cannot be transmitted softly among all layers of management (Stein, 2002).

Despite the above argument, it is found that large banks provide less credits to SMEs relative to smaller banks and they are focused on providing their assets to well-established organizations. Therefore, despite technological advantages, smaller banks have the competitive advantage as smaller SMEs are larger in number relative to well-established organizations in the US (Cole et al., 2004). The main reason for this is that larger banks rely mainly on hard-information-based transactions that complicate their dealings with the customers. This makes them less competitive and profitable relative to smaller banks, although they are trying to be more secure, safer, and transparent while lending to borrowers. On the other hand, although risky, but transactions of smaller banks are more profitable as they rely on soft-information-based transactions and they are able to deal with smaller and opaque clients that are usually larger in number (high risk high return phenomenon). It is also found in several research studies that major GDP growth in the banking sector of an economy depends upon the number of smaller banks it has in its banking sector. It is because, as discussed earlier, smaller banks are

able to cater the needs of a large amount of customers and they have relatively higher SME employment ratios and more lending relative to larger banks (Berger et al., 2004b).

On the other hand, the number and shares of larger versus smaller banks in an economy do not have a relationship with SME credit availability (Berger and Mester, 2003). This element can be specifically found in the banking industry in the US. It is because banks and customers are mature enough to find mutually beneficial relationships with each other that reduces the impact of the size of the banking corporation on competition. For example, a large number of banks in US frequently entered into a state of mergers & acquisitions to reduce the intensity of competition as well as to find mutual benefits. But, it is important to note that this trend affected the SME lending of such setups as small banks merging or being acquired by large banks focused on reducing their SME lending through soft-information-based relationships and they tried to focus on hard-information-based relationships (Strahan and Weston, 1998). But, this happens specifically to banks undergoing mergers & acquisitions as the gap created by such banks is filled with competing banks as other banks react to an increase their market shares by treating the deprived SMEs through soft-information-based relationships. This is the main reason for which SME credit availability is not affected by size of banks in US markets (Avery and Samolyk, 2004; Berger et al., 2001). This happens in two ways: (1) new smaller banks are formed to fill up the space created by mergers & acquisitions and (2) competing banks reacts by providing their funds to SME (Berger et al., 2004a).

It is also important to consider the role of foreign or multinational banks to intensify the competition in local markets. Multinational banks are large banking corporations that operate across borders and they might have some advantages as well as disadvantages relative to local or domestically owned banks. The advantages of multinational banks could be customers across borders, high end technology, and access to capital etc. Their disadvantages could be local cultural barriers, distant management, varying economic environment, and difficulty to establish or maintain soft-information-based relationships. The majority of the studies argue

that multinational banks have so many advantages that these advantages may negate the effect of their weaknesses, especially in developed economies like US (DeYoung and Nolle, 1996; Berger et al., 2000; Claessens et al., 2001). One of the largest barriers for multinational banks is regulatory restrictions for entry into local markets. The impact of such regulatory restrictions can be so large that they sometimes define the bank interest margins of multinational banks entering into a new territory Levine (2003). This signifies that local barriers and market contestability can be an important factor affecting the competition and profitability of banks despite their size, advantages, and origins.

Lending behavior of multinational banks in developing and developed economies are often dependent on the competitive advantages these banks have in local markets and this affects the credit availability in local markets as well (Berger et al., 2004a; Clarke et al., 2002, 2005). But, one element is common is all multinational banks and that is their size and advantages that can also become their disadvantages in some scenarios. For example, the majority of the SMEs in developing economies are smaller and these banks could never cater the needs of such SMEs due to their hard-information-based relationships and lending policies (Berger et al., 2001). Also, in those economies where government intervention is more, state-owned banking corporations lead the markets and there is relatively less intensity of competition that also lead to negative economic consequences (Barth et al., 2001; Levine and Barth, 2001; Barth et al., 2004; Berger et al., 2004b; La Porta et al., 2002).

Research is not limited to exploring merely the simple profit and price measures to understand the intensity of banking competition, performance, and concentration in economies but it has expanded to explore deeper impacts of structures and dynamics of banking markets on economic performance. For example, Berger and Hannan (1998) find that the banks that have high market concentration do not experience cost efficiency due to managers reduced efforts. Even some research studies argue that banking market concentration in the United States is not affected by consolidation of the US banking industry. On the other hand, consolidation of banking industry result in improvement of banking services to the

consumers in terms of banking technological developments, increase in the number of branches, and access to ATMs Board of Governors (Dick, 2006). A study indicate that banking corporations involving in mergers are unable to enhance their cost productivity, but they rather succeed in enhancing their profit productivity in 1990s. This proves the fact that when banks are able to offer premium and high-end services to customers through mergers & acquisitions, consumers are also inclined to reward more amount to the banks for provision of these services (Berger and Mester, 2003).

Another study shows that a majority of the banks tried to protect their franchise value in high concentration and they tried to do so by keeping their risks low. But, this negatively affected their quality and service delivery that further affected the stability of the bank (Keeley, 1990). For example, it is found that majority of the banks in concentrated US banking markets tended to invest a little amount in construction and land development projects to keep their risks low. This affected their profitability and financial cycles and effects of this could further be felt in the quality of services as low profitability that led to cost challenges for such banks and they tried to cover their costs by cutting their services as they had relatively less funds due to low profitability (Bergstresser, 2001). Interestingly, majority of the studies found that banks usually grew and gained competitive advantage by gaining diversification advantages through geographical expansions as well as mergers & acquisitions. It is because diversification enhances the focus of the banks while serves as a means to diversify the risks of such banks as well. The returns earned in one high risk in their portfolio outweigh or level the losses incurred in other portfolios. According to the studies (Akhavein et al., 1997; Hughes et al., 1996), managing a combination of high and low risk enhances the overall return and profitability of such banks (Akhavein et al., 1997; Hughes et al., 1996). It can be summarized from the findings of these studies that portfolio diversification strategy of the bank defines the expected returns and performance of the banks.

Moving forward, a large number of studies have also explored the influence of competition and concentration in banks for non-financial industries that run parallel to financial industries and/or that look for the banking industries for financial

services. SCP hypothesis argues that market concentration leads to fewer bank lending caused by the high prices, but alternative hypothesis suggests that bank concentration even encourages more endured lending relationships because lending options for borrowers are reduced due to high levels of mergers & acquisitions (Petersen and Rajan, 1995). Moreover, the disrupting competition intensifies in the banking industry through barriers of entry, legal frameworks, and interstate banking restrictions can have both favorable and/or unfavorable consequences of the credit available for SMEs, economic growth, and banking industry productivity.

Some studies have found that concentration or restriction on competition have negative effects on the economy as it restricts new firm creation, employment, and economic growth while making a market exit difficult (Beck et al., 2003; Berger et al., 2004b; Cetorelli and Rajan, 2003; Cetorelli and Strahan, 2002). On the contrary, a number of studies also recorded positive association of concentration in banks as growth rates and bank lending are increased to borrowers as their lending options for borrowers are limited (Bonaccorsi di Patti and Dell'Ariccia, 2004; Bonaccorsi di Patti and Gobbi, 2001; Cetorelli and Gambera, 2001; Zarutskie et al., 2003).

These studies explore the impact of concentration in banking on the overall financial system in the economy. It is important to discuss here concentration-stability view of the banking concentration. As per this view, if an economy has a few large banking corporations instead of many small organizations then that the industry is more stable because these large banking corporations would be more diversified, stable, and profitable while they will be easier to monitor and check. Also, the few corporations would be more resistant to market or economic declines (Allen and Gale, 2000a,b).

The opposing paradigm of concentration-stability is concentration-fragility view that argues that if an economy has high concentration, then it is relatively less stable because the organizations in such settings would be prone to take higher risks and their policies would be less safe than a competitive or saturated industry. This would make them prone to several economic shocks and market dynamics (Mishkin, 1999; Carletti et al., 2002).

The effects of mergers & acquisitions (M&A) on bank prices have also been explored by some research studies. It is worth noticing that M&A upturn the concentrations in the banking industry. Some studies argued that this resulted in unfavorable prices for consumers as few banks control the prices of the whole market or industry. On the other hand, this resulted in the enhancement of efficiency savings that are further passed on the customers resulting in more favorable prices. It is interesting to note that studies have revealed mixed findings for the impact of M&A on bank rate (prices). There are a number of studies that argue that M&A increase the bank concentration and result in unfavorable prices (loan and deposit) for consumers (Prager and Hannan, 1998). On the other hand, there are studies that found that M&A have little to no impact on prices in the banking industry (Akhavein et al., 1997). Research studies conducted in Italian context also find mixed findings (Sapienza, 2002). At this point, interestingly, short-term effects of mergers & acquisitions on prices differed from their long-term effects. For example, a study conducted in the Italian context indicates that short-term effects on M&A on prices are unfavorable to end consumers. On the other hand, same M&A has a favorable long-term effect on prices for the consumers (Panetta et al., 2004).

Finally, some of the research studies also explored the impact of geographic expansion on bank performance. For example, some studies (Petersen and Rajan, 2002; Hannan, 2003) find that those US banks that had a high geographic expansion could expand loan to more SMEs and they are able to win news customers not only in their own territories, but also outside their territories even with or with M&A (Petersen and Rajan, 2002; Hannan, 2003). In last decade, some of the US banks started providing services to household consumers beyond their territories (Amel and Starr-McCluer, 2002). Also, retail, financial services are being improved by a large number of banks by increasing their geographic expansion (Wolken and Rohde, 2002). Some studies have also examined whether the area has a fair geographic market compared to the United States state. With mixed results, some banks that are found in various local markets had to offer prices similar to the prices of statewide. Those markets are similar in offering i.e. The same

prices are offered as the prices are offered statewide (Heitfield, 1999). Both local level and state-level impact tests explains that concentration vary, but in some cases, even state-level concentrations are also localized that makes a difference (Heitfield and Prager, 2004).

While making international comparisons, some research studies included developed and developing nations to make international comparisons. For example, in order to examine the effects of bank concentration and competition, Panetta et al. (2004) take the sample of non-U.S. Developed nations, Beck et al. (2003) take the sample of developing nations, and La Porta et al. (2002) compare effects across many nations. The major difference between studies conducted in US and non-US context is that majority of the non-US studies treat the entire nations as one market that becomes a limitation because the majority of the nations in these days does not have a fragmented market as in US caused by strict legal restrictions for banking corporations in the US. For example, European Union nations are considered as a single market in certain studies but there are significant differences in the banking legislation of these nations, and they could never be as fragmented as the United States. Therefore, a clear comparison is not possible by treating European Union as single market (Dermine, 2003; Goddard et al., 2001).

2.3 Measurement of Competition

The majority of the societys savings are allocated, mobilized, and invested by banks. As a result, performance of banks is crucial for economic growth, industrial expansion, employment, and capital allocation of an economy (Levine et al., 2000; Beck et al., 2000).

Recently, many banking corporations around the world have entered in M&A to avoid the competition that has resulted in a high concentration of banking industries around the world. This has resulted in consolidation of banking industries as public policy debates have increased with increasing concentration and barriers to competition in various developed and developing banking markets (BIS, 2011; ECB, 2001). Research studies have not taken all theoretical issues into account

while analyzing bank concentration and competition. There is some relationship between market growth and structure highlighted by certain research studies, but this linkage is not clear in terms of market competition as can be observed in general contestability literature (Baumol et al., 1983). Some studies use concentration as a measure of bank competition. However, it really does not capture the competition intensity in banking. As per long existing theories of industrial organizations, market indicators alone do not reflect the competitiveness of an industry like the Herfindahl or other concentration indexes (CR5, CR3), and number of institutions, or ownership structure, such as the degree of state or foreign ownership. On the other hand, a non-structural model is required to analyze the intensity of bank competition.

In the modern world, an effective industrial organization based model is required to analyze the competition intensity among banking sectors and only it can answer the concerns raised by contestability literature. Moreover, a comparison of results through different approaches while analyzing the impact of market structures on competition should be used as an additional measure of competition. Claessens and Laeven (2004) use an alike structural measure of bank competition in fifty economies. It is also analyzed in thier study that how does market structure, presence of foreign banks, competition, and legislation affects the competition in a banking industry. But, this study do not analyze the relationship between this competition measures with other economic variables such as industrial growth.

It is important to note that the industrial organization based approach can enable the researchers to address the issues raised by contestability literature. The methodology used by Panzar and Rosse (1987) provides an effective measure of competition in theoretical way and it is an efficient model to measure the competitive intensity and competitiveness of banking corporations. Research studies found different indicators to compete in terms of competition measure and they could be divided into two categories which are as follows: the first category involves traditional structural measures of competition while the second category involves non-structural or new empirical industrial organization models. Concentration indices are used by traditional measures as they believe in an efficient structure

hypothesis or SCP hypothesis. Contemporary or non-structural measures include the mark-up test of Bresnahan (1989) the Panzar and Rose test (Molyneux et al., 1994; Bikker and Haaf, 2002) or measures derived from MontiKlein-type banking competition models (Klein, 1971; Monti et al., 1972), such as Lerner index (Fernández and Garza-García, 2015).

SCP paradigm states that conduct of banks is affected by market structure. Therefore, all the initial studies on industrial organizations use variables reflecting the market structure to measure the intensity of bank competition that is further measured by assets held by banks, number of banks, and HHI. But, this SCP approach has some serious loopholes that affect its robustness and consistency to represent the intensity of competition in markets. Also, the market structure is considered as a weaker indicator of competition in banking as argued by theory of efficient-structure (Demsetz, 1973) and theory of contestability (Baumol et al., 1983). By realizing the weaknesses of the SCP hypothesis and structure as a proxy of competition, several research studies explore by collecting empirical data on the intensity of competition in banks. The most common and non-structural approaches are the Panzar- Rosse H-statistic, Lerner index, and the Boone indicator. As far as the study of Panzar and Rosse (1987) is concerned, it introduces a measure that identifies the nature of competition by transmitting input prices on firms revenues.

The basic point of this transmission of input prices is to show that these transmitted prices varies and this variation is dependent upon the nature or the intensity of competition in the market. As a result, regression between input prices and firms revenues is used to tap intensity of competition in the market. If a firm has a weak transmission of input prices to its revenues, then it is supposed to exercise market power in pricing and greater values reflected higher competition in the banking industry. Lerner index measures the intensity or nature of competition through individual market power. Market power is actually the divergence between marginal costs (relative to price) of a firm and its price. Higher market power is reflected by higher values or readings of Lerner index. Finally, indicator presented by Boone (2008) where he argued that higher profits and higher market shares reflected the superior performance of efficient firms and this effect is

stronger when competition is strong in the industry. As a result, Boones indicator suggests to establish a regression of profit on marginal cost in logarithm to get the value of competition.

In the following section, these techniques are discussed in detail:

2.3.1 Lerner Index

Some studies (Cetorelli and Strahan, 2006) follow the earlier tradition of industrial organization and use concentration to measure bank competition. However, it is widespread that concentration measures may reveal important industry structural characteristics but it is not a good indicator of competition (Beck et al., 2006; Claessens and Laeven, 2004). In contrast, recent literature advocates the use of price-cost based margin indices (Lerner, 1934), H statistics (Panzar and Rosse, 1987) and profit elasticity (Boone, 2008). Since marginal cost data is often not available, an important first step in building a competition index is to use econometric methods to estimate marginal costs. The measurement of competition has been made in industrial organizations from very earlier, seeing back to Lerner (1934). Lerner defines his "monopoly power index" (or "degree of monopoly"). Lerner index measures the intensity or nature of competition through individual market power. It involves marginal costs (MC) and price (P) set by the firm and has a range from 0 to 1. A number closer to 1 indicates high market power while a number closer to zero reflects the low market power. As this index involves marking up in banking, therefore, most of the studies in banking use Lerner to identify the nature of competition in the market (Brei et al., 2020). Measuring the difference between revenues and marginal costs is the primary concern of this index. Revenues or prices of output refer to total revenues to total assets while a translog cost function is used to obtain marginal costs. A value nearer to 0 refers to high competition and a value nearer to 1 refers low competition. Moreover, 0 refers to perfect competition in market while 1 refers to absolute monopoly.

In Lerner index, pi and mci represents firms price and marginal cost respectively. The index may attain a value between 0 to 1. The Zero reflects perfect competition

and increasing values indicate greater market power. The Lerner Index is by far the most widely used and popular measure of market power and the intensity of competition. It is very popular as it is simple, maybe interpreted intuitively and data requirement is modest. Marginal Cost is derived from a translog cost function from Berger et al. (2009) and in mentioned in section 3.4.

To calculate translog cost function, OLS estimator is used. The study also includes trend (T) for controlling the evolution of translog function with the passage of time. The cost represents a banks total costs divided by the total assets where total assets depicts a proxy for bank output (Q). W1, W2 and W3 represent three input prices of labor, funding, and physical capital respectively. The ratios are calculated for all of these three in terms of personnel expenses to total assets, interest expenses to total deposits, and other administrative and operating expenses to fix assets of the bank respectively (Clerides et al., 2015; Kasman and Kasman, 2015; Fiordelisi and Mare, 2014; Beck et al., 2013).

TCit refers to the total costs of the bank in millions including interest, commission, fee, trading, personnel, admin, and operating expenses measured whereas Qit refers to quantity of output (total assets). Computation of the Lerner Index is a simple percentage if data is available as it gauges the capability of banks to charge prices above marginal cost. Due to the rare availability of marginal cost data, marginal cost estimates are obtained on the basis of either a cost function or theoretical models generating equilibrium conditions. The former method is usually used in the banking literature, while the latter is preferred by industrial organization economists. The NEIO literature is marked by the use of equilibrium conditions (Bresnahan, 1989). This study will involve the same techniques to estimate the cost functions in the banking literature.

2.3.2 Penzer-Rosse H Statistic

In many historical banking studies, Penzer-Rosse measure has been the measure to assess the competition. The basis of this statistic is the test done for the purpose of measuring monopoly equilibrium that is proposed by Panzar and Rosse

(1987). It is actually the methodology of Rosse and Panzar (1977) further expended by Panzar and Rosse (1987). According to them, while conditions are general, the sum produced by monopolists factor price elasticities reduced from the equation of revenue ought to be a non-positive. In addition to that in the settings of oligopolistic models, the same sum has to be strictly positive. They further on notify this result rests upon comparatively simplistic oligopoly models and therefore can be generalized less than the results produced by the monopoly. Further emphasis is upon the point that monopoly which faces an elastic demand curve which is perfect, under the influence of some specific condition, can show a negative value for the H-Statistic. Let aside that monopoly does not have market power. These assertions have given rise to a considerable amount of literature most notably in the sector of banking employing the H-Statistic for measuring the competition. It is donated as PR H-Statistic and it anticipates the degree to which changes in factor input prices are represented in (equilibrium) revenues generated by a specific or particular bank. In specific terms, PR H-Statistic is an estimate of the sum of elasticities of bank revenues with respect to its input prices and it used a reduced form of revenue equation to provide its measures. There are two interrelated steps involved in this measure. Initially, a regression of the logarithms of gross total interest revenues on logarithm measures of bank input prices is run and all the coefficient of input prices are summed or added. The prices also involve the prices of personnel, deposits, and equipment and fixed capital. Higher competition is represented by greater values of PR H-Statistic. If there is a monopoly is the market, then marginal costs will increase due to increase in input prices while outputs and revenues would also decrease as demand curve will move in the downward slope and this situation represents a state where PR H-Statistic is closer to 0. On the other hand, a 1 or near to 1 reading represents perfect competition that would result in an increase in marginal costs and total revenues resulted in an increase in outputs and demand curve will move in an upward and positive slope. To calculate this H-statistic, following reduced-form revenue regression is estimated:

Where Pit refers to the total income (interest and non-interest) divided by total

assets and measures the output price of loans. The value of W1 input price of loans. The value of W2 measures personnel expenses. The value of W3 refers to the input price of capital. The control variable Y1 refers to equity assets ratio, Y2 refers to the loans to assets ratio, and the third control variable Y3i refers to total assets. In this formula, the subscripts of i and t show the banks and its reporting years respectively.

H $\leq$ 0 shows monopoly

0 $<$ H $<$1 shows monopolistic competition

H = 1 shows Perfect competition

When the sum of elasticity of revenues with respect to three input prices is concerned, then H-Statistic would be calculated as $\beta 1+\beta 2+\beta 3$ and it ranges from -∞ to 1.

Apart from its strengths, this approach has various limitations. The major flaw lies in the interpretations of this measure. Contrary to above mentioned interpretation of PR-stat, Shaffer (1983) and Bikker et al. (2012) report that a negative value may occur theoretically in case of high competition when average cost is constant or when the number of firms are fixed in short run, respectively. Complexity of interpreting H-statistics is further aggravated due to doubt on the continuous nature of this measure (Bikker et al., 2012; Shaffer, 2004b). Moreover, this measure is also prone to monopsony power which requires the exogenously determined honogenous input prices. A specific bank may act as monopsony when no alternative saving products exists (Shaffer, 2004a). It leads to the higher values of H-statistics and mask market power on output side (Leon et al., 2015). However, other non-structural competition measures are less prone to monopsony.

2.3.3 Boone Indicator

Boone (2008) propose another technique to measure competition called relative profit differences (RPD) and made a new addition to the family of measures of competition and performance measures. This model is based on the theoretical models of oligopolistic competition and considered that profit difference in more

and less efficient firms intense the competition. Let assume that competition has increased due to declining entry costs or the goods becoming closer to alternatives. This results in decreasing profits for all but inefficient firms suffer severely. In other words, the profits of high-efficiency firms increase relative to the profits of inefficient firms because intensifying competition result in more severe penalties for less-efficient firms. RPD is a theoretical construct practically difficult to calculate. Boone (2008) proposed profit elasticity (PE) as an empirical equivalent of RPD. PE is the percentage decrease in profit due to 1% increase in marginal cost.

The PE may be called the Boone indicator and attain a negative value as there is an inverse relation between profits and marginal costs. The PE of an efficient firm will be slightly lower as profits less affected by change in marginal costs. It may be read as for example, a P.E of -0.3 indicates that 1% increase in marginal cost will lower profits by 0.3 percent.

A greater absolute number of the PE can be interpreted as a decrease in the ability of the bank to contain its losses due to an upturn in competition. The profit elasticity, therefore, links bank performance to differences in efficiency (in terms of marginal cost). The larger value of PE interpreted as the diminished ability of banks to contain their losses due to increased competition. The PE, therefore, relates the performance of banks to efficiency in terms of marginal cost.

The measure introduced by Boone estimates the performance of firms in terms of profits as a resultant element of efficiency of the firm. As a result, it establishes on the relationship between efficiency and performance or profits of the banks. It also analyzes the elasticity of profits and its association with marginal costs of the firm. A logarithm of profit such as Return on Assets (ROA) or Return on Investments (ROI) is used to calculate the elasticity of the profits and the logarithm of profit is regressed against logarithm of marginal costs. Furthermore, coefficients of marginal costs reflect elasticity and they are calculated by a derivative of a translog cost function. As per Boone Indicator, banks in current world are more efficient and their higher return profits and returns. It is because competition in modern markets has increased that have allowed for only efficient banks to survive that earn high profits with their superior performances. It is because, as per

Boones argument, market share of inefficient firms is reallocated to efficient firms that capture the whole market and market efficiency increases resulting in more profits for these firms. Symbolically, PE can be estimated from the equation:

$$\ln\pi_i = \alpha \ + \beta \ ln(mc_i)$$

The coefficient βi is the desired profit elasticity index of market power. On the basis of intuition, the above equation can be look in two ways: (1) as a direct relationship between profit and marginal cost and (2) as an indirect relationship between profit and efficiency. Profitability may assume any value, so it is a continuous indicator of market power.

It has already been used in empirical applications in various industries e.g., (Delis, 2012; Van Leuvensteijn et al., 2013). The index has also received some criticism; for example, (Schiersch et al., 2010) show that the profit elasticity makes critical assumptions relative to firm size (the biggest firms are assumed to be the most efficient) and relative to the definition of the extent of the market.

2.4 Competition and Financial Stability

In the current world, the majority of the countries are seeking consolidation of banking industries that are also raising a debate among researchers and industry experts regarding the impact of this consolidation on financial stability. Also, as per economic theory, there are conflicting predictions regarding the association between competition and competition (Badarau and Lapteacru, 2020). Different hypotheses are generated to explain or predict this association which are explained in the following sections.

2.4.1 Charter Value Hypothesis

A large number of research studies have argued that low concentrated banking markets lead to financial crises while banks are safer for such risks in concentrated

banking sectors (Allen and Gale, 2000b, 2004; Saif-Alyousfi et al., 2020; Nguyen and Tran, 2020)There are a number of reasons for it. First of all, market power and bank profits are boosted in concentrated banking systems that provides protection to banks against financial disasters while increasing the franchise or charter value of the banks. Also, it reduces incentives for managers and bank owners to take larger risks making the risk management for such banks effective (Matutes and Vives, 2000; Hellman et al., 2000)The second reason is that fewer banks in a concentrated banking industry are easier to monitor relative to a large number of banks in low concentrated banking industries. This makes the supervision and policymaking significant effective and easier reducing the chances of systemic crisis. Allen and Gale (2000a) further argue that although US has many large banks it supports this concentration-stability view as low concentration has been the reason for making banking industry crises in Canada and Europe.

The concentration-stability view is further supported on the argument that other things in the banking industry are held constant as policymakers and bankers have a few banks to handle and compete. Also, this system leads to larger but rather diversified banks relative to small banks in less concentrated systems. These larger banks are more financially viable and they are relatively less fragile as compared to smaller banks. A large number of studies and models support this phenomenon such as models by Boyd et al. (1998), Diamond (1984), and Allen (1990) . On the other hand, there is also a supporting view to this one that argues that bank consolidation is counterproductive for the concentration of the banking industry and it negates the impact of concentration. For example, Hughes et al. (1996) argue that the risk of banking portfolios increases in case of bank consolidation and similar policies. Conversely to this hypothesis of Charter Value, Boyd and Runkle (1993) further argue that there is an inverse association between volatility of bank assets and size of the banks but this study provide no evidence that larger banks are more likely to fail relative to smaller banks. As compared to this study, De Nicolo et al. (2001) find a negative association between bank size and the failure probability banking industry in the economies of the US, Japan, and European economies.

2.4.2 Risk Shifting Hypothesis

There is also an opposing view of the Charter Value Hypothesis that is known as Risk Shifting Hypothesis. It states that bank fragility is increased in concentrated banking structure. First of all, Boyd and De Nicolo argue that profits are boosted by market power, but a powerful bank ignores the effectiveness and productivity benefits of a saturated market and it becomes overly relied upon its market power. As a result, they start charging higher interest rates leading to a financial bubble. They also argue that the concentrated nature of the market causes this behavior of the banks. According to the theoretical model of Boyd and De Nicolo (2005), it is further suggested that higher interest rates encourage large banks to take higher risks that can be detrimental to their financial stability. This translates into bank fragility because playing riskier increases financial challenges for banks in concentrated markets resulting in systemic distress. Also, it is observed in the study of Caminal and Matutes (2002) that low credit rations, larger loans, and higher chances of failure could be found if there is relatively less competition in the market and it further lead to multiplicative uncertainty. This view is also known as concentration-fragility view. This view further argues that bank systems become diffuse in concentration when there resulting in fewer banks in a concentrated banking market. In this scenario, policymakers become more focused and concerned upon bank failures as they are left with a few options. Therefore, in this case, policymakers increase the subsidies to the banks that further encourage them to take larger risks as funds are not their own but provided by the government. This enhances the fragility of the banks and the system (Mishkin, 1999).

A large number of studies also investigate the concept of deposit insurance and its impact on decisions taken by the bank. Such studies (Chan et al., 1992; Cordella and Yeyati, 2002; Keeley, 1990; Matutes and Vives, 2000) argue that banks incentive to take larger risks increase as a consequence of mispriced deposits. Due to mispriced deposits, larger banks receive more incentives and they take significant risks in the market. On the other hand, regulators and policy makers do not treat all banks equally that further intensify the connection of bank size and risk taking behavior of banks.

A large number of countries in concentrated markets have implemented too large to fail regulations where all the liabilities and obligations of the bank are protected by the governments with or without insurance because such economies are concerned about economic and social consequences of failure of such large but few banks and they put in all their efforts to protect them resulting in an increase of government subsidy (O'hara and Shaw, 1990). Also, in such settings when deposit insurance does not exist, banks have a tendency to take larger risks as they have limited liability (Stiglitz, 1972) which further increases risk taking of larger banks. This paradigm is also supported with the moral hazarad view. Banks can charge high interest rate in collusive market which increases the borrowing cost for entrepreneurs that triggers moral hazard problem. Entrepreneurial moral hazard provides the risk-taking incentives to borrowers to invest in to risky projects to pay increased interest payments which increase the default of loans. It creates a risk shifting effect and make the banking system unstable (Boyd and De Nicolo, 2005; Martín-Oliver et al., 2020).

Another argument made by the supporters of concentration-fragility view is that it is difficult to observe fewer banks in concentrated markets and also they strongly oppose concentration-stability view holders in this respect. They further base their argument on the fact that larger bank sizes enhance the complexity of the system making it difficult to be monitored.

2.4.3 Hypotheses Statements

On the basis of the literature mentioned in section 2.4 and relevant discussion, following hypotheses are developed in bank level analysis.

1. Bank competition has a negative influence on financial stability of banks in emerging Asian and European economies.

2. There exists a non-linear relationship between bank competition and financial stability of banks in emerging Asian and European economies.

2.5 Bank Size and Financial Stability

Farhi and Tirole (2012) explain that anticipation of implied public guarantee to bailout, particularly from systematically interlocked large-sized banks, incentivizes these banks to take high risk and act in morally hazardous way. This too big to fail assumption infers that the banking system having large banks become susceptible to shocks. Additionally, agency problem tends to increase in diversified and big banks. Mentioning about large banks along with too big to fail assumption as a primary reason behind the recent financial crisis, Moutsianas and Kosmidou (2016) suggest that it is essential to levy stern and rigorous requirements on large banking firm or to divide them in smaller firms.

On the contrary, with increasing the size, banks have well-organized intermediation, enhanced supervisory mechanism and they are profited through economies of scale (Beccalli et al., 2015). However, with the increase in diversification by banks, the risk is being reduced and eventually there is an advantageous impact on the bank soundness. The bank size is often related to bank performance in recent studies on banking. The literature suggests on both sides and even no relationship between the two. The most prominent studies include Laeven et al. (2016), Moutsianas and Kosmidou (2016), De Jonghe et al. (2015), Beccalli et al. (2015), De Haan and Poghosyan (2012b,a), Bertay et al. (2013), Vallascas and Keasey (2012) and Mercieca et al. (2007).

Among the studies mentioned above, Bertay et al. (2013) have explained that there is no evidence about size on soundness of bank measured with Z-score. However, large banks are found more prone to the shocks in a panel study during 1992 to 2008 for 153 banking firms (Vallascas and Keasey, 2012). Laeven et al. (2016) and Mattana et al. (2015) support to cap bank size as bank level prudential tool. The study of 1366 European banks using cross-sectional data and analyze the nonlinear relationship of size with bank profitability and risk. It reports negative impact on profitability and positive impact of size square and size for bank risk. Laeven et al. (2016) used the market measure of bank risk and explained that risk is being increased with the increase in size of the bank. De Jonghe et al. (2015) state that

bank size is directly related with risk and supported the downsizing of the banks. Contrarily, Mercieca et al. (2007) study 755 banks of 15 European countries and find that size and Z-score are positively related to each other, and conclude that small banks should increase their size to be more stable than before. De Haan and Poghosyan (2012b) investigate the panel data of US banking firms and find that earnings volatility is lower for larger banks. Moutsianas and Kosmidou (2016) studies the UK banks and find that earnings volatility becomes lower as the size of bank increase up to a point (threshold). Beccalli et al. (2015) offer the view in contradiction to split the banks by studying the 103 banks from 17 countries of Europe. It finds that in large investment banks economies of scale prevails.

Prior research has addressed that size as one of the main factor that influence the effectiveness of banking regulation such as Agoraki et al. (2011), Haw et al. (2010), Williams (2014), Triki et al. (2017), and Doumpos et al. (2015). Haw et al. (2010) conduct study using the sample of East Asian and Western Europe commercial banks, findings of the study suggest that concentration will negatively influence firm performance, risk cost, and efficiency. Moreover, they provide evidence that private monitoring play constraining action and state interference further intensifies the effect. Further, Agoraki et al. (2011) suggest that the stability of the bank resulting with market control is enhanced by the restriction on activities in emerging economies but minimum capital requirement more likely to deteriorate it. Williams (2014) shows that effective institutional and government settings partly compensate for the moral hazard impact of bank size and effective government settings also increases the bank risk. Finally, Triki et al. (2017) provide the most recent evidence from Africa, suggesting that large banks benefited from the more rigorous capital requirement and face low risks.

2.5.1 Hypotheses Statements

On the basis of the literature mentioned in section 2.5 and relevant discussion, following hypotheses are developed in bank level analysis.

1. Bank size has a positive impact on financial stability of banks in emerging Asian and European economies.

2. There exists a non-linear relationship between bank size and bank stability of banks in emerging Asian and European economies.

2.6 Regulations

Previous research literature from law and finance has proven, with empirical findings, that financial development directly supported the development of firms as they could get more access to external funds and legal as well as financial structure of a country or economy played the most important role in developing an economy (Porta et al., 1998; Rajan and Zingales, 1998; Levine, 2005). The evidence of this proposition can be observed in the banking crisis period when influence of financial development on growth becomes contradictory especially when banks are more reliant upon external funding and negative shock affects the supply of credit leading to financial problems.

Keeley (1990) is one of the early researchers who start investigating the interaction of competition with legal frameworks of an economy as well as the impact on this interaction on financial stability. His study uses the example of banking deregulation in US where competition in the banking sector is increased while market power of banks reduces. As a result, banks in US started taking larger risks in order to cover their losses caused by intense competition. The studies of Beck et al. (2006) and OECD (2010) also highlight the impact of regulation on competition as they argued that poor regulation might have unfavorable consequences on competition in banking industry while increasing the banks to take larger risks. This situation makes the banking sector for fragile to financial shocks. As banking legislations, including supervisory powers, activity restrictions, capital requirements, and deposit insurance are the most important areas that regulators and policymakers are targeting to bring financial stability for the banks and improve situation of competition among them. It is also interesting to note that majority of the literature examining the relationship among legislation, competition, and financial stability

relies heavily on theories and they have little to no empirical evidence to support their results or conclusions.

A study conducted by Barth et al. (2004) examines the relationship between development of banking sectors and regulatory practices by government. The study found a positive impact of policies promoting accurate information and incentives for banks on financial development of banking sectors but those policies that are highly dependent upon restrictions and official supervision tend to have detrimental effects on financial stability and development in banking sectors. An interesting relationship is observed by Beck et al. (2006) that argues that if legislation for control are significant in an economy then concentration reduces the financial fragility of the banks.

The above argument is further validated by research studies such as the studies of Hutchison and Noy (2005) and Boyd and De Nicolo (2005). These studies revealed the extent of losses incurred by banks varies significantly between different phases of the crisis. Furthermore, the study of Hoggarth et al. (2002) argued that developed nations usually had more output losses in financial shocks relative to developing countries. There are also studies that associate the magnitude of output losses with the size of the crisis such as the study of Serwa (2010). In the research of Kroszner et al. (2007) and Dell'Ariccia et al. (2008), it is found that negative effects of crisis remained even after implementing strong checks and regulatory procedures for recovery between economic crises and downturns. It is also argued in their studies that those firms that are highly dependent upon external funding and investments are deeply affected by financial crises relative to firms having a relatively little dependence. This shows a significant relationship between regulatory frameworks, financial stability, and competition of firms that may affect the credit supply and even lead the industry to shocks and crises. In the study of Kroszner et al. (2007), it is found that banks in developed nations had more dependence on external funds and are more adversely affected in financial shocks relative to banks in developing nations. The study extended research on the findings of Rajan and Zingales (1998) who studied this phenomenon and relationship during non-crises periods.

It is important to note that bank competition plays an ambiguous role during financial crises and shocks. There are studies that found negative association between economic growth and competition in non-crisis periods of the banking industry. Also, in markets where agents have asymmetric information, few banks acquire significant market power and this leads to higher interest rates and low credit supply for borrowers. As a result, concentration leads to decline in market growth. Also, as discussed earlier, relationship banking or relying on soft information might be a way to overcome the negative effects of concentration in markets with availability of asymmetric information to agents (Boot, 2000; Dell'Ariccia and Marquez, 2004). In some cases, reliance of banks on soft information or relationship banking can turn the tide as concentration enhances the efficiency and interactions of the banks to borrowers leading to more lending and transparency of investigations/monitoring.

It is interesting to note that there is also a research gap regarding the relationship between economic growth and competition in non-crisis times as well. For example, (Cetorelli and Gambera, 2001) used the bank concentration as a measure of competition and found that there is a variation in economic growth across various sectors of economy. More interestingly, it is perceived that bank concentration has a detrimental impact on growth but their study showed that bank concentration in fact promoted competition in some sectors as funding and capital opportunities for young firms are increased. As discussed earlier, this phenomenon leads to the development of models that argue that relationship and lending practices are enhanced because of increase in banking concentration and they further promote the economic growth in banking sectors. Claessens and Laeven (2004) argues the financial development is the moderating factor among banking competition and economic growth. For example, they found that developing countries with developing markets enjoyed faster economic growth in less competition relative to developed markets that grew because of intense competition unlike developing markets.

Moving forwards, same is the case of crisis periods as there is also a research gap regarding the relationship between economic growth and competition in crisis

times as well. There are research studies that argue that concentrated markets improve the relationship of banks that further promotes the economic growth in crisis periods as discussed earlier. On the other hand, there are conflicting studies that argue that concentrated markets impact the quality of goods and services available to consumers that affects the credit supply of banks Wurgler (2000); Almeida and Wolfenzon (2005). Adding more to the fire, switching costs for borrowers are increased especially when the lending relations are pushed through soft-information processing by banks in concentrated markets that intensify the decline (Detragiache et al., 2000). A lot of this phenomenon have been discussed in previous sections.

There are various restrictions imposed upon non-conventional banking, including bank control and ownership of non-financial companies along with the bank competition. The need to emphasize on the banking liabilities and debts can also develop some help to develop beneficial relationships that can be more useful for banking companies. Here, in such case, markets with low competition may contribute a major role in developing lending links and consequently can positively influence economic growth (Cetorelli and Gambera, 2001).

Constitutional and legislative environment plays an important role in this regard as financial development directly supports the development of firms as they can get more access to external funds and legal as well as financial structure of a country or economy plays the most important role in developing an economy (Levine, 2005; Porta et al., 1997, 1998). The evidence of this proposition can be observed in the banking crisis period when impact of financial development on growth becomes contradictory especially when banks are more reliant upon external funding and negative shock affects the supply of credit leading to financial problems.

Technologies are also considered as an important variable that could shape the competition intensity in the banking industry. Large banks have large pockets and, thus, have more access to advanced technologies that may affect the customer satisfaction and banking operations. On the other hand, small banks have little reliance on technology and they might be at some competitive disadvantage as they rely mainly on relationship skills to enhance customer satisfaction (Berger et al.,

2007). Also, small banks have more agency problems relative to large banks as information cannot be transmitted softly among all layers of management (Stein, 2002).

For banking legislations which are deeply focused by research studies because they are the main focus of modern policymakers to promote financial stability and competition in banking markets. In the following sections, these banking legislations policies are discussed.

2.6.1 Capital requirements

It refers to the requirements of minimum capital to be maintained by the banks against their risk weighted assets (Laeven and Levine, 2009). These requirements are used as a regulation by World Bank and IMF to enhance the financial stability of the banks (Deli and Hasan, 2017; Cubillas and González, 2014). Both the franchise and equity at risk effects have an impact on these capital requirements (Repullo, 2004; Hellmann et al., 2000). The equity-at-risk effect provides the banks an incentive to focus on careful investment decisions in addition to effectively control and monitor over the process of investment that supports them from potential financial distress. Therefore, the higher are minimum capital requirements, the lower/reduced will be the risk-taking intensity of banks. This happens because of 'equity-at-risk' effect that consequently promotes their financial stability. Contrariwise, the franchise value effect provides the banks an incentive for assuming higher risk and resultantly the banks involve themselves in riskier lending in order to accelerate profitability to cover the cost of equity. However, Hellmann et al. (2000) establish the negative effect of equity-at-risk on bank stability. Contrary to their findings, franchise value effect is not identified by (Repullo, 2004).

Capital requirements significantly influences financial stability of the banks as a result of decreased competition channel (Northcott et al., 2004). Therefore, being a regulatory tool, capital requirement discourages entry of new banks into the competition and existing banks maintain their behavior and market power carefully. This enhances the financial position. Also, Bolt and Tieman (2004) find

that capital requirements imposed as a regulatory method is one of the reasons for which banks take careful and less risky measures while providing loans to borrowers. Similarly, Behr et al. (2010) write that risk-taking incentives in 61 countries have directly affected by such capital requirements from both empirical and theoretical point of view. It is also stated by them that risk-taking behavior of banks could be greatly enhanced in concentrated markets due to such capital requirements and regulatory measures. Berger and Bouwman (2013) state that capital requirements strengthened their relationships with their borrowers that had reduced moral hazards and defaults. In the similar direction, Holod et al. (2017) also discovered that problems of moral hazards and bad choices are very well eradicated by using capital requirements as regulatory measures.

2.6.2 Activity restrictions

As far as activity restrictions are concerned, they are actually regulatory restrictions to limit the banking operations and keeping them to a magnitude that is favorable to the economy (Barth et al., 2013a). Activity restrictions show regulatory restrictions imposed on operations of the banks including safety, insurance, real estate and/or ownership of non-financial firms by the banks. It refers to a major action that restricts Bank operations that can affect competition and risk taking strategies of corporations (Barth et al., 2013b).

Keeleys theoretical model describes that freedom form activity restrictions gradually enhance competitive intensity by reducing charter value of banks, which then lures banks to take additional risks. In the similar way, Boyd et al. (1998) report that various activities accelerated the interest of banks to take more risks. On the contrary, as per Barth et al. (2004), there are five reasons for which operations of banks must restricted and they are: conflicts of interest, overexposure against risks, troublesome in monitoring, and unfair competition. Also, Barth et al. (2004) discover another arrangement of numerous reasons to justify the World Banks engagement in activities that enabled the Bank to achieve efficiency, effective information management, and to improve quality of their services for customers.

In the reports of Barth et al. (2004, 2008, 2013a), it is found that market growth faced problems due to imposed activity restrictions in the banking markets. It is also detrimental to financial stability of the banks. Similarly, the study of Claessens and Laeven (2004) competition in banking markets further increased when restrictions are imposed while competitive intensity remained low when little restrictions are imposed by the governments. Intense competition had a negative effect on franchise value of banks and banks start to take high risks to prevent their share in the market. Also, Beck et al. (2006, 2013) find the alike results in the context of international markets as well.

Moving forward, study of Liu et al. (2012) finds a direct significant association of activity restrictions with risk in Southeast Asian banks. But, Mohsni and Otchere (2017) find that the sanctions resulted in higher risk stake for Bank of Canada and lower risk for Bank of America. Fernández and Gonzalez (2005) argue that higher limitations on activity effectively prevent banks from taking on excess risk. However, they believe that restrictions on activities can effectively reduce risk only when audit and disclosure requirements are developed and reporting misdemeanors.

2.6.3 Deposit insurance

It is another form of regulatory measure that encourages financial intermediation and stability by ensuring that deposits are secured, and establish a financial safety net for depositors. The major reason for its implemented in the industry is to avoid banks from displacing their competitors (Diamond and Dybvig, 1983) as well as to avoid disasters (Demirgüç-Kunt and Kane, 2002). Also, Gropp et al. (2011) argue that deposit insurance overcome the social consequences of crises and drawbacks in industry. It is one of the major reasons to provide higher returns to rational depositors because it enables the bank to overcome maturity mismatches in relation with transformation of assets and it becomes beneficial for those borrowers specifically who are willing to share the risks of the bank (Lowe, 2015). It is one of

the reasons for which confidence of borrowers on the bank is enhanced. So, theoretically, government-aided deposit insurance reduces the risk of bank penetration and, thus, promotes financial stability.

Keeley (1990), and Salas and Saurina (2003) suggest that deposit insurance, like other insurance systems, might lead to ethical risk problems in the form of a disproportionate risk of Banks. In the case of deposit insurance, the depositor is not affected by the disaster of the banks. More importantly, they cannot find a motive to administer the bank's risk-taking behavior. In this case, the risk of contracts changes if banks are aware of the deregulation of depositors' monitoring of banking activities, as the risks identified by close supervision banks may be greater than the risks. Therefore, the ethical risk of a bank is investing in a higher risk borrower or by taking additional risks or gambling projects to get higher returns. This means that moral gambling negates the its advantages.

2.6.4 Official supervisory powers

Powerful supervisory power is one of the major ways to promote governance and regulations to banking sectors. It imposes various restriction on banks where banks are prohibited from excessive risk-taking to maintain financial stability of the banks as per the explanations by Barth et al. (2004). They further argue that primary functions of exercising official supervisory power is to reduce moral hazards by increasing the control and monitoring the banking operations. Its major target to reduce the incidents in which managers have private agenda or interests that might be detrimental to the practice of efficient banking. In the words of Laeven and Levine (2009), governance in the banking sector can be tremendously enhanced with official supervisions while it is also a major contributor to enhance competitiveness of banks in the industry. Exercising official supervisory power are a means to effectively differentiate between private and public interests. This prevents powerful supervisors to impose their personal interests over public interests while enhances the risk-taking position and strategies of the banks (Beck et al., 2006). Their study further explains that stronger supervisor has the ability to force the non-compliant banking firms, but they may act adversely when they

force them to fund specific allocation to serve the political motives. An example may be lending of easy term to some borrower of interest. This view supports the negative association with bank stability when they are connected via politically terms.

There are also certain cons or disadvantages that are found by Barth et al. (2003) while exercising official supervisory power especially in the case of developing countries. They found that too much (overemphasized and strict) supervision led an increase in non-performing loans of the banks that negatively affected banking industry and economy. Also, Fernández and Gonzalez (2005) argue that profits of the banks are reduced because official supervisory power reduces the risk-taking activities of bank that prevent the bank to take on new profitable opportunities and investments that is crucial for the development of banking sector in developing countries. In case of developed nations, it is found by Tabak et al. (2016) that there exist a positive between financial stability and stronger banking supervision as it prevented banking from taking unnecessary risks. Similarly, Barth et al. (2013b) presence of supervisor increases efficiency when they are independent and free from poetical links. Further, Lee and Hsieh (2014) establish that weaker private monitoring and supervision and increases the fragility of the banking system. Therefore, presence of stronger supervisor improves the stability of the banks (Cubillas and González, 2014).

2.6.5 External governance

Beck et al. (2006) mentions that external governance increases the variety of supervisory approaches that results in fruitful information. It influences stability by creating regulatory arbitrage. Maintaining external ratings and audits, which is one tool of private monitoring system among other, can enhance the stability of banking. Banks can increase the quality of their asset portfolio by risk sensitive funding decisions when higher level of disclosure is available which facilitates depositors for deciding about the risk profile of bank. Therefore, it can be summarized that banking crisis of US in 1980s sparked the empirical discussion on competition-stability relationship.

Earlier studies strongly favor the competition fragility view (Keeley, 1990). The competition stability assumption suggests that competition leads to lesser risk-taking (Boyd and De Nicolo, 2005). While conducting an investigation on the relationship between the bank risk and concentration ratio, researchers such as Nicoló et al. (2004) report that the countries where the banking system is more concentrated show comparatively higher levels of the risk-taking. Houston et al. (2010) confirm this by using the Herfindahl index. Barth et al. (2009) report that bank competition is a source of reducing the corruption in lending of bank, which enhances bank stability.

In line with lending rate channel Garmaise and Moskowitz (2006) suggest that after the mergers of banks higher interest rates are charged. Beck et al. (2013) suggest that there exists a negative relationship between the risk taking and competition, using Lerner index. However, its strength changes across the countries. According to Boyd et al. (2009), in the presence of higher bank competition there is low chance of the banks bankruptcy risk. Similarly, risk of the borrower is also lower while there is a higher loan to asset ratio. This is in line with the banks competitions impact on asset allocation and bank risk as modeled by Boyd et al. (2009).

Additionally, as competition is captured with concentration ratios originally. Claessens and Laeven (2004) show that concentration (like HHI and nCR) may not be used as an appropriate measure of competition in banking as concentration and competition represents divergent features of banking system.

A non-linear relationship between competition and bank stability posits by Martinez-Miera and Repullo (2010) in a pure theoretical way. Their study showed theoretical existence of this U-shape relationship in loan market. According to MRR model, argument competition stability ignore the reality that lower rates charged by more competitive banks reduce the revenue of bank form healthy loans. Hence, a U shape relationship is obtained between bank failure and competition. This study will test this hypothesis using cross country data. Jiménez et al. (2013) tested the MMR model in Spanish banking system and Liu et al. (2013) tested this model across a sample of European Banks. The bi-directional relationship

creates a problem to assess the alteration of competition policy and the appropriate level of competition between banks may be a substitute way of increasing bank stability.

2.6.6 Hypotheses Statements

On the basis of the literature mentioned in section 2.6 and relevant discussion, following hypotheses are developed for bank regulatory environment.

1. Capital adequacy ratio increases the financial stability of banks in emerging Asian and European economies.

2. Deposit insurance improves the financial stability of banks in emerging Asian and European economies.

3. Activities restriction positively influences financial stability of banks in emerging Asian and European economies.

4. Capital stringency regulation improves the financial stability of banks in emerging Asian and European economies.

5. Supervisory powers improve the financial stability of banks in emerging Asian and European economies.

6. Private monitoring supports the stability of banks in emerging Asian and European economies.

2.7 Country Level Analysis

In country level analysis, this study Boone uses indicator to measure competition which as it measures the country level competition. Boone (2008) is the most recent approach; that study bank competition using a straightforward measure of firm competitive behavior called the Boone indicator. It measures the performance of the firms in terms of profits as a result of firm efficiency, and it captures the

association of elasticity of profits to marginal costs (MC). Elasticity is the coefficient of the log of MC which obtained when we regress the log of profit on the log of MC. The Boone indicator reveals which banks are more efficient and therefore more profitable. Negative values of the Boone indicator suggest that high competition exists among banks in the market. High competition consequently allows only efficient banks to earn more profits whereas inefficient banks may not be able to gain such profits. Accordingly, this study uses the Boone measure to capture banking sector competition and find support for the channel of bank stability through which competition affects economic growth even during crisis periods.

In literature, connection between bank competition and economic growth is explained in the context of bank-firm relationship. On the one hand, perfect information hypothesis affirms that lower competition leads to high interest rates in concentrated market, when perfect information is available to all agents, which reduces the financial intermediation activity, the lending channel, and in turn reduces the economic growth (implying positive relationship). On the other hand, asymmetric information hypothesis postulates that banks in collusive markets can reduce information asymmetries by relationship lending as higher costs are associated with information acquisition. This eliminates financing constraints, spurs loan growth, and increase access to finance which in turn boosts economic growth (implying negative relationship).

According to Caggiano and Calice (2016), competition among banks affects economic growth in two ways: First, banking competition facilitates access to credit for small and new firms, which is important for economic growth. Second, companies dependent on external financing to run their operations are associated with slow patterns of economic growth; an increase in market power may hasten that economic growth (Hamada et al., 2018; Diallo and Koch, 2018; Mitchener and Wheelock, 2013). Claessens (2009) states that banking competition increases the quality and innovation in financial services. It also reports that banking competition draws organizations and households toward banking products, which contributes to the growth of the overall economy.

Claessens and Laeven (2005) and Cetorelli and Gambera (2001) study the association between bank competition and economic growth. The later studies bank competition and concentration measures for economic growth in 41 economies. The study find that concentration adversely affects economic growth. Claessens and Laeven (2005) initially estimate bank competition in sixteen economies using an IO-based competition measure. They find that relate industrial growth to competition, they find that more financially dependent industries grow quickly in competitive banking systems.

de Guevara and Maudos (2011) analyze how bank competition effects economic growth using both structural and non-structural measures based on the NEIO in a sample of 21 countries. Results of their study show that financial development enhances economic growth. Soedarmono et al. (2011) examine the association between bank competition and financial stability, as well as how economic growth effects competition-stability link in Asia. The results show that economic growth encourages banks in collusive markets to enhance their stability. By analyzing the economic impact, the authors find that the banking industrys monopolistic structure benefits the economy as a whole because it contributes to the industrys stability (Schnitzer, 1999; Albaity et al., 2019).

Financial stability helps stakeholders manage their risks promptly and enables them to use their financial resources efficiently, which ultimately increases economic growth (Hoggarth et al., 2002; Jokipii and Monnin, 2013; Creel et al., 2015). In addition, some researchers argue that financial stability and economic growth reinforce each other. Countries facing economic decline, notably, have hindered banking operations and business activities. For such countries, it is difficult to get foreign financing, which lowers GDP growth and credit. Therefore, in this context, it is quite obvious that economic growth promotes financial stability (Dell'Ariccia et al., 2008; Wang et al., 2019; Cave et al., 2019). Considering this view, this study regresses economic growth on lag value of bank stability using a fixed-effect estimator to tackle reverse causality. However, in GMM estimation it uses current period realizations of bank stability because it already uses lags of endogenous variables in instrument matrix to tackle endogeneity caused by reverse causality.

2.8 Bank Competition and Economic Growth

Competition is significantly important but it is one of the least focused and research areas as well (Claessens and Laeven, 2005). The banking industry has also faced intense competition but, unlike other free markets, regulators have always focused on controlling and restricting the competition in banking and financial sectors as they do not want the banks to take larger risks due to the severe consequences of this process on the economy. Traditional banking sectors in 1950s were intensely monitored and controlled by the governments but things started in change in US in 1970s when competition in the mutual funds increased. Then, after this event, a large number of banking sectors of the world and US started receiving more liberation and fewer control from the government, but it also led to unfavorable consequences as a large number of free banks failed. Also, after this era, use of technology increased in the banking sector further enhanced the liberation of banking markets across the world, but it has also increased competition.

The banking industry is like other industries where competition has a direct impact on the quality of products and services as well as the innovation capability of the industry. Therefore, research in the financial and banking sectors have started to recognize the relationship and linkage between stability and competition. This recognition also attracted the attention of the policymakers that started to see the banks differently or precariously in terms of policy making (Allen and Gale, 2004). Furthermore, the research also recognized intensity of competition that could impact the investment and financing the sector like it impacts on other sectors (Vives, 2001). But, it is also important to note that research and literature is still struggling to understand the direction of this relationship. For example, external investors in the banking sector might prefer industries with low competition because it encourages the banks to improve their performance and develop good terms with the borrowers and consumers. On the other hand, low competition also increases the concentration in the banking industry as options for the borrowers and governments are reduced as they might stay committed to fewer banks reducing the opportunities and gaps for new banks to enter the market that might be a discouraging factor for external investors. Also, the cost of services can

be too high in low competitive banking sectors that would also impact the quality of services leading to unsustainable growth.

In todays world, research has focused significantly on understanding the relationship between competition and performance of banking systems. Some studies even studied the impact of government interventions, regulatory structures, and policies (limiting competition) on the banking system performance. For example, Barth et al. (2003) collected data from 107 countries across the world that imposed regulatory limitations on commercial banks in 1999 regarding market entry and exit decisions. It is found that such measures got the better of the banking efficiency as interest rate margins and operating costs of commercial banks increased while it also limited the funding and investments by foreign banks in the market resulting in a market decline. Also, Demirguc-Kunt et al. (2004) specifically focused the process of intervention, policy making and structural regulations as well as their impact on banking performance. It is found that such practices only reduced the performance of banking systems while limiting the external funding crucial for development of sectors. However, the relationship between competition and investment still remains confusing as the above studies only focused on understanding the relationship between regulations to control the competition and banking performance but did not investigate the competition directly. One study by Rajan and Zingales (1998) collect data from a large sample of countries regarding sectoral growth but the issue still remains ambiguous.

So, the above discussion can be summarized as: there is an ambiguous connection between competition, stability, and banking performance and research have not identified the clear direction of this relationship and linkage. There are studies like the study of Rajan (1992) that found that when competition in the banking sector increases, then it halts the financing as investors and companies find fewer incentives to develop close relationships with borrowers and other firms. This portrays negative impact on growth and development. On the other hand, there are studies like the study of Boot and Thakor (2000) argue that lower competition in banking sector lead to concentration that captures the borrowers in relationships they cannot leave as they have fewer options in the market. It leads to increase

in the bargaining power of banks, but also reduces their quality of services and monopoly in the markets. This reduces the incentives for new entrants reducing the investments and financing the sector.

It is pertinent to note that only a few studies have examined the effect of banking system on the development of the banking sectors in economies. Some studies report that low competition enhances the banking system and attracts investments that result in growth of the sector while other studies negate this view further increasing the ambiguity of the issue. For example, Cetorelli and Gambera (2001) found that concentration is negatively associated with the overall growth of the banking sectors and economy as it increases the dependence of local firms on external funding and subsidies. On the other hand, surprisingly, Deidda and Fattouh (2005) used the same empirical methodology and found entirely opposite results that banking concentration could fuel the growth and development of banking sectors and increase the economic prosperity of a nation in developing countries. But, they also found that this relationship did not exist in the case of developed nations. It is also found by Cetorelli and Gambera (2001) that concentration in banking sectors also increase the concentration in other sectors that are highly dependent upon the banking sectors. Also, this relationship becomes stronger in developing countries relative to developed nations. So, confusing and conflicting impact of concentration on banking and economic growth has been reported by literature and research studies.

2.8.1 Perfect Information Hypothesis

Perfect information has a significant impact in banking and financial markets. In perfect markets where economic agents have complete information about the goods and services quality to be exchanged, therefore, market power of the banks is increased. This further enhances the price for credit while limiting the availability of credits to borrowers. In this case, the relationship between concentration and external financing becomes negative that have a negative impact on economic growth. According to perfect information hypothesis, increase in market power portrays negative impact on the growth and economy of the banking sector.

According to two models of Monti- Klein model (Klein, 1971; Monti et al., 1972) and Structure-Conduct-Performance paradigm, interests are significantly increased in markets with higher levels of concentration and it further limits the supply of credits to borrowers. Also, the study of Besanko and Thakor (1992) presented a theoretical model based on lending and deposits and argue that this model enabled the banks to differentiate them from competitors. One of the interesting points revealed by this model that if entry barriers of a banking market are reduced then deposit interest rates in market increased while equilibrium loan rates declined that enhanced the capability of firms to differentiate competition. The negative and detrimental impact of market power on banking sector growth and industry is also recorded by (Guzman, 2000) as he compared the effect of capital accumulation between two systems of monopoly and perfect competition. He concluded that credit rationing increased in banking sectors having monopoly while it reduced the capital accumulation rate as well.

Some of the studies like the study of Barth et al. (2009) also worked on finding an indirect channel that might cause the competition to be beneficial to increase the funding in the markets. It is found in their study that corruption in lending is one of the reasons that might affect the capability of banks to allocate capital efficiently in the market. More interestingly, they found that banking concentration increased the lending corruption in banks when simple bargaining model is used in the study. This corruption could be detrimental for economy because banks are supposed to provide loans by considering economic outcomes of the project while corruption encourages the corrupt offers to consider non-economic elements in competitive credit markets that lead to inefficiency of capital allocation.

The study Hainz et al. (2013) found an alternative channel that could relieve the credit access limitations to small borrowers and firms. Asking the collateral or screening could improve the selection process of the banks. The need for collateral increases in case of concentrated banking markets. On the other hand, real assets of small borrowers are limited and it improves the competition among small borrowers to obtain credit in concentrated markets. Research studies have found conflicting and confused relationship between concentrated and debt availability or credit

availability. For example, Berlin and Mester (1999) argue that financial constraints increase of US banks is relatively less concentrated markets. On the contrary, Gonzalez and González (2008) used the data from 39 countries and argues the low bank concentration reduces the financial constraints for borrowers and their access to capital is enhanced.

2.8.2 Asymmetric Information Hypothesis

Absence of perfect information or availability of asymmetric information for borrowers and lenders have different results relative to markets where agents have perfect information. Unlike perfect information markets, asymmetric information markets hold the leisure where increase in concentration of banking sector leads to increase the incentives for all banks to develop soft information relationships with the borrowers and they try to develop optimal relationships with borrowers to facilitate credit availability. This ultimately reduces the financial constraints of the firm (Dell'Ariccia and Marquez, 2004; Boot and Thakor, 2000). This further translates into economic growth as market concentration directly promotes the development of banking sectors. It is also interesting to note that this relationship between market concentration and growth is mediated by intensity of hold-up problems as highlighted by Rajan (1992) because hold-up problems prevent the borrowers to enter in such relationships with banks that reduces the benefits of concentration to anticipate growth.

(Degryse and Ongena, 2005) studied Belgian firms and found that rise in banking competition enhanced the financing costs of banks. Furthermore, Cetorelli and Gambera (2001)studied the relationship between economic growth and concentration directly. They found a conflicting result that concentration in banking is detrimental to economic growth.

The risk of adverse selection increase in markets where agents have asymmetric information leading to credit rationing and moral hazards (Stiglitz and Weiss, 1981). The trend to study the banks behavior regarding mitigating information problems in unclear firm lending increased since 1990s. It is important to note that

true information of borrowers can be obtained through ex-post monitoring services and ex-ante screening that helps the banks to mitigate the information problems. On the contrary, asymmetric information paradigm postulates that information gap is often increased by market power as screening and monitoring services are impacted with high power of banks.

It is worth to note that limited competition in such markets encourage the bank to adopt a risk-aversive behavior (Petersen and Rajan, 1995) but it promotes the banks to focus on short-term losses in relationships with borrowers that can be recovered later in developing long-term relationships. In such markets, there is a reliance on banks on the fact that they cannot be bidden away by rivals in future as information is asymmetric. On the other hand, if competition is intense in markets with asymmetric information with agents, a bank cannot bear short-term losses to sustain a relationship because it has not guarantee that it would be able to secure a profitable relationship in future. According to the study of Petersen and Rajan (1995), it further limits the relationships between borrowers and lenders in highly competitive markets. This idea is not new as it already has been discussed in traditional literature like the study of Mayer and Vives (1995).

One of the best ways to reduce asymmetry of information is to focus on relationship banking. Berger et al. (2005) defines the lending expertise and technology as a mixture of information sources, loan structures, and monitoring/evaluation processes. Such lending technologies through relationship banking reduce asymmetry of information. Lending technologies can be classified in two kinds that are: (1) transaction lending that relies heavily on concrete information and (2) relationship lending that primarily relies on soft information to facilitate lending (Stein, 2002; Liberti and Petersen, 2019). There are two major elements of relationship lending which are: acquiring of personal information and numerous and continuous touch points with the borrowers for a period of time across various products (Boot and Thakor, 2000; Boot, 2000). One of the major benefits of relationship lending is that it relaxes the financial constraints for both the borrowers and lenders (Boot and Thakor, 2000; Eber, 2001). On the other hand, it improves the monitoring and investigation process that further facilitates the credit lending to small firms.

One of major benefits of relationship banking is that it does not only motivates the lender to collect more information from borrower but borrower may be motivated enough to provide more first-hand and strategic information to lender to facilitate the process (Yosha, 1995). This particularly avoids the adverse business relationship between bankers and borrowers (Berlin and Mester, 1999).

There is another role of relationship banking to relax financing constraints, as managers are having more control and leverage over the process of interaction with borrowers. As interaction in relationship banking are increased, moral hazards and corruption in credit lending is reduced ultimately (Bolton and Scharfstein, 1990; Stiglitz and Weiss, 1983) as the threat of termination and threat of reputation come into play (Boot and Thakor, 1994). It can be concluded from the above discussion that intense competition had a negative impact on credit availability and relationship banking in markets with agents having asymmetric information.

2.8.3 Hypotheses Statements

On the basis of the literature described in section 2.7 and 2.8, and relevant discussion, following hypotheses are developed in country level analysis.

1. Financial stability has a positive impact on economic growth in Asia and Europe
2. Global financial crisis and local banking crisis negatively affect the growth in Asia and Europe.
3. Bank competition has a decreasing impact on economic growth in Asia and Europe.
4. Bank competition is having a decreasing impact on financial stability in Asia and Europe.
5. Impact of competition on economic growth is transmitted through bank stability in Asia and Europe.

6. Competition intensity and bank stability are significantly different in European and Asian banking systems.

7. Impact of bank stability and competition on economic growth is significantly different in European and Asian banking systems.

2.9 Control Variables

Bank level control variables for bank characteristics and actions include non-interest income, deposits to assets ratio, loan growth rate, , loan loss reserve ratio, cost to income ratio, capital asset ratio, net interest margin, money supply, inflation, exchange rate, economic growth, concentration ratio and economic freedom index bank as potential determinants of bank risk selected from Engle et al. (2014), Williams (2016), Ramayandi et al. (2014), Laeven and Levine (2009), DeYoung and Torna (2013), Distinguin et al. (2013), Lee and Hsieh (2014), Casu et al. (2011), Gonzalez (2005), Rime (2001) and Shrieves and Dahl (1992), Soedarmono and Tarazi (2016), Lee and Hsieh (2014), Fu et al. (2014), Fang et al. (2014), Abedifar et al. (2013), Thenuwara and Morgan (2017), Bertay et al. (2015), Castro (2013), Nkusu (2011), Demirgüç-Kunt and Huizinga (2004), Beck et al. (2006), Fernández et al. (2010) that are commonly used in stability literature. After the global financial crisis, composition of bank income has gain attention for bank risk. Engle et al. (2014), Williams (2016) and DeYoung and Torna (2013) provide the evidence that non-interest income reduces the bank risk.

Bank profitability positively effects bank risk. Greater profitability enables bank to successfully run its operations. Following previous studies like (Tabak et al., 2015; Zhang et al., 2016; Bokpin, 2016; Anginer and Demirguc-Kunt, 2014) this study use profitability as control variable. Historical performance may show quality of management and this performance is inversely related to bad debt of future (Louzis et al., 2012). This may result in lower NPLs. Therefore, profitability may negatively affect bank risk. Economic growth represented by growth rate of GDP is supposed to effect bank stability in positive way. During the time of economic

expansion, institutional and individual borrowers hold sufficient cash flows to service debt. However, debt servicing ability declines during recession. NPLs are also increased when low quality loans are granted during economic recession. So, economic growth affect NPL positively (Ali and Daly, 2010).

Inflation is an indicator of macroeconomic imbalances and it negatively affects stability of banks. It may decrease the debt servicing capacity of borrowers due to decrease in their real income (Castro, 2013). Money supply is another monetary policy instrument that may affect stability. M1 or narrow money is the amount of money in the form of domestic currency and DDs denominated in home currency held by public with self and commercial banks. M2 or broad money includes M1 and time and saving deposits (Thenuwara and Morgan, 2017).

2.10 Economic and Financial Linkages of Asia and Europe

In this sub-section, this study explores the linkages between Asia and Europe, and then it further discusses the growth and global challenges related to both Asia and Europe. This study focuses on the banking systems of selected emerging economies from the Eurasian continent, Asia and Europe. The economic linkages of Asia and Europe are continuously increasing. This integration is discussed by experts of the industry. In his speech to Asia Europe Economic Forum, vice president of ECB has outlined that "*The relations between the two continents are getting stronger and more relevant. This is particularly important at the current juncture, as we are regaining growth after the global financial crisis*".

After the financial crisis, a slowdown has been observed in globalization even then the relationship between Asia and Europe is likely to grow positively because, in the global economy, many Asian countries have broadened their integration. The economic relationships have been flourished due to an increase in the investment flow and in the volumes of two-way trade mainly because of China. The total trade between Asia and the EU has been reached 1.25 trillion in 2013 which is

about double that documented ten years back and has contributed up to one-third of the total trade of the European Union. Also in 2012, the European Union has contributed about 28% of Asian trade which is quite high than any of the other trading partners. The main imports of the EU coming from Asia are mainly due to the contribution of China (16.6%). Other countries such as Japan (3.4%), India (2.2%) and South Korea (2.1%) also made significant contributions and they come under the top ten countries with major imports. EU also has a major contribution in Asia the EU has invested 22% of its total outward investment in Asia as in 2011. As per BIS, banking exposure of major reporting Euro area countries concerning Asia has been increased from USD 144 billion in the year 2005 to 340 billion USD in the year 2013. Hence, financial links are also multiplying and strengthening (Papademos, 2008).

The economic and financial developments have been increased by the steady increase in the scope and also by the increase in the number of agreements. Since 2011 the free trade agreement was signed by the EU, forming about 70% of the bilateral trade. Another comprehensive FTA has been signed in 2012 between the EU and the ASEAN countries. In April 2013, the consultations regarding FTA were started with Japan. Also, the negotiations on the agreements to invest in China started in the year 2013. As the relationships between Europe and Asia have been strengthened, the interdependency between them has also increased. According to IMF 1% decrease in the growth of emerging markets will negatively affect the output of the euro area by 0.3% (International Monetary Fund, 2013). Also, the internal estimates show that the 1% decrease in the growth of China alone can decrease the GDP in the euro area by 0.1 to 0.2 % (CNB, 2016; (Dieppe et al., 2018).

A considerable decrease has been observed in the growth of growing markets since the financial crisis. 4% growth was observed in the year 2014 which was over 6% between the time period of 2000 to 2007. To further comprehend this issue, the growth rate of China has decreased sharply from about 10% before 2008 to 7.7% in the year 2013 (WDI, 2013). This largest drop is attributed to the increase in the leverage and credit growth since 2008 which causes a sharp increase in the

corporate debt, thus increasing the overall risk in the financial markets. China is bringing many changes in the financial markets by developing long term strategies to bring structural reforms. One of such strategies is the liberalization of interest rates. Legally, only the deposit rates of banks are in control of the authorities but due to liberalization of interest rates, even the non-bank institutions now have the right to offer different alternatives to their customers for example, deposits through internet banking. Therefore, it is timely to study the links of competition, financial stability, and growth in Asian and European regions.

After the crisis, the slow recovery has been observed in the growth of the euro area as the GDP has been increased gradually. Broad ranged on-going recovery has been observed in the Euro area. This is a positive sign even though the growth rate is still below the growth that was observed before the financial crisis and also the unemployment rate especially among the youth is still very high (Papademos, 2008). Existing literature and experts have suggested three main factors to enhance growth in the euro area; i) restructuring of the banking system of the euro area; ii) achieving efficient allocation of credit and justifiable level of debts, iii) and implementing strategies for such structural reforms which can enhance growth and productivity (Regan, 2017; Rehn, 2004). Hence, this study highlights the competition and banking regulations to promote the stability of banking systems and to enhance economic growth.

During crises, it was necessary to rehabilitate the banking system by providing liquidity to banks as the banks are the lender of last resort. This could be done by providing state guarantees and by enhancing public capital injections. Especially for the undercapitalized banks and banks with fragile funding structures. The reason behind this is based on the standard growth theory, which states that the capital moves towards economies and sectors that have very low capital-to-output ratios which indicates how much additional units of output will be produced by one unit of additional capital. Further improvement is vital in this situation because, for long-term economic growth, financial development is critical as there is a positive relationship between the economic growth of a nation and its financial development.

From this discussion, it can be summarized that, in recent years, the relationship between the Euro area and Asia has been strengthened. It has however increased interdependencies between the two. Both the Euro area and Asia are facing many domestic challenges to deal, especially related to structural reforms for adjusting growth composition, and structural reforms in the banking system, achieving efficient credit allocation and justifiable debt levels, and development of strategies which can enhance productivity in the euro area.

Chapter 3

Methodology

The study aims to investigate the impact of bank competition and financial stability on economic growth in Asian and European economies using the bank level and country-level panel data over 2001 to 2017. The study postulates the objectivism and positivism approaches of research philosophy with reference to ontological and epistemological assumptions. As discussed in section 1.8 in chapter 1, hypotheses are tested based on available data of banking industry at country level and bank level in Asian and European economies.

3.1 Sample Selection

The population of this study is banking firms. In order to achieve its objectives, this study uses two different samples in data analysis. The first sample consists of the fourteen emerging economies of Asia and Europe, showing a major portion of Asian and European, in which bank-level data are analyzed to test the related hypotheses. However, macro-economic variables are used as control variable in bank-level anaysis and is a potential determinant of bank competition and financial stability. The second sample consists of Asian and European countries in which country-level data is used to test relevant hypotheses of the study using country-level data. The total sample consists of 2001 to 2017.

3.2 Sample for Bank-Level Analysis

This section describes the details regarding the selection of banking systems for bank-level analysis. First, it highlights the importance of emerging markets used in the bank-level analysis in sub-section 3.2.1. Followed by the details regarding the selection of Asian and European countries included in the sample in sub-sections 3.2.2 and 3.2.3.

3.2.1 Focusing Emerging Economies

This study focuses on the banking systems of selected economies from the Eurasian continent, Asia and Europe. The sample of the study consists of emerging economies only and excludes developed economies.

The study includes the set of those countries which have so far received less focus in research. Most of the previous literature is available regarding linkages of growth and stability in the USA or some other developed nations Buch et al. (2014) and Jiménez et al. (2014) use the bank data from the U.S. and Spain, respectively). Emerging economies have witnessed a rapid increase in economic growth and stability however in the recent decade, they have also experienced the crisis in the banking systems (Daniel and Jones, 2007; Laeven and Valencia, 2013). As the banking system is supposed to be a vital tool in emerging economies, it serves to achieve several purposes, for example, curbing inflation, stabilizing exchange rates and promoting economic growth. In addition to this, banking system still constitutes significant portion of financial system and also it serves as a major source of funding in the developing economies (Čihák et al., 2013), indicating that taking more risk related to banking systems in such economies will ultimately leads to more devastating effects as compared to the economies which are less dependent on banking systems (Kroszner et al., 2007). The annual growth rate of bank assets in the developing economies during the years 2006 to 2010 was above 20% as compared to developed economies where the rate was only 6%. Such a high growth rate in developing economies is attributed to about 40% of the increase in banking assets during the same time.

Considering the aforementioned issues, this study examines the nexus between bank competition, stability, and growth, particularly from the perspective of emerging economies with bank-based financial systems. It also evaluates a set of regulations that may affect banking stability. Indeed, a great number of studies have extensively examined the link between competition, risk in banking and economic growth, but only a few works have been dedicated to emerging economies. Such focus on the Asian and European banking industry enables us to investigate this important link between bank competition, stability, and growth and thus provides a benchmark for policymakers in emerging economies regarding banking reforms such as consolidations, foreign participation, and bank capitalization.

3.2.2 Selection of European Banks

For the selection of emerging countries in Europe, the database of World Economic Outlook (WEO) 2015 and 2017 is initially explored. The list of emerging countries obtained from the WEO database is compared with emerging countries compiled by the European Central Bank (ECB) in Financial Stability Review (2018) of Eurosystem, a monetary system comprised of ECB and NCBs of Euro Area. This study selects five emerging European countries on the basis of high GDP growth. Excluding Russia and Turkey, which are trans-continental countries and the disputed territory of the Republic of Kosovo, Europe has thirteen emerging economies[1]. After careful selection, Croatia, Hungary, Poland, Romania, and Ukraine are included in the sample. Geographically, Hungary and Poland fall in Central Europe while others are in Eastern Europe.

3.2.3 Selection of Asian Banks

As per World Economic Outlook (WEO), there are thirty-three emerging countries in Asia[2] including Syria, for which no economic data is available and Iran

[1]These include Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, FYR Macedonia, Hungary, Moldova, Montenegro, Poland, Romania, Serbia, and Ukraine.

[2]These consist the countries that are analyzed in country level analysis and are described in section 3.3.

for which recent economic data is not available in WEO. The sample consists of nine countries selected based on the GDP of these emerging economies which are China, India, Indonesia, Malaysia, Pakistan, Philippines, Saudi Arabia, Thailand, and the United Arab Emirates (UAE). Excluding Saudi Arabia and UAE, seven out of these nine markets are the part of MSCI Emerging Market Asia Index. Geographically, the sample consists of Indonesia, Malaysia, Philippines, and Thailand from Southeast Asia, Saudi Arabia and UAE from West Asia, Pakistan and India from South Asia and China from East Asia. The overall sample of the study consists of 14 emerging countries. This covers almost thirty-three percent of emerging Asia and Europe.

3.3 Sample for Country Level Analysis

This study examines the link between bank stability, competition, and economic growth in a sample of 38 European and 33 Asian countries over 2001 to 2017. In this analysis, this study extends the sample and includes all countries of Asia and Europe due to a couple of reasons. First, the use of country-level data allows us to change the cross-sectional dimension of the data to the country (which is a bank in the bank-level analysis). This significantly reduces the observations count for this analysis. In order to allow for a sufficient number of observations, this study analyzes an extended sample of countries.

Second, in order to achieve the objective related to the comparative stability and competition intensity of the two regions, this study needs to find separate estimates for European and Asian countries. Therefore, this study extends the sample from selected emerging regional economies (of bank-level analysis) and includes all Asian and European countries in the country-level analysis for which the data was available in World Bank's Database. Sample of Asian economies includes Afghanistan, Bahrain, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Egypt, India, Indonesia, Iran, Iraq, Jordan, Kuwait, Lao PDR, Lebanon, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Oman, Pakistan, Philippines, Qatar, KSA, Sri Lanka, Syria, Thailand, Timor-Leste, UAE, Vietnam, and Yemen.

Table 3.1: Overview of the bank data assessed in the database

Specialization	Asia										Europe						Total
	CHN	IND	IDN	MAL	PAK	PHI	KSA	THA	UAE	Total	CRO	HUN	POL	ROM	UKR	Total	Total
Bank Holding & Holding Companies	0	0	1	18	0	2	0	1	0	22	0	0	2	0	1	3	25
Central Bank	1	1	1	1	1	1	1	1	1	9	1	1	1	1	1	5	14
Clearing Institutions & Custody	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Commercial Banks	187	81	124	53	29	63	11	29	21	598	59	43	76	35	188	401	999
Cooperative Banks	6	8	0	1	0	0	0	0	0	15	1	1	2	1	0	5	20
Finance Companies	9	15	17	10	1	5	2	9	2	70	2	13	8	7	4	34	104
Investment Trust Corporations	24	2	1	2	2	3	2	1	0	37	0	0	0	0	0	0	37
Investment Banks	7	18	6	36	19	4	0	29	5	124	1	6	5	0	4	16	140
Islamic Banks	0	0	10	18	9	1	4	0	10	52	0	0	0	0	0	0	52
Micro-Financing Institutions	0	2	0	0	3	2	0	0	0	7	0	0	0	1	0	1	8
Multi-Lateral Government Banks	0	0	0	0	1	1	1	0	0	3	0	0	0	0	0	0	3
Other Non-Banking Credit Institution	0	1	1	1	1	1	2	1	1	9	0	0	0	0	0	0	9
Private Banking & Asset Mgt Companies	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	2
Real Estate & Mortgage Bank	0	4	0	1	0	1	0	0	0	6	2	6	0	0	1	9	15
Savings Bank	2	0	0	0	0	18	0	1	0	21	1	1	1	3	3	9	30
Securities Firm	7	3	3	2	0	2	0	6	0	23	0	0	1	0	1	2	25
Specialized Governmental Credit Institution	2	10	0	7	5	6	0	5	1	36	1	2	2	1	1	7	43
Total	245	146	164	150	71	110	23	85	41	1035	68	73	98	49	204	492	1527
Eligible (Commercial, Finance Co. Islamic and Investment)	203	114	157	117	58	73	17	67	38	844	62	62	89	42	196	451	1295
Bank with less than 3 year data	18	10	30	10	12	12	0	14	2	108	6	8	7	4	117	142	250

Asian countries include China (CHN), Indonesia (IDN), India (IND), Saudi Arabia (KSA), Malaysia (MAL), Pakistan (PAK), Philippines (PHI), Thailand (THA), and United Arab Emirates (UAE). European countries include Croatia (CRO), Hungary (HUN), Poland (POL), Romania (ROM), and Ukraine (UKR).

TABLE 3.2: Information about the banks in bank-level analysis

Country	Banks	Bank-Year Obs
China	185	1390
India	104	1139
Indonesia	127	1014
Malaysia	107	919
Pakistan	46	569
Philippines	61	501
Saudi Arabia	17	218
Thailand	53	492
UAE	36	422
Asia	736	6664
Croatia	56	501
Hungary	54	442
Poland	82	698
Romania	38	352
Ukraine	79	626
Europe	309	2619
Grand Total	1046	9283

The sample of the European economies includes Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Luxembourg, Macedonia FYR, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Ukraine, and the United Kingdom. We exclude Andorra, Holy See, Liechtenstein, Monaco, Montenegro, and San Marino from sample due to data problems.

3.4 Variable Description

This section describes the details of dependent, independent, and control variables.

3.4.1 Bank Stability

This study uses four measures of bank stability which are standard deviation of return of assets (SROA), bank Z-score (BZSB, LBZS, and BZS), non-performing loan ratio (NPR and NPL) and the ratio of loan loss provisions (LLP). The following text mentions the details of these variables.

3.4.1.1 Income Volatility

This study uses volatility of return on assets (ROA) as a measure of bank stability. This measure has been used in banking literature to measure financial stability (e.g., Beck et. al., 2013 and Soedarmono and Tarazi, 2015). This study uses a three-year rolling window to calculate the volatility of return on assets. This method is advantageous over the use of a full sample period which creates a time-invariant measure of volatility. Therefore, it captures the time variation and is denoted by SROA.

$$SROA_{it} = \sqrt{\frac{\sum_{k=1}^{3}(ROA_{it} - Avg.ROA_{it})^2}{n-1}} \tag{3.1}$$

Here, ROAit is the return on assets of bank i at time t. Average ROAit is the average of three years return on assets including current year.

3.4.1.2 Bank Z-Score

The study adopts the Z-score ratio, as taken in prior studies, as a second measure of bank stability. Z-score ratio can be obtained by taking the aggregative sum of the two ratios (return on assets of a bank and ratio of equity-to-asset) and then dividing the sum by the standard deviation of return on assets. Capturing the difference in standard deviations of returns on assets to fall to vanish bank capital. The Z-score estimates the distance remained from the point of default of a bank and solvency. Hence, a higher Z-score is needed to show a higher level of bank stability (Goetz, 2018). This measure is denoted by BZSB.

$$BZSB_{it} = \frac{Return\ on\ Assets_{it} + Capital\ Asset\ Ratio_{it}}{SROA_{it}} \tag{3.2}$$

Z-score is considered as the distance from insolvency or probability of default of a bank (Boyd and Runkle, 1993; Laeven and Levine, 2009; Beck et al., 2013). So, the Z-Score could be understood as the number of standard deviations profits that could fall before the bankruptcy of a bank. The information relating to the Return-on-assets (ROA) and the capital-asset-ratio usually are depicted in the annual reports of the banks. The volatility of return of assets (ROA) would be estimated on a three-year window. The effect of outliers is adjusted by excluding observations beyond the 1st and above the 99th percentile. As the Z-score is highly skewed in its nature, in the analysis, it is also transformed into natural logarithmic form (Anginer and Demirguc-Kunt, 2014; Cubillas and González, 2014; Hoque et al., 2015). Therefore, this study also employs a log transferred Z- score. However, some of the values are observed negative. After winsorizing the data, descriptive statistics show that no negative Z-scores are present. So, this transformation does not need any scaling. Following the literature, this study calculates the rolling window denominator instead of using period average; it prevents the variation of Z-score totally driven from the profitability and capitalization of the bank as well as use of different time windows for different banks due to unbalanced structure of data and allows time variation in Z-score.

3.4.1.3 NPL Ratio

NPL ratio can be used as an alternative accounting-based proxy of stability, which also has been used in various studies (Ariss, 2010; Schaeck and Cihák, 2014). The study uses the measures the NPL ratio (total amount of impaired loans / the amount of loans) denoted by NPL. The higher the NPL ratio is, the greater is the bank's insolvency probability.

$$NPL = \frac{Total\ amount\ of\ NPL}{Gross\ Loans} \tag{3.3}$$

3.4.1.4 Loan loss provisions

It is the ratio of loan loss provisions to gross loans, which is the incurred cost of the bank as used by Soedarmono and Tarazi (2016). It is denoted by LLP and high values indicate higher credit risk.

$$LLP = \frac{Total\ amount\ of\ LLP}{Gross\ Loans} \tag{3.4}$$

3.4.1.5 Country-level stability measures

For country-level measures of bank stability, this study calculates two measures, namely bank Z-score (denoted by BZS) and non-performing loan ratio (denoted by NPR) at the country level by transforming bank-level measures. The Z-score (BZS) measure is transformed to the country level by taking the weighted average; weights are based on bank asset size in each country and NPR is the country-level aggregate figure. Bank Z-score at the country level is the probability of default of the banking system of a specific country and serves as a buffer and NPR at the country level is the aggregate figure. These measures are used by some county-level studies to measure bank stability at the country level. These studies include Nier and Baumann (2006), Martinez Peria and Schmukler (2001), Fernández et al. (2016), and Davis et al. (2020).

3.4.2 Bank competition

This study uses direct measures of bank pricing behavior instead of using concentration measures due to the flaws in concentration proxies. The concentration proxies are, usually, not considered good predictive measures of competitiveness due to their low accurate predictive accuracy, which is usually encountered by the concept of market contestability. The banks are forced to exhibit a pattern of behavior led by threat of entry and exit in the contestable markets. Even in concentrated markets, the banks come into competition in a market segment where entry restrictions are very low on new banks and the exit restrictions are also very

easy for the unprofitable banks. Hence, this study uses direct measures of bank market power or bank pricing behavior and profit elasticity including the Lerner index and Boone indicator.

3.4.2.1 Lerner Index

The Lerner index (Lerner, 1934) describes the market power of a firm. This index comprised of the price (P) set by the firm and marginal cost (MC) of a firm. The index scores range from 1 (being high) to 0 (being low), with higher numbers implying greater market power. Lerner index has been frequently employed in the research studies of banking as it is based on markups. This measure compares the difference between marginal costs (costs) and output prices (revenues). The prices of output refer to the total revenues over total assets, and the marginal costs are obtained from an estimated translog cost function with respect to output. The higher values, inclining to 1 show lower bank competitiveness and lower values inclining to 0 show high bank competitiveness. Hence, in case of perfect competitiveness and pure monopoly, the values of 0 and 1 are achieved respectively.

In Learner Index, the power of the firms is expressed by the percentage difference between price and costs to price and can be written in the form of the equation as under:

$$Lerner_{it} = \frac{p_{it} - mc_{it}}{p_{it}} \tag{3.5}$$

MC_{it} is Marginal Cost of bank i at time t

P_{it} is price of total assets (the ratio of total revenues to total assets for bank i at time t), Marginal Cost is derived from a translog cost function from Berger et al. (2009).

$$lnTC_{it} = \eta_0 + \eta_1 lnQ_{it} \frac{\eta_2}{2} lnQ_{it}^2 + \sum_{k=1}^{3} \beta_k lnW_{kit} + \sum_{k=1}^{3} \phi_k lnQ_{it} lnW_{kit}$$
$$+ \sum_{k=1}^{3}\sum_{j=1}^{3} \frac{\rho_{kj}}{2} lnW_{kit} lnW_{jit} + \lambda_1 T + \lambda_2 T^2 + \lambda_3 T lnQ_{it} + \sum_{j=1}^{3} \varphi_k T lnW_{kit} + \mu_{it} \tag{3.6}$$

Here, the translog cost function of each country is calculated by using ordinary least squares. The use of time dummies captures the differences in technology across banking markets. Hence, the study includes trend (T) for controlling the evolution of translog function over time. Here, the cost represents a bank's total costs divided by the total assets where Q depicts a proxy for bank output, i.e., total assets or total loan. W1, W2, and W3 represent three input prices of labour, funding, and physical capital respectively. The ratios are calculated for all of these three in terms of personnel expenses to total assets, interest expenses to total deposits, and other operating and administrative expenses to fix assets of the bank respectively (Clerides et al., 2015; Kasman and Kasman, 2015; Fiordelisi and Mare, 2014; Beck et al., 2013; Amidu and Wilson, 2014). The study tries to control the heteroscedasticity and scale biases as suggested by Ariss (2010) for the cost and input prices. MCs then is computed as follow:

$$mc_{it} = \frac{TC_{it}}{Q_{it}}\left[\eta_1 + \eta_2 Q_{it} + \sum_{k=1}^{3}\phi_k lnW_{kit} + \lambda_3 T\right] \tag{3.7}$$

$TCit$ refers to the total costs of the bank in millions, including interest, commission, fee, trading, personnel, admin, and operating expenses measured whereas Qit refers to the quantity of output (total assets or loan). The study estimates the regression for each country by taking pooled ordinary least squares (POLS). For the marginal cost, price P of aggregate output Q is required. This is calculated as the ratio of total revenue (interest plus non-interest income) over total assets (Berger et al., 2009; Beck et al., 2013; Fiordelisi and Mare, 2014). In the bank-level analysis, LER and LER^2 denote linear and squared series, respectively.

3.4.2.2 Boone indicator

Boone indicator Boone (2008) is a new addition in the family of indices being used to measure the performance of the firms. The Boone indicator measures the performance of the firms in terms of profits as a result of efficiency exhibited by the firm. Hence, it measures the direct association of efficiency and performance (profits) of the firms. This index also measures the association of elasticity of

profits to marginal costs of a firm. The elasticity of profits is calculated as a log of profit (i.e., ROA, ROI) regressed against log measure of marginal costs (MC). Elasticity is calculated by the coefficient of log of marginal costs, which are typically calculated from the first derivative of a translog cost function. Boone indicator reveals that the banks are more-efficient and resultantly earn higher profits. The negative values of Boone indicator show a higher level of competition amongst the banks in the market. The situation of high competition will consequently allow only efficient banks to gain high rewards in terms of profits whereas inefficient banks may not be able to gain such profits. In this way, Boone Indicator captures the reallocation of market share from inefficient to efficient firms. The intensity of competition is measured from the profitability equation as follows:

$$ln\pi_i = \alpha + \beta lnc_i + \mu_i \tag{3.8}$$

c is the total cost of bank, π is the profit of bank and β is termed as Boone indicator, a measure of competition. It shows the elasticity of profit concerning cost. Its value is theoretically non-positive. The reason behind this is that increased profits are linked to reduced costs and vice versa. Greater value (smaller but negative sign) represent lower-level competition and higher value vice versa.

This study uses marginal cost to calculate Boone indicator (denoted by BNE) rather than average cost following Tabak et al. (2012), Delis (2012), and Van Leuvensteijn et al. (2011). The average cost is generally treated as a weaker proxy for efficiency (Schaeck and Cihák, 2014). As the equality of marginal cost with average cost relies on the assumption of being a equilibrium point. Furthermore, previous work (Van Leuvensteijn et al., 2011; Tabak et al., 2012) conclude that financial firms may convert lesser cost into reduced profit as compared to higher profit to enhance market share. The equation mentioned below is separately estimated for each country from bank-level data, and multiplicative time dummies are used in order to calculate yearly values. This measure is used in the country-level analysis. So, equation is as follows:

$$ln\pi_i = \alpha + \beta lnmc_i + \mu_i \tag{3.9}$$

3.4.3 Size

The study measures the bank size by using natural logarithms of total assets (LTA) as used in following previous studies Bourkhis and Nabi (2013); Čihák and Hesse (2010); Doumpos et al. (2015); Triki et al. (2017). All the measures except size are ratios, percentages, or indices. Therefore, before taking the log of total assets, it first converts total assets into dollar after ensuring that all groups are shown in million and is denoted by LTA.

$$LTA = ln(Total\ Assets) \tag{3.10}$$

3.4.4 Regulation

Current study uses regulation measures of Barth et al., (2006) along with the capital adequacy ratio. These measures have been widely used in banking studies (Mollah et al., 2017; Ibrahim and Rizvi, 2017; Beck et al., 2013). These variables include a set of seven variables related to bank regulatory and supervisory environment.

3.4.4.1 Capital adequacy ratio

This study uses the total regulatory capital ratio (including Tier 1 and Tier 2 capital). According to Mathisen and Buchs (2005), these ratios measure the strength of a bank's capital and its ability to cover the risks of its undertakings and protect the interests of its depositors; this could enhance the stability and efficiency of the banking system. This is frequently used in the banking literature Rime (2001); Hussain and Hassan (2005); Ashraf et al. (2016). CAR denotes the capital adequacy ratio.

3.4.4.2 Deposit insurance

The year of inception of deposit insurance (DI) scheme is mentioned in Table 3.3. It shows that two countries namely Pakistan and UAE have not introduced such

schemes or have introduced after the sample period. Five countries namely China, Indonesia, Malaysia, Saudi Arabia, and Thailand, have introduced DI schemes during the sample period. Remaining seven countries, namely Croatia, Hungary, India, Philippines, Poland, Romania, and Ukraine, having DI systems before the start of the sample period.

Table 3.3: Deposit Insurance (DI) Schemes in Sample Countries

Country name	**Date of inception of explicit DGS**	**Name of DI Agency**
China	2015	Deposit Insurance Fund Management Co.
Croatia	1997	Drzavna agencija za osiguranje stednih uloga (DAB)
		State Agency for Deposit Insur. and Bank Rehabilitation
Hungary	1993	Orszagos Betetbiztositasi Alap
		[National Deposit Insurance Fund of Hungary]
India	1961	Deposit Insurance and Credit Guarantee Corporation
Indonesia	2004	Lembaga Penjamin Simpanan/Indo. Deposit Insur. Corp.
Malaysia	2005	Malaysia Deposit Insurance Corporation
Pakistan	2018	Deposit Protection Corporation
Philippines	1963	Philippine Deposit Insurance Corporation
Poland	1995	Bankowy Fundusz Gwarancyjny [Bank Guarantee Fund]
Romania	1996	Bank Deposit Guarantee Fund
Saudi Arabia	2016	Depositor Protection Fund in Central Bank
Thailand	2008	Deposit Protection Agency of Thailand
Ukraine	1998	Deposit Guarantee Fund
UAE	-	-

3.4.4.3 Activities restriction

The third regulatory variable is activity restriction (ART), which is the degree of restriction or permission on the activities that are directly associated with securities, insurance, and real estate markets and to ownership and control of financial firms for which the banks are allowed or prohibited. This variable is denoted by ART and it lies between 3 and 12 with higher values showing more restrictions.

3.4.4.4 Capital stringency regulation

The fourth dimension is capital stringency (CRG) shows the degree to which a supervisory agency regulatory powers and actions on the capital level and structure

of a bank. CRG denotes this variable and it lies between 0 and 10 with higher values showing more stringent capital requirements.

3.4.4.5 Supervisory Powers

The fifth dimension supervisory power (SUP) refers to the degree of regulation of supervisory agency and its strong actions in case of non-compliance to the banks. This variable is denoted by SUP, and it lies between 3 and 12 with higher values showing more restrictions.

3.4.4.6 Private Monitoring

The sixth dimension of private monitoring (PMN) refers to the degree of regulation that supports incentives and enhances private monitoring of the banks. PMN denotes this variable and it lies between 0 and 14 with higher values showing more powers of bank supervisory authorities.

3.4.4.7 External governance

The last measure of regulation is the external governance index (EXG) and its values lie between 0 and 19 where higher values indicate a higher level of corporate governance. This measure contains details like financial statement transparency, external audit quality, monitoring by creditors, and evaluations of credit rating firms. Llewellyn and Mayes (2003) and Barth et al. (2007) argued that having multiple supervisors and external governance can produce multiple supervisory approaches and create useful information which is ignored in its absence.

3.4.5 Financial Crises

The financial crisis is an explanatory variable in the country-level analysis. This study considers two crisis periods. First is the global financial crisis (denoted by GFC) and second is the local banking crisis (denoted by LBC). Global financial crisis is the dummy variable, which is 1 for 2008 and 2009 and zero for other years

as in Fu et al. (2014) and Kasman and Kasman (2015). The next crisis variable is also a dummy variable for a systemic banking crisis as used by Beck et al. (2006) and Luginbuhl and Elbourne (2019). This variable equals 1 when there are significant signs of systemic bank distress in a specific country.

3.4.6 Economic Growth

Economic growth is the primary variable of interest in country-level analysis. Some studies use industry-level measures of economic growth. However, this study uses the straight forward measure of economic growth which is GDP growth as suggested by Soedarmono et al. (2011), Jayakumar et al. (2018), Ali and Daly (2010), and Coccorese (2008). It is measured by two widely used measures namely annual GDP growth, denoted by AGR and per capita GDP growth, denoted by (CGR).

3.4.7 Control Variables

3.4.7.1 Income diversification

After the global financial crisis, the composition of bank income has gained attention for bank risk. Therefore, following the work of Engle et al. (2014), Williams (2016). and DeYoung and Torna (2013), this study controls for non-interest revenue share. It is calculated as the ratio of non-interest revenue to total revenue and is denoted by NNI.

$$NII = \frac{Non - interest\ revenue}{Total\ revenue} \tag{3.11}$$

3.4.7.2 Liquidity

The liquidity of the bank is measured with the ratio of total deposits to total assets ratio following Soedarmono and Tarazi (2016). This is denoted by DTA.

$$DTA = \frac{Total\ Deposits}{Total\ Assets} \tag{3.12}$$

3.4.7.3 Financial intermediation

Financial intermediation (LNG) shows the degree to which the bank financing is being used in any economy. This measure is adopted from Soedarmono and Tarazi (2016) and is denoted by LNG.

$$LNG = \frac{Gross\ loans_t - Gross\ loans_{t-1}}{Gross\ loans_{t-1}} \tag{3.13}$$

3.4.7.4 Operational efficiency

Operational efficiency is measured with cost to income ratio (CIR) following Lee and Hsieh (2014) and Liu et al. (2013). It directly measures cost inefficiency and is denoted by CIR.

$$CIR = \frac{Operating\ expenses}{Operating\ income} \tag{3.14}$$

3.4.7.5 Loan quality

Loan quality is measured with loan loss reserves to gross loan (LLR) following Fang et al. (2014). Higher values of the variable indicate poor loan quality. It is denoted by LLR.

$$LLR = \frac{Loan\ loss\ reserves}{Gross\ loans} \tag{3.15}$$

3.4.7.6 Bank profitability

Bank profitability is measured with net interest margin following Fu et al. (2014), Soedarmono et al. (2011) and Abedifar et al. (2018). Net interest margin variable is denoted by net NIM.

$$NIM = \frac{Interest\ income - Interest\ expense}{Average\ earning\ assets} \tag{3.16}$$

3.4.7.7 Solvency

Bank solvency is measured with the ratio of equity to total asset ratio (ETA) following the work of Abedifar et al. (2018) and is denoted with ETA.

$$ETA = \frac{Total\ equity}{Total\ Assets} \tag{3.17}$$

3.4.7.8 Money supply

M1 or narrow money is the amount of money in the form of domestic currency and DDs denominated in home currency held by the public with self and commercial banks. M2 or broad money includes M1 and time and saving deposits Thenuwara and Morgan (2017). This study uses broad money growth as macroeconomic control and it is denoted by MSP.

$$MSP = \frac{Broad\ money_t - Broad\ money_{t-1}}{Broad\ money_{t-1}} \tag{3.18}$$

3.4.7.9 Inflation

Following Bertay et al. (2015), this study uses GDP deflator as a proxy of inflation and is denoted by INF. Apart from the consumer price index, GDP is also a widely used measure of inflation, which as a whole measure the rate of change in price in any country. It is calculated as a ratio of GDP in current local currency (nominal) to GDP in constant local currency (real).

$$INF = \frac{GDP\ current}{GDP\ constant} \tag{3.19}$$

3.4.7.10 Exchange rate

Following the work of Castro (2013) and Nkusu (2011), the exchange rate (EXR) is included in this study as macroeconomic control and is denoted by EXR.

$$EXR = \frac{Domestic\ Currency}{USD} \tag{3.20}$$

3.4.7.11 Economic freedom

Economic freedom index (EFR) is a measure of the regulatory environment of the country. This measure is used by Demirguc-Kunt et al. (2004), Beck et al. (2006), and Fernández et al. (2010). This index lies between 0 and 100, with higher values indicating a better regulatory environment.

3.4.7.12 Concentration ratio

Concentration ratio measures the degree to which the banking assets are held n the largest banks in the country. Following Khan et al. (2016), this study uses the concentration of assets held by the five largest banks of each country and is denoted by CR5.

$$CR5 = \frac{Total\ assets\ held\ by\ five\ largest\ banks}{Total\ banking\ assets} \tag{3.21}$$

3.4.7.13 Trade openness

Trade openness (TPN) is the average trade and included as a control variable in the country-level analysis following the work of Creel et al. (2015).

$$TPN = \frac{Imports + Exports}{GDP} \tag{3.22}$$

3.4.7.14 Capital formation

Capital formation is the second control variable (LFF) which is included in the country-level analysis following the work of Catrinescu et al. (2009).

$$LFF = ln\Big(\frac{Gross\ fix\ capital\ formation}{GDP}\Big) \tag{3.23}$$

3.4.7.15 Government expenditure

Government expenditure (GEX) is the third control variable, which is included in the country-level analysis following the work of Ngare et al. (2014). It shows

the expenditure of the government for the purchase of goods and services and is denoted by GEX.

$$GEX = ln(Government\ expenditure) \tag{3.24}$$

3.4.7.16 Economic integration

Economic integration (EAL) is the fourth control variable, which is included in the country-level analysis following the work of Masten et al. (2008). It shows the volume of assets and liabilities held outside for a specific country and is denoted by EAL.

$$EAL = ln\Big(\frac{External\ assets + External\ liabilities}{GDP}\Big) \tag{3.25}$$

3.5 Data Description

This study uses bank-level data from Bankscope and Orbis databases. In order to compile the data, it first considers the type of banks and their financial data (bank specialization and consolidation code in the database). In first stage, this study excludes bank holding companies, central banks, clearing institutions, cooperative banks, trust corporations, micro-financing institutions, multi-lateral government banks, other non-banking credit institution, asset management companies, real estate and mortgage bank, savings bank, securities firm, specialized governmental credit institution (these details are presented in Table 3.1) restricting the sample of the study to commercial banks, finance companies, and investment banks. Then it considers the type of financial data. There are two types of data in the database. This study preferably uses consolidated financial data and uses unconsolidated data when consolidated accounts are unavailable. Ignoring this dimension of the data results in the duplication of bank-year observations as both consolidated and unconsolidated data are available for some bank-year observations. This duplication of data is carefully addressed and such bank-year observations are cleaned before further analysis. Further, this study considers the number of years for which data of the bank is available. It excludes specific banks for which data

is not available for more than three years as the standard deviation of return on assets is calculated on the bases of three years rolling window. After this, the sample consists of 1045 banks from nine emerging Asian and five emerging European economies. Country-wise bank-year observations are presented in Table 3.2.

3.5.1 Data Sources

This study collects the data from various sources. Most of the data come from Bureau van Dijk (BvD) database and the World Bank. More specifically, bank-level data is obtained from bankscope and bankfocus and macroeconomic data are obtained from World Development Indicators and Global Financial Development Database.

This study uses two measures of economic growth (ECG), four measures of bank stability (BST), and two measure of banking competition (Lerner index (LER) and Boone indicator (BNE), which are calculated from bank-level data from BvD database), along with seven bank-level control variables and six macroeconomic control variables. The economic growth measures are annual GDP growth rate (AGR) and annual GDP per capita growth rate (CGR). Data of these measures are obtained from World Development Indicators (WDI) published by the World Bank.

Bank competition and stability measures are from Bankscope, Orbis Bank Focus, and the Global Financial Development Database. Four measures of bank stability include (SROA, BZSB, NPL, and LLP). Data on these measures have obtained the data from BvD database. For county-level stability measures, this study uses two measures of stability (BZS and NPR). Bank Z-score is transformed to the country level by taking the weighted average; weights are based on bank asset size in each country and NPR is the country-level aggregate figure as economic growth is measured at the country level. Data related to local financial crisis (LBC) is obtained from Laeven and Valencia (2012) and the World Bank.

The macroeconomic data related to money supply growth (MSP), GDP Growth (AGR), Inflation (INF), exchange rate (EXR), trade openness (TPN), fixed capital

formation (LFF) and government expenditure (GEX) is taken from WDI published by the World Bank. Data of concentration ratio (CR5), external assets and liabilities (EXT), and economic freedom (EFR) are taken from Global Financial Development Database of World Bank, Lane and Milesi-Ferretti (2007), and Heritage Foundation respectively. Regulations measures come from different sources. All measures are taken from Barth et al. (2013a,b) except capital adequacy ratio and deposit insurance. These include activities restriction (ART), capital stringency regulation (CRG), official supervisory powers (SPW), private monitoring (PMN), and external governance (EXG). The data on capital adequacy ratio is taken from bankscope, deposit insurance dummy variable is taken from Demirgüç-Kunt et al. (2014). Appendix A provides a summary of the description of the variables along with data sources. The following equation estimates the effect of bank competition and stability on economic growth.

3.6 Estimation Technique

This study uses panel data specifications to obtain the estimates of parameters using a fixed-effect estimator and a system generalized method of moment (GMM) estimator. The following sub-sections describe the details of the two estimators.

3.6.1 Fixed effect estimator

In general, a simple panel data model can be estimated using three different methods: (a) with a common constant effect, known a pool estimator (b) with a cross section-specific fixed effect (c) and with random effects. The estimated common constant method (also referred to as the pool OLS method) presents the results under the main assumption that there is no difference between the cross-sectional dimension data matrices. In other words, the model estimates the common constant of all cross-sections. In fact, the common constant method means that there is no difference between the estimated cross-sections, and it is useful if the data set is assumed to be a priori homogeneous. However, this situation is quite difficult,

and most studies related to financial stability in banking rely on fixed effects in the estimation method (Goetz, 2018; Abedifar et al., 2018; Tabak et al., 2012).

In the fixed-effect method, constants are considered cross-section specific. This means that the model allows different constants for each cross-section. The fixed effect estimator is also referred to as a least squares dummy variable (LSDV) estimator because it includes dummy variables for each group in order to allow each group to have different constants. Before assessing the validity of the fixed-effect method, it is not uncommon to test the presence of fixed effects (i.e., different constants for each section). To do this, the standard F-test is used to check for fixed effects. The null hypothesis is that all constants are the same (homogeneous), so the fixed effects method is appropriate when a significant probability value of the test is observed.

Another method of estimating the model is the random-effects model. The difference between fixed effects and random effects methods is that the constants that deal with each part of the latter are not fixed but random parameters. Again, in order to use random effects, it is essential to check whether the model has any randomness compared to the fixed effect model. The Hausman test helps to choose between fixed and random effects. Hausman (1978) builds on the point that in case of no correlation between fixed effects and explanatory variables, both fixed and random effects are consistent but the fixed effect becomes inefficient. However, when there is a correlation, random effects inconsistent but fixed effect is consistent. So, with the null hypothesis of no correlation, the fixed effect is used when significant probability values are observed. This study also includes year dummies in its estimation.

Following the literature (Goetz, 2018; Abedifar et al., 2018; Tabak et al., 2016; Fazio et al., 2018; Laeven et al., 2016), this study uses fixed effect estimator to estimate the parameters. However, the use of fixed-effect estimator may lead to biased estimation due to endogeneity issues. Following the literature, this study regress current observations of bank stability on lag values of main explanatory variables i.e., competition and bank size, and bank-level controls instead of using current period observation, as i (Chen et al., 2017). According to Beck et al.

(2013), the use of lag regressors mitigates the problem of endogeneity caused by reverse causality. It is also relevant for the county level analysis when this study regresses the economic growth on bank stability. As the banking system may be stable when the economy is performing well. So, this study uses lag of stability in the country-level analysis. However, together with this, the problem of endogeneity may exist due to omitted variable bias. Although this study uses a comprehensive set of the control variable, this study complement fixed effect estimation with instrumental variable technique (Beck et al., 2013) i.e. system GMM estimation, as an additional check and robustness of the results which is explained in the next sub-section.

3.6.2 System GMM Estimator

This study further uses the generalized method of moment (GMM) dynamic panel estimator to analyze the dynamic relationships among bank stability, competition, and economic growth. Using an estimator developed by Arellano and Bond (1991) and Arellano and Bover (1995), the model may be estimated in two ways: system or difference. The difference estimator removes the country-specific effect while differencing. The error term of the differenced equation is correlated with the lagged dependent variable by construction. Arellano and Bond (1991) develop two-step estimators by using the exogeneity of regressors and a serially uncorrelated error term as the moment condition. The two-step GMM estimator is more efficient due to the assumption that the error term is homoskedastic and independent over time and cross-sections in the first step, and the error term is assumed to be independent. These assumptions are relaxed in the second step, in which the first-step error term is used to make the consistent estimates for the variance-covariance matrix. This study uses two-step system estimators from Blundell and Bond (1998) to get efficient and consistent approximations of parameters because the lagged values of regressors are weak instruments for the GMM equation in difference form and because difference equations may suffer from small sample bias.

The consistency of the Arellano and Bover (1995) and Blundell and Bond (1998) GMM estimator relates to a set of assumptions regarding error term. These assumptions posit that the error term is not serially correlated with instruments and therefore is valid for use in the instruments matrix. To test these assumptions, this study relies on a set of specification tests. The first test tests the null hypothesis that the error term does not exhibit serial correlation in the second order. First-order serial correlation may be present in differenced residuals due to the specification of the equations of GMM estimator, even if the original residuals are not. Therefore, this study seeks to avoid rejecting the null hypothesis for second-order serial correlation. The second test examines the presence of over-identification of the restrictions. The results indicate the holistic validity of the instruments together with the moment conditions of the GMM estimator. Roodman (2009) xtabond2 can do the Windmeijer (2005) finite-sample correction to the reported standard errors. This study uses this procedure using the robust command in Stata to adjust standard errors that are severely downward biased in a two-step estimation. Therefore, system-GMM estimator is used to specific econometric issues that are described in economic literature. First, the dynamic nature of the data can be modeled by the GMM estimator without bias and inconsistency (Baltagi, 2015; Blundell and Bond, 2000). Second, GMM estimator enables the use of increased number of regressor without worrying about endogeneity problems. Third, the accuracy of the coefficients is improved due to removing the bias caused by week instruments in difference GMM by putting level values back in the equation. In recent literature, banking stability studies are conducted in a dynamic fashion (Imbierowicz and Rauch, 2014; Ghenimi et al., 2017). Therefore, this study estimates the results of system GMM by estimating dynamic panel equations.

3.7 Econometric Models

This section describes the regression models that are estimated using bank-level and country-level data. Sub-sections 3.7.1 and 3.7.2 describes regression equations

estimated for bank-level analysis and country-level analysis, respectively. All models are estimated with year fixed-effects. For this purpose, time dummies are used in all the estimations.

3.7.1 Bank-level analysis

For bank-level analysis, this study uses the following generic equation to estimates the impact of bank completion and size on economic growth. Initially, a static equation is estimated as under:

$$BSTijt = \alpha + \beta_i X_{ijt-1} + \sum_{i=1}^{7} \gamma_i Y_{ijt-1} + \sum_{i=1}^{6} \delta_i Z_{jt} + \mu_{ijt} \quad (3.26)$$

Where BST denotes bank stability measures, X denotes independent variable i.e., bank competition, bank size and regulations. Y denotes the vector of bank-specific controls and Z denotes the vector of macro economic controls. Where μ_{ijt} it is the standard disturbance term. Competition, bank size, and bank-level controls are considered at lag in fixed effect estimation as the use of lag regressors mitigates the problem of endogeneity caused by reverse causality. Afterward, the study applies a dynamic model of bank stability using system GMM. Further, bank level variables are considered at level in GMM estimation as lagged regressors are already present in the instrument matrix. Following dynamic model of bank stability is estimated to capture the persistence in the bank stability over time, it is of the following form:

$$BSTijt = \alpha + \theta BST_{ijt-1} + \beta_i X_{ijt} + \sum_{i=1}^{7} \gamma_i Y_{ijt} + \sum_{i=1}^{6} \delta_i Z_{jt} + \mu_{ijt} \quad (3.27)$$

In equation 3.27, θ captures the dynamic effect of bank stability. Vector X consists of main independent variables, which are competition measured with Lerner index (LER) and bank size (LTA) and are simultaneously entered in the estimation. Vector Y consists seven bank-level control variables which are non-interest revenue ratio (NNI), deposits to total assets (DTA), loan growth (LNG), cost to income ratio (CIR), loan loss reserve (LLR), net interest margin (NIM) and equity

total asset ratio (ETA). Vector Z consists of six macro-economic control variables which are money supply (MSP), annual GDP growth (AGR), inflation (INF), exchange rate (EXR), economic freedom (EFR), and concentration ratio (CR5). After incorporating the control variables in equation numbers 3.26 is represented as under:

$$\begin{aligned} BSTijt = \alpha + \beta_1 LER_{ijt} + \gamma_1 NNI_{ijt-1} + \gamma_2 DTA_{ijt-1} + \gamma_3 LNG_{ijt-1} + \gamma_4 CIR_{ijt-1} \\ + \gamma_5 LLR_{ijt-1} + \gamma_6 NIM_{ijt-1} + \gamma_7 ETA_{ijt-1} + \delta_1 MSP_{jt} + \delta_2 AGR_{jt} \\ + \delta_3 INF_{jt} + \delta_4 EXR_{jt} + \delta_5 EFR_{jt} + \delta_6 CR5_{jt} + \mu_{ijt} \end{aligned} \quad (3.28)$$

$$\begin{aligned} BSTijt = \alpha + \beta_1 LTA_{ijt} + \gamma_1 NNI_{ijt-1} + \gamma_2 DTA_{ijt-1} + \gamma_3 LNG_{ijt-1} + \gamma_4 CIR_{ijt-1} \\ + \gamma_5 LLR_{ijt-1} + \gamma_6 NIM_{ijt-1} + \gamma_7 ETA_{ijt-1} + \delta_1 MSP_{jt} + \delta_2 AGR_{jt} \\ + \delta_3 INF_{jt} + \delta_4 EXR_{jt} + \delta_5 EFR_{jt} + \delta_6 CR5_{jt} + \mu_{ijt} \end{aligned} \quad (3.29)$$

In equation 3.28 and 3.29, this study analyses the effects of competition and bank size on financial stability,respectively. Further, this study also uses a squared term of Lerner index (LER^2) and bank size (LTA^2) in equation 3.28 and 3.29 to analyses the non-linear relationship. To analyze the impact of regulations, this study estimates the following equation.

$$BSTijt = \alpha + \beta_i REG_{jt-1} + \sum_{i=1}^{9} \gamma_i Y_{ijt} + \sum_{i=1}^{6} \delta_i Z_{jt} + \mu_{ijt} \quad (3.30)$$

In equation 3.30, REG shows seven regulatory variables which are capital adequacy ratio (CAR), deposit insurance (DIN), activities restriction (ART), capital stringency regulation (CRG), supervisory powers (SPW), private monitoring (PMN), and external governance (EXG) and are simultaneously entered in the estimation. The equation is estimated separately for each of the seven regulatory measures. In this estimation, the level of competition and bank size are also included as control variables.

3.7.2 Country-level analysis

In the country-level analysis, this study uses the following equation to estimates the effect of bank stability on economic growth.

$$ECGit = \alpha_i + \beta_{21} BST_{it-1} + \gamma_1 TPN_{it} + \gamma_2 LFF_{it} + \gamma_3 GEX_{it} + \gamma_4 EAL_{it} + \epsilon_i + \mu_{it} \tag{3.31}$$

In equation 3.31, ECG represents the two proxies of economic growth: annual GDP growth rate (AGR) and annual GDP per capita growth rate (CGR); in the economics literature, annual growth rate and per capita growth rate are widely used measures of economic growth. This study uses both measures for the robustness of the results; α is the country's fixed effect, and β is the main coefficient of interest in this study. BST represents the two proxies of bank stability: bank Z-score (BZS) and the non-performing loan ratio (NPR) which are measured at country level. Four control variables are adopted from prior literature (Cole et al., 2008; Ngare et al., 2014; Creel et al., 2015). They include trade openness (TPN), which is the ratio of imports and exports to GDP, the log of gross fixed capital formation (LFF), the log of government expenditures (GXP), and financial integration, which is the log of external assets and liabilities (EXT). Also, ϵ measures unobserved heterogeneity, and μ is the random error term. Subscripts i and t index the country and time, respectively. Time dummies are also included in country level analysis.

This study also adds crises variables and the interaction term of crisis and stability in the above equation. The equation 3.32 and 3.33 shows these relationships. In these equations, Crisis represents two proxies of global financial crisis (GFC) and systemic banking crisis (LBC). This study uses lag value of stability as an explanatory variable to mitigate the problem of endogeneity caused by reverse causality of economic growth and bank stability:

$$ECGit = \alpha_i + \beta_{21} BST_{it-1} + \beta_{22} Crisis_{it-1} + \gamma_1 TPN_{it} + \gamma_2 LFF_{it} + \gamma_3 GEX_{it} + \gamma_4 EAL_{it} + \epsilon_i + \mu_{it} \tag{3.32}$$

$$ECGit = \alpha_i + \beta_{21} BST_{it-1} + \beta_{22} Crisis_{it-1} + \beta_{23} Crisis^* BST_{it-1} + \gamma_1 TPN_{it} + \gamma_2 LFF_{it} + \gamma_3 GEX_{it} + \gamma_4 EAL_{it} + \epsilon_i + \mu_{it} \quad (3.33)$$

Equation 3.34 investigates the relationship between economic growth (ECG) and banking competition (BNE) by replacing the bank stability variable with competition in equation 1. The measure of bank competition is the Boone indicator, which measures profit efficiency in relation to marginal cost.

$$ECGit = \alpha_i + \beta BNE_{it} + \gamma_1 TPN_{it} + \gamma_2 LFF_{it} + \gamma_3 GEX_{it} + \gamma_4 EAL_{it} + \epsilon_i + \mu_{it} \quad (3.34)$$

3.7.3 Channeling effect in the country-level analysis

This sub-section concentrates on how bank stability affects the relationship between bank competition and economic growth. The premise is that bank market power effects stability of banks and that this stability leads to higher or lower economic growth. To quantify these indirect effects of bank competition on economic growth through bank stability, this study uses the methodology of Preacher and Hayes (2004), which requires estimating the following equations in three steps. These steps presented in the following equations:

$$EconomicGrowth = f(BankCompetition, Controls) \quad (3.35)$$

$$BankStability = f(BankCompetition, Controls) \quad (3.36)$$

$$EconomicGrowth = f(BankCompetition, BankStability, Controls) \quad (3.37)$$

The literature frequently uses this approach. First introduced by (Baron and Kenny, 1986), it appears in reputable business and finance journals such as Management (Rungtusanatham et al., 2014), Entrepreneurship (Semrau and Sigmund, 2012), and Finance (Fedaseyeu et al., 2018; Ferris et al., 2017). Fedaseyeu et al. (2018) studies the impacts of director's qualifications and Ferris et al. (2017) studies the CEO social capital using this approach.

3.8 Comparison of Regression Weights of Asia and Europe

This study compares the regression weights of bank competition, financial stability and economic growth connections in Asian and European economies to assess the strength of causal influence. Confidence intervals of coefficients are calculated at 1%, 5% and 10% level of significance. Then, overlapping coefficients are observed to know the significant lower or higher impact in competition-stability, stability-growth, and competition-growth relationships (Neal et al., 2012; Payton et al., 2003; Law and Singh, 2014).

Chapter 4

Results and Discussion

This chapter presents the empirical results of bank level and country level analysis for Asia and Europe. In bank level analysis, it presents overall and country wise descriptive statistics, results of fixed effect estimator and system GMM estimator.

4.1 Impact of Competition and Bank Size on Financial Stability of Banks in Emerging Asian Economies

This section of the study presents the results of descriptive statistics, correlation and regression for nine emerging Asian economics using bank-level data from 2001 to 2017. These countries include China, India, Indonesia, Malaysia, Philippines, Pakistan, Saudi Arabia, Thailand, and United Arab Emirates. First, it presents overall descriptive statistics in subsection 4.1.1, followed by country-wise descriptive statistics in section 4.1.2, and correlation are presented in section 4.1.3.

4.1.1 Descriptive Statistics

The sub-section presents the results obtained for bank-level analysis for the banks in Asia in Table 4.1. It the overall mean, standard deviation, maximum and

minimum values of study variables. Table 4.1 illustrates the values of descriptive statistics for all banks of Asia. The results show that the mean value of bank Z-score is 15.01 and log of bank Z-score is 1.65 which show the stability of the banking system in the region. Furthermore, the value of Lerner index is 0.326 shows the bank competition in Asia (higher values indicate less competition). For bank risk taking measures, mean value std. deviation of return on assets is 5.781%, non-performing loan ratio is 5.131% and loan loss provision ratio is 1.261%. For size, the value of log of assets is 7.267. The annual GDP growth in Asian region is reported with the mean value of 5.338%. In addition, descriptive statistics of inputs of Lerner index (cost of labour prices, funding and physical capital) are also reported. The table also describes the minimum and maximum values of descriptive stats against each variable used in the study for the overall Asian region. Highest inflation is observed in Pakistan (20.67%) and lowest in Saudi Arabia (-2.75%) in 2009 (observed from dataset) and is also reported in Table 4.2 (B & C).

4.1.2 Country Wise Descriptive Statistics

This sub-section, table 4.2a to 4.2c presents the mean, standard deviation, maximum and minimum values of study variables in each country. In Table 4.2(a), descriptive statistics illustrate that the volatility of return on assets for Indonesia is (6.252%) which is almost double that of China and India. However, the lowest volatility of return on assets has been observed in China which is (3.412%). As far as bank stability score is concerned, Indonesia has the most stable banking system with highest log of bank Z-score (1.723%) and bank Z-score (17.591%). However, Chinas bank stability score is least with mean value of log of bank Z-score (1.515%) and bank Z-score (11.244%) showing that its banks are least stable in terms of z-score. Highest average nonperforming loans has been observed in Indonesia (4.83%) while China showed the lowest average (2.03%). This shows that Indonesian banks have high credit risk as compared to the banks of China and India. The same has been observed in the values of loan loss provisions ratio (LLP), Indonesian banks have the highest figure (2.08%), which is far more

TABLE 4.1: Descriptive Statistics of Asian Banks in Emerging Economies

Variable	**Obs**	**Mean**	**Std.Dev.**	**Min**	**Max**
SROA	5916	5.781	12.197	0.05	129.73
BZSB	5895	15.01	31.463	0.01	329.27
LBZS	5820	1.65	1.456	-3.14	5.8
NPR	6233	5.131	8.569	0	55.455
LLP	6129	1.261	3.107	-8.072	34.551
LER	6242	0.326	0.139	0.129	0.585
LTA	6218	7.267	2.364	1.526	13.782
NII	6216	32.157	32.434	-97.06	388.78
DPT	5664	0.671	0.201	0.021	0.92
LNG	5781	2.273	45.229	-0.733	1035.56
CIR	6032	53.965	31.351	6.49	317.64
LLR	5828	5.188	6.57	0.17	52.38
NIM	6228	3.55	2.965	-9.97	24.98
CTA	6237	13.887	13.122	-2.18	91.29
MSP	153	82.256	40.858	36.000	176.130
AGR	153	5.338	3.002	-5.240	11.400
INF	153	6.182	5.280	-2.350	20.670
EXR	153	1079.139	2990.795	3.060	10260.8
EFR	153	59.132	5.683	49.0	71.4
CR5	153	70.417	15.952	39.475	100.000
Input of Lerner Index					
W1	6161	0.013	0.014	0.001	0.167
W2	5719	0.065	0.078	0.001	0.703
W3	6240	0.015	0.02	0	0.221
TC	5955	0.086	0.084	0.008	0.753
P	6227	0.067	0.071	-0.02	0.667
Q	6242	18204.22	85430.46	4	968000

This Table shows the overall descriptive statistics of banks in nine emerging Asian economies. In this Table, SROA is the volatility of earnings, BZSB is the bank Z-score, LBSZ is the log of BZSB, NPR is the non-performing loan ratio, LLP is the ratio of loan loss reserve, LER is the Lerner index, LTA is the Log of Total Assets, NII is the no- interest revenue to total revenue, DPT is the Ratio of total deposits to total assets, LNG is the Loan growth rate, CIR is the Cost to Income ratio, LLR is the Loan Loss reserve ratio, NIM is the Net interest margin, CTA is the capital asset ratio, MSP is the Money Supply Growth, AGR is the Annual GDP Growth, INF is the Inflation Rate, EXR is the Exchange Rate, EFR is the Economic Freedom Index, and CR5 is the Concentration Ratio. W1, W2, and W3 are cost measures. TC is total cost ratio. Q is the total assets in million USD

than that of India and China. China however has the least value of LLP which is 0.633% depicting that its banks are least risky in terms of Credit risk. Looking

at the broader perspective, the economic growth in China is far more than that of India and Indonesia, as it shows the highest annual percentage of growth rate (9.590%) whereas, the growth rate in Indonesia is far less (5.315%). Seeing Intra country bank competition, China has the least competition among its banks with highest value of Lerner index (0.356) however the it is least in India which is (0.259) showing that Indian banks have higher competition. India has highest total input cost (0.106%) comprising of labour, funding and capital cost.

In Table 4.2(b), descriptive statistics illustrate that the average volatility of return on assets for Pakistan is highest (13.875) whereas, the lowest volatility of return on assets has been observed in Malaysia (4.404%). As far as bank stability score is concerned, Philippines has the most stable banking system with highest LBZS score of (1.773) and BZSB score (18.605%). However, Pakistans bank stability score is least with mean value of LBZS (1.017) and BZSB as (6.942) showing that its banks are least stable.

Highest average non-performing loans that is 9.719% in Pakistan while Malaysia report the lowest average NPR (8.086%). This shows that Pakistani banks have high credit risk as compared to the banks of Philippines and Malaysia. The same has been observed in the values of LLP (loan loss provisions to total loans), Pakistani banks have the highest figure of LLP that is, (1.823%) which is far more than that of Philippines and Malaysia.

Philippines, however, report the least value of LLP which is 1.048% depicting that its banks are least risky in terms of Credit risk. Looking at the broader perspective, the economic growth in Malaysia is greatest, as it shows the highest annual percentage of growth rate of 5.109% whereas, the growth rate in Pakistan is far less (4.152%). Seeing competition, Malaysia has least competition among its banks with highest value of 0.294 however the LER index is least in Pakistan which is 0.148 showing that Pakistani banks have highest competition among them.

In Table 4.2(c), descriptive statistics show that the average volatility of return on assets for Thailand is far more (13.875%) than that of KSA and UAE. However, the lowest volatility of return on assets has been observed in KSA which is 2.754%. As far as bank stability score is concerned, UAE has the most stable banking

system with highest LBZS score of 2.486. BZSB score, however, is highest in UAE (33.691). However, the average BZSB score is least in Thailand (14.862) showing that its banks are least stable.

Highest average nonperforming loans, that is 6.035% has been observed in Thailand while KSA report the lowest average NPR that is 4.092%. This shows that KSAs banks have high credit risk as compared to the banks of Thailand and UAE. The same has been observed in the values of LLP (loan loss provisions to total loans). Thailand banks have the highest figure of LLP that is 1.7%, which is far more than that of KSA and UAE. KSA, however, have the least value of LLP which is (0.808%) depicting that its banks are least risky in terms of Credit risk. Looking at the broader perspective, the economic growth in UAE is greatest, as it shows the highest annual percentage of growth rate of 4.781% whereas, the growth rate in Thailand is least 4.091%. Seeing bank competition, KSA has least competition among its banks with highest value of (0.525) however the LER index is least in Thailand which is 0.338 showing that Thailands banks have highest competition among them.

4.1.3 Pairwise Correlations: Emerging Asian Economies

Table 4.3 shows the pairwise correlation among dependent, explanatory, and control variables of banks in emerging Asian economies. This study initially explores the objective of the study separately for banks in Asian and European economies. Therefore, descriptive statistics, correlations, and allied diagnostics are performed separately for both regions. While observing the results of this analysis, it is found that correlation is not beyond 0.7 (between minimum -0.564 and maximum 0.618). It shows that multi-collinearity problem is less likely to be present in this analysis. This study further calculates variance inflation factor (VIF) and tolerance statistics (1/VIF) using a pooled estimator command. The results of VIF and tolerance statistics are reported in Table 4.4. These results also show that multi-collinearity issue is less likely to occur as the value of VIF is observed at 2.32 (corresponding tolerance stat = 0.43) which is less than the threshold of 5.0 (this VIF is sometimes compared with 10 as a relaxed threshold).

TABLE 4.2A: Country-Wise Descriptive Statistics of Asian Banks in Emerging Economies

China			India			Indonesia		
Variable (Obs)	**Mean (SD)**	**(Min, Max)**	**Variable, (Obs)**	**Mean (SD)**	**(Min, Max)**	**Variable, (Obs)**	**Mean (SD)**	**(Min, Max)**
SROA (1358)	3.412 (4.117)	(0.09, 19.86)	SROA (1123)	3.728 (4.402)	(0.07 ,22.13)	SROA (936)	6.252 (11.117)	(0.06 ,65.19)
BZSB (1357)	11.244 (20.175)	(0.3 , 109.33)	BZSB (1119)	13.332 (27.676)	(0.26 ,152.45)	BZSB (927)	17.591 (36.807)	(0.03 ,208.4)
LBZS (1353)	1.515 (1.293)	(-1.03, 4.69)	LBZS (1111)	1.539 (1.375)	(-1.14 ,5.03)	LBZS (914)	1.723 (1.541)	(-1.5 ,5.47)
NPR (1389)	2.03 (3.845)	(0, 19.05)	NPR (1139)	2.625 (4.042)	(0 ,17.91)	NPR (1014)	4.834 (9.856)	(0 ,50.95)
LLP (1380)	0.633 (0.593)	(-0.207, 2.402)	LLP (1131)	1.094 (1.335)	(-0.251 ,6.657)	LLP (998)	2.088 (6.017)	(-6.604 ,34.551)
LER (1390)	0.356(0.028)	(0.305, 0.413)	LER (1139)	0.259 (0.0312)	(0.179 ,0.310)	LER (1014)	0.303 (0.0724)	(0.156 ,0.387)
LTA (1389)	9.141 (1.952)	(4.794, 13.782)	LTA (1137)	8.159 (1.667)	(4.534 ,11.459)	LTA (1000)	4.605 (1.749)	(1.526 ,8.389)
NII (1389)	17.791 (20.296)	(-70, 135.22)	NII (1136)	39.347 (32.233)	(-87.94 ,358.27)	NII (1006)	25.865 (31.027)	(-90.91 ,388.78)
DPT (1344)	0.711 (0.183)	(0.101, 0.92)	DPT (976)	0.708 (0.222)	(0.028 ,0.898)	DPT (907)	0.691 (0.2)	(0.11 ,0.919)
LNG (1347)	0.338 (0.434)	(-0.142, 2.588)	LNG (1091)	0.218 (0.391)	(-0.733 ,2.188)	LNG (916)	0.303 (0.503)	(-0.405 ,2.548)
CIR (1382)	43.507 (16.909)	(12.92, 90.53)	CIR (1129)	50.418 (16.219)	(14.41 ,93.54)	CIR (965)	57.761 (27.084)	(12.87 ,162.49)
LLR (1266)	2.411 (1.481)	(0.39, 7.49)	LLR (1108)	3.082 (3.97)	(0.17 ,22.12)	LLR (980)	6.082 (8.835)	(0.23 ,44.97)
NIM (1390)	2.768 (1.053)	(0.54, 5.7)	NIM (1137)	3.297 (2.913)	(-9.97 ,11.97)	NIM (1014)	5.519 (4.12)	(-5.02 ,19.9)
CTA (1390)	9.417 (9.847)	(1.95, 52.13)	CTA (1137)	10.12 (9.124)	(3.01 ,47.01)	CTA (1012)	14.569 (11.229)	(-2.18 ,55.55)
MSP (17)	160.767 (13.899)	(141.09, 176.13)	MSP (17)	71.430 (7.499)	(57.74 ,79.08)	MSP (17)	41.702 (4.576)	(36 ,50.89)
AGR (17)	9.590(1.980)	(7.3, 11.4)	AGR (17)	7.0714 (2.176)	(3.09 ,8.5)	AGR (17)	5.315 (0.764)	(3.64 ,6.35)
INF (17)	3.972(2.955)	(-0.21, 8.08)	INF (17)	6.46 (2.344)	(3.22 ,10.53)	INF (17)	9.802 (4.664)	(3.75 ,18.15)
EXR (17)	7.325 (0.878)	(6.14 8.28)	EXR (17)	48.275 (5.648)	(41.35 ,61.03)	EXR (17)	9487.277 (591.903)	(8577.13 ,10260.8)
EFR (17)	52.478 (0.804)	(51, 53.7)	EFR (17)	53.257 (1.916)	(49 ,55.7)	EFR (17)	54.507 (2.039)	(51.9 ,58.5)
CR5 (17)	72.410(8.166)	(55.380, 84.233)	CR5 (17)	41.979 (2.073)	(39.474 ,45.465)	CR5 (17)	59.350 (5.836)	0.789)
Input of Lerner Index								
W1 (1215)	0.006 (0.002)	(0.002, 0.014)	W1 (1124)	0.013 (0.009)	(0.002 ,0.06)	W1 (997)	0.017 (0.011)	(0.004 ,0.057)
W2 (1281)	0.032 (0.031)	(0.01, 0.2)	W2 (1047)	0.094 (0.111)	(0.039 ,0.703)	W2 (1010)	0.094 (0.08)	(0.024 ,0.419)
W3 (1390)	0.009 (0.008)	(0 ,0.046)	W3 (1139)	0.013 (0.015)	(0.003 ,0.08)	W3 (1012)	0.021 (0.018)	(0.004 ,0.111)
TC (1349)	0.043 (0.029)	(0.016, 0.194)	TC (1138)	0.106 (0.107)	(0.008 ,0.648)	TC (1011)	0.122 (0.082)	(0.023 ,0.437)
P (1390)	0.035 (0.022)	(0.005, 0.15)	P (1130)	0.071 (0.052)	(0.029 ,0.292)	P (1009)	0.089 (0.079)	(-0.003 ,0.451)
Q (1390)	66414 (177000)	(121, 968000)	Q (1139)	11043 (18563)	(92 ,94734)	Q (1014)	407 (821)	(4 ,4354)

This table shows the country-wise descriptive statistics of banks in emerging Asian economies. In this Table, SROA is the volatility of earnings, BZSB is the bank Z-score, LBSZ is the log of BZSB, NPR is the non-performing loan ratio, LLP is the ratio of loan loss reserve, LER is the Lerner index, LTA is the Log of Total Assets, NII is the no- interest revenue to total revenue, DPT is the Ratio of total deposits to total assets, LNG is the Loan growth rate, CIR is the Cost to Income ratio, LLR is the Loan Loss reserve ratio, NIM is the Net interest margin, CTA is the capital asset ratio, MSP is the Money Supply Growth, AGR is the Annual GDP Growth, INF is the Inflation Rate, EXR is the Exchange Rate, EFR is the Economic Freedom Index, and CR5 is the Concentration Ratio.

TABLE 4.2B Country-Wise Descriptive Statistics of Asian Banks in Emerging Economies (Continued...)

Malaysia			Pakistan			Philipines		
Variable, (Obs)	**Mean (Std.Dev.)**	**(Min, Max)**	**Variable, (Obs)**	**Mean (Std.Dev.)**	**(Min, Max)**	**Variable, (Obs)**	**Mean (Std.Dev.)**	**(Min, Max)**
SROA (873)	4.404 (6.436)	(0.05 ,35.29)	SROA (529)	13.875 (25.673)	(0.12 ,129.73)	SROA (439)	7.056 (12.505)	(0.07 ,69.21)
BZSB (872)	12.853 (23.56)	(0.17 ,130)	BZSB (528)	6.942 (12.008)	(0.03 ,60.11)	BZSB (439)	18.605 (39.173)	(0.03 ,219.78)
LBZS (865)	1.719 (1.255)	(-1.21 ,4.87)	LBZS (507)	1.017 (1.484)	(-2.42 ,4.19)	LBZS (433)	1.773 (1.52)	(-2.06 ,5.39)
NPR (918)	8.086 (10.995)	(0 ,53.87)	NPR (567)	9.719 (11.474)	(0 ,48)	NPR (500)	8.798 (11.327)	(0 ,55.455)
LLP (883)	1.214 (3.04)	(-8.072 ,13.706)	LLP (565)	1.823 (3.55)	(-2.21 ,18.333)	LLP (492)	1.048 (1.616)	(-0.658 ,7.588)
LER (919)	0.294 (0.162)	(0.049 ,0.519)	LER (569)	0.148 (0.103)	(0.049 ,0.350)	LER (501)	0.230 (0.076)	(0.094 ,0.365)
LTA (915)	7.801 (1.486)	(4.868 ,10.926)	LTA (569)	6.139 (1.776)	(2.653 ,9.292)	LTA (500)	5.687 (1.794)	(2.526 ,9.775)
NII (917)	37.67 (28.292)	(-14.31 ,258.04)	NII (565)	47.659 (55.648)	(-58.34 ,385.06)	NII (501)	33.723 (24.143)	(-71.69 ,179.15)
DPT (880)	0.596 (0.21)	(0.102 ,0.9)	DPT (520)	0.626 (0.219)	(0.021 ,0.863)	DPT (482)	0.658 (0.161)	(0.171 ,0.841)
LNG (876)	0.21 (0.529)	(-0.67 ,2.75)	LNG (516)	0.257 (0.476)	(-0.647 ,2.213)	LNG (482)	25.6 (158.91)	(-0.489 ,1035.5)
CIR (891)	45.627 (19.961)	(6.49 ,107)	CIR (547)	80.542 (55.825)	(26.51 ,317.64)	CIR (445)	71.961 (38.912)	(29.95 ,265.57)
LLR (855)	5.54 (5.548)	(0.79 ,28.32)	LLR (483)	8.357 (8.381)	(0.31 ,40.32)	LLR (474)	6.683 (5.986)	(0.63 ,31.98)
NIM (919)	3.036 (1.647)	(0 ,8.27)	NIM (564)	3.054 (3.905)	(-8.35 ,17.74)	NIM (500)	4.469 (4.193)	(-0.18 ,24.98)
CTA (919)	13.202 (10.633)	(3.72 ,59.04)	CTA (569)	14.509 (13.374)	(1.58 ,68.48)	CTA (500)	15.983 (9.708)	(2.825 ,49.615)
MSP (17)	132.24 (6.039)	(119.59 ,140.09)	MSP (17)	50.681 (4.691)	(40.14 ,58.87)	MSP (17)	60.736 (4.720)	(54.28 ,71.68)
AGR (17)	5.109 (2.460)	(-1.51 ,7.42)	AGR (17)	4.152 (1.836)	(1.61 ,7.67)	AGR (17)	5.095 (1.748)	(1.15 ,7.63)
INF (17)	3.781 (3.720)	(-2.35 ,10.39)	INF (17)	10.042 (5.852)	(2.46 ,20.67)	INF (17)	4.145 (1.592)	(1.97 ,7.55)
EXR (17)	3.482 (0.292)	(3.06 ,3.8)	EXR (17)	74.14 (16.777)	(57.75 ,101.63)	EXR (17)	48.205 (4.883)	(42.23 ,56.04)
EFR (17)	63.592 (2.916)	(59.9 ,69.6)	EFR (17)	55.571 (1.169)	(53.3 ,57.9)	EFR (17)	57.835 (2.184)	(54.7 ,61.3)
CR5 (17)	84.993 (14.858)	(62.263 ,100)	CR5 (17)	85.195 (14.936)	(58.314 ,100)	CR5 (17)	69.348 (16.895)	(56.3 ,73.0)
Input of Lerner Index								
W1 (854)	0.01 (0.01)	(0.001 ,0.053)	W1 (551)	0.013 (0.008)	(0.003 ,0.039)	W1 (448)	0.016 (0.014)	(0.004 ,0.095)
W2 (846)	0.056 (0.048)	(0.009 ,0.259)	W2 (497)	0.11 (0.117)	(0.013 ,0.658)	W2 (433)	0.053 (0.033)	(0.01 ,0.167)
W3 (919)	0.01 (0.013)	(0 ,0.075)	W3 (569)	0.027 (0.038)	(0.005 ,0.221)	W3 (501)	0.02 (0.017)	(0 ,0.084)
TC (902)	0.074 (0.056)	(0.009 ,0.312)	TC (568)	0.138 (0.128)	(0.03 ,0.753)	TC (386)	0.089 (0.052)	(0.026 ,0.3)
P (919)	0.058 (0.056)	(0 ,0.293)	P (569)	0.077 (0.072)	(0 ,0.379)	P (501)	0.07 (0.062)	(0 ,0.326)
Q (919)	6786 (11213)	(122 ,55616)	Q (569)	1657 (2580)	(14 ,10854)	Q (501)	1473 (3441)	(13 ,17255)

See Table 4.2a for description.

TABLE 4.2C Country-Wise Descriptive Statistics of Asian Banks in Emerging Economies (Continued...)

KSA			Thailand			UAE		
Variable, (Obs)	**Mean (Std.Dev.)**	**(Min, Max)**	**Variable, (Obs)**	**Mean (Std.Dev.)**	**(Min, Max)**	**Variable, (Obs)**	**Mean (Std.Dev.)**	**(Min, Max)**
SROA (208)	2.754 (3.262)	(0.12 ,15.16)	SROA (450)	11.759 (22.944)	(0.135 ,116.215)	SROA (405)	4.255 (7.074)	(0.06 ,38.09)
BZSB (207)	23.209 (31.72)	(1.38 ,148.37)	BZSB (446)	14.862 (29.379)	(0.01 ,161.73)	BZSB (403)	33.691 (61.506)	(0.46 ,329.27)
LBZS (206)	2.416 (1.114)	(0.33 ,5)	LBZS (431)	1.492 (1.794)	(-2.14 ,5.28)	LBZS (403)	2.486 (1.456)	(-0.77 ,5.8)
NPR (218)	4.092 (4.909)	(0 ,22.12)	NPR (488)	6.035 (8.013)	(0 ,33.28)	NPR (422)	5.372 (6.395)	(0 ,26.58)
LLP (215)	0.808 (0.854)	(-0.435 ,3.555)	LLP (465)	1.7 (3.325)	(-2.326 ,15.116)	LLP (420)	1.148 (1.686)	(-1.056 ,8.413)
LER (218)	0.525 (0.062)	(0.381 ,0.584)	LER (492)	0.338 (0.088)	(0.091 ,0.412)	LER (422)	0.475 (0.074)	(0.355 ,0.584)
LTA (218)	9.242 (1.191)	(6.934 ,11.22)	LTA (490)	5.779 (1.838)	(1.764 ,9.018)	LTA (422)	7.941 (1.537)	(4.756 ,11.151)
NII (218)	26.643 (16.946)	(-74.62 ,101.16)	NII (484)	38.335 (36.83)	(-97.06 ,334.41)	NII (422)	36.256 (21.371)	(-20.96 ,133.66)
DPT (192)	0.657 (0.209)	(0.053 ,0.828)	DPT (363)	0.675 (0.169)	(0.231 ,0.908)	DPT (398)	0.637 (0.152)	(0.128 ,0.845)
LNG (189)	0.189 (0.272)	(-0.135 ,1.463)	LNG (364)	0.183 (0.494)	(-0.444 ,2.311)	LNG (398)	0.275 (0.447)	(-0.293 ,2.207)
CIR (210)	38.212 (12.851)	(20.15 ,72.8)	CIR (463)	71.707 (45.903)	(29.39 ,275.73)	CIR (416)	41.393 (20.016)	(17.07 ,124.04)
LLR (213)	4.935 (4.4)	(0.27 ,20.69)	LLR (449)	8.109 (9.815)	(0.44 ,52.38)	LLR (382)	6.066 (5.662)	(0.44 ,26.1)
NIM (218)	3.092 (1.242)	(0 ,7.85)	NIM (486)	3.081 (2.346)	(-2.31 ,10.98)	NIM (422)	3.54 (1.824)	(0 ,10.24)
CTA (218)	20.854 (18.355)	(7.85 ,91.29)	CTA (492)	23.08 (23.718)	(0 ,87.41)	CTA (422)	20.983 (12.654)	(7.83 ,66.81)
MSP (17)	52.277 (5.559)	(44.65 ,64.57)	MSP (17)	112.682 (9.060)	(100.37 ,127.05)	MSP (17)	57.781 (13.397)	(40.81 ,78.2)
AGR (17)	4.126 (3.953)	(-2.82 ,11.24)	AGR (17)	4.0914 (2.5243)	(-0.69 ,7.51)	AGR (17)	4.781 (3.984)	(-5.24 ,9.84)
INF (17)	7.602 (8.065)	(-2.35 ,20.15)	INF (17)	2.875 (1.569)	(0.19 ,5.13)	INF (17)	6.950 (7.287)	(-2.35 ,18.53)
EXR (17)	3.75 (0)	(3.75 ,3.75)	EXR (17)	36.127 (4.915)	(30.49 ,44.43)	EXR (17)	3.67 (0)	(3.67 ,3.67)
EFR (17)	62.885(1.686)	(60.4 ,66.2)	EFR (17)	64.514 (2.118)	(62.3 ,69.1)	EFR (17)	67.542 (3.578)	(62.2 ,71.4)
CR5 (17)	78.742 (1.428)	(76.329 ,80.798)	CR5 (17)	66.776 (1.395)	(64.060 ,69.536)	CR5 (17)	74.960 (4.999)	(66.734 ,80.774)
Input of Lerner Index								
W1 (204)	0.009 (0.004)	(0.003 ,0.022)	W1 (359)	0.022 (0.038)	(0.002 ,0.167)	W1 (409)	0.012 (0.009)	(0.004 ,0.054)
W2 (210)	0.048 (0.102)	(0.001 ,0.552)	W2 (395)	0.044 (0.038)	(0.011 ,0.205)	W2 (385)	0.036 (0.026)	(0.008 ,0.162)
W3 (218)	0.006 (0.004)	(0 ,0.021)	W3 (492)	0.02 (0.034)	(0 ,0.188)	W3 (421)	0.01 (0.013)	(0.002 ,0.076)
TC (204)	0.058 (0.093)	(0.008 ,0.536)	TC (397)	0.08 (0.061)	(0.019 ,0.263)	TC (421)	0.058 (0.041)	(0.02 ,0.262)
P (218)	0.056 (0.027)	(0.026 ,0.153)	P (491)	0.108 (0.154)	(-0.02 ,0.667)	P (422)	0.071 (0.05)	(0.027 ,0.3)
Q (218)	18382 (18042)	(1026 ,74632)	Q (492)	1136 (1768)	(6 ,8247)	Q (422)	8351 (14158)	(116 ,69617)

See Table 4.2a for description.

Table 4.3: Pairwise correlations of study variables - Asia

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) SROA	1								
(2) LBZS	-0.554***	1							
(3) NPL	0.203***	-0.175***	1						
(4) LLP	0.158***	-0.107***	0.284***	1					
(5) LER	-0.209***	0.210***	-0.166***	-0.192***	1				
(6) LTA	-0.238***	0.061***	-0.132***	-0.134***	0.340***	1			
(7) NII	0.207***	-0.019	0.078***	0.065***	-0.091***	-0.158***	1		
(8) DPT	-0.107***	-0.120***	-0.003	-0.031**	0.035***	0.221***	-0.241***	1	
(9) LNG	-0.01	0.02	0.026**	-0.011	-0.034***	0.004	-0.008	0.013	1
(10) CIR	0.618***	-0.389***	0.220***	0.076***	-0.260***	-0.302***	0.189***	-0.004	0.024*
(11) LLR	0.295***	-0.113***	0.589***	0.406***	-0.295***	-0.300***	0.164***	-0.137***	0.034**
(12) NIM	-0.110***	0.163***	-0.056***	0.000	0.007	-0.182***	-0.361***	0.033**	-0.002
(13) CTA	0.112***	0.280***	-0.056***	-0.069***	0.089***	-0.413***	0.231***	-0.564***	0.008
(14) MSP	-0.095***	-0.028**	-0.104***	-0.089***	0.260***	0.457***	-0.143***	0.013	-0.032**
(15) AGR	-0.132***	-0.004	-0.211***	-0.294***	0.324***	0.313***	-0.114***	0.135***	-0.011
(16) INF	0.069***	-0.038***	0.085***	0.325***	-0.230***	-0.263***	0.022*	-0.055***	-0.01
(17) EXR	0.015	0.026**	-0.015	0.112***	-0.106***	-0.465***	-0.082***	0.054***	-0.018
(18) EFR	0.055***	0.122***	0.185***	0.087***	0.087***	-0.104***	0.082***	-0.159***	-0.014
(19) CR5	0.095***	0.003	0.227***	0.015	-0.006	-0.050***	0.028**	-0.119***	-0.025**

TABLE 4.3 Continued

Variables	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(10) CIR	1									
(11) LLR	0.231***	1								
(12) NIM	-0.084***	-0.077***	1							
(13) CTA	0.080***	0.156***	0.137***	1						
(14) MSP	-0.195***	-0.167***	-0.207***	-0.126***	1					
(15) AGR	-0.146***	-0.289***	-0.076***	-0.110***	0.385***	1				
(16) INF	0.032**	0.180***	0.116***	0.003	-0.348***	-0.303***	1			
(17) EXR	0.056***	0.055***	0.285***	0.026**	-0.444***	-0.147***	0.369***	1		
(18) EFR	0.007	0.202***	-0.027**	0.225***	-0.068***	-0.406***	-0.034***	-0.172***	1	
(19) CR5	0.062***	0.158***	-0.085***	0.088***	0.200***	-0.116***	0.033***	-0.187***	0.326***	1

*This Table shows the pairwise correlations among study variables for Asian countries. In this Table, SROA is the std. deviation of ROA, LBZS is the log of bank z-score, NPL is the non-performing loan ratio, LLP is the loan loss provisions to total loans, LER is the Lerner index, LTA is the log of total assets, NII is the non-interest revenue to total revenue, DPT is the ratio of total deposits to total assets, LNG is the loan growth rate, CIR is the cost to income ratio, LLR is the loan loss reserve ratio, NIM is the net interest margin, CTA is the capital asset ratio, MSP is the money supply growth, AGR is the annual GDP growth, INF is the inflation rate, EXR is the exchange rate, EFR is the economic freedom index, CR5 is the concentration ratio, *** p<0.01, ** p<0.05, * p<0.1*

TABLE 4.4: Variance inflation factor and tolerance of study variables - Asia

	Variable	VIF	1/VIF
(1)	LER (Lerner index)	1.46	0.686201
(2)	LTA (Log of Total Assets)	2.32	0.430542
(3)	NII (non-interest revenue to total revenue)	1.56	0.642013
(4)	DPT (Ratio of total deposits to total assets)	1.62	0.61911
(5)	LNG (Loan growth rate)	1.01	0.990145
(6)	CIR (Cost to Income ratio)	1.26	0.79069
(7)	LLR (Loan Loss reserve ratio)	1.23	0.809945
(8)	NIM (Net interest margin)	1.71	0.583151
(9)	CTA (capital asset ratio)	1.86	0.537748
(10)	MSP (Money Supply Growth)	2	0.498865
(11)	AGR (Annual GDP Growth)	1.7	0.586603
(12)	INF is the Inflation Rate	1.35	0.739205
(13)	EXR is the Exchange Rate	2.06	0.486259
(14)	EFR is the Economic Freedom Index	1.66	0.603662
(15)	CR5 is the Concentration Ratio	1.23	0.809843

This Table shows the VIF and tolerance of explanatory variables using an auxiliary regression for Asian countries.

4.1.4 Bank Competition and Financial Stability in Emerging Asian Economies

This sub-section presents the results of the competition stability relationship using the data of banks from nine emerging economies of Asia from 2001 to 2017. These results are estimated with panel data estimator (i.e., fixed effect estimator) which considers the panel structure of the data, unlike the pooled estimator which ignores the panel structure of the data (Beck et al., 2006). In fixed-effect estimation, this study calculates the standards errors clustered at the bank level (rather using simple or robust standard errors) and include year dummies. This allows us to control from correlations of error term which is assumed to be correlated within-cluster and independent across clusters (Soedarmono and Tarazi, 2016). Table 4.5 presents the results of this analysis in which competition measure (Lerner index) is regressed on five measures of financial stability. In specification 1, income volatility

is used as the dependent variable and it is found that competition measure is negatively associated with income volatility. It shows that low bank competition reduces the standard deviation of return on assets. In specification 2 and 3, this study regresses credit risk measures on the Lerner index (non-performing loan ratio and loan loss provisions, respectively). The results show that credit risk is positively associated with competition (or lower market power) in model 2 and is insignificant in model 3. In specification 4 and 5, Lerner index is regressed on bank Z-score and its log-transformed series which are the direct measures of bank financial stability in contrast to the dependent variables (SROA, NPL and LLP) in model 1 to 3 which are the inverse measures of bank stability. The results of models 4 and 5 show that competition is negatively associated with bank Z-score and its log-transformed values. All the relationships are significant at 1% level except model 4 where this relationship is significant at 5% level.

These results show that higher market power promotes the financial stability of banks. These findings support the charter value hypothesis. These findings are opposite of the recent stance of competition stability which is related to Latin America (Yeyati and Micco, 2007); developed European countries (Fiordelisi and Mare, 2014), who studied the banks in five developed countries, i.e. Austria, France, Germany, Italy, and Spain and Korea (Jeon and Lim, 2013) among others. However, these findings are intuitive for banks in emerging countries. Emerging countries adopt finance for growth regulation for a much longer period and priority sectors are being financed by large banks in concentrated banking systems in emerging countries which ultimately brands them (the borrowers) to reach too-big-to-fail status. Therefore, banks end up with high levels of non-performing loans due to the loss of maintaining a good credit culture (Fu et al., 2014). Further, bank moral hazard serves as a major problem in emerging countries. The major investment vehicle of public saving in emerging countries is bank deposits which lend them to be too-systemically-important-to-fail as a consequence of bank moral hazard (Sheng, 2009).

The results of the study are supported by the finding of Fu et al. (2014) and Berger et al. (2017). The former studies the competition stability relationship

in Asia-Pacific countries and later studies 23 developed countries. More recently, Yusgiantoro et al. (2019) find support for the competition-fragility paradigm in Indonesia. Elzinga and Mills (2011) describe that the Lerner index is a superior measure of price-setting discretion of a firm to sustain monopoly rents. Therefore, the results of the study imply that banks in emerging markets are able to obtain premium profits due to higher discretion in terms of price-setting, which creates a capital buffer and reduce insolvency risk. This capital buffer enables banks to be more resilient at the times of macro-shock, financial crisis, and liquidity shocks. All the specifications of models 1 to 5 of Table 4.5 are significant as F-values of all models (joint-significance of coefficients) are significant at 1% level and Hausman test reveals the appropriate use of fixed effect estimator.

For control variables, non-interest income (NNI) is positive and significant in model 1 to model 3 at 10%, 5%, and 1% levels respectively. In model 4, it is negative and significant at the 10% level and insignificant for model 5. These results show that that involvement in non-interest income increases the volatility of earnings, non-performing loans, and the use of provision for lost loans implying the greater risk of non-interest income activities. It is consistent with the international evidence of a positive relationship between non-interest income and risk-taking (Williams, 2016).

Deposits to assets ratios (DPT) is found to be positively associated with financial stability in model 5 and negatively associated with credit risk in model 2. However, it is insignificant for models 1, 2, and 4. It shows that deposits ratio reduces credit risk and increases bank stability as deposits increase the liquidity of banks (Foos et al., 2010; Yusgiantoro et al., 2019). Moreover, it boosts stability due to higher loans which increases the riskiness due to increased financial intermediation (Soedarmono et al., 2017).

For loan growth rate (LNG), it is observed that it increases the volatility of earnings (SROA) and reduces bank stability (BZS, LBZS). This finding is in line with the finding of Kasman and Kasman (2015) who found that higher loan growth

upturns the credit risk. This may be due to the weaker screening standards, relaxed collateral requirements and lower interest rates (Ogura, 2006; Dell'Ariccia and Marquez, 2006).

For operational efficiency measure (CIR), which directly measures cost inefficiency, it is observed to have positive association with volatility of earnings (SROA) and credit risk (NPL, LLP) significant at 1% level and negative association with solvency measures (BZS, LBZS at 5% and 1% levels respectively). These results show that cost inefficiency increases credit risk and reduces stability. According to (Kwan and Eisenbeis, 1997), inefficiency enhances the risk-taking due to the moral hazard problem (showing greater risk-taking incentives for poorly managed banks). These are consistent with the finding of (Abedifar et al., 2018) who find that negative association between cost inefficiency and solvency as these banks earn reduced interest margins due to inefficacy and search for high profits to compensate their losses exacerbating risk-taking incentives.

For loan quality measure (LLR), it is economically and statistically significant in all models at 1% except (higher values of LLR indicate poor quality of loan portfolio). These results show that poor loan quality is positively associated with higher credit risk and lower stability as it increases the volatility of earning (SROA), loan loss provision (LLP) and credit risk (NPL) and reduces solvency (BZS, LBZS). These results support the findings of Fang et al. (2014) and Laeven and Levine (2009) that LLR enhances the risk of default of non-performing loans reduces stability as it comprises the loans which are provided for but not actually charged off.

For profitability measure (NIM), results reveal that NIM is positively and significantly associated with stability in models 2, 4, and 5. However, it is found to be increasing the volatility of earnings and loan loss provisions. The results of solvency show that it increases the stability (as it reduces the NPL and LLP in models 1 and 2 and increases BZSB and LBZS in models 4 and 5) and is insignificant in model 1. These results may be explained as higher equity can reduce the moral hazard problem and escalate monitoring incentives (Diamond, 1984) and it

may exacerbate the risk-taking incentives for banks (Abedifar et al., 2018). Economic freedom is positively associated with stability. Concentration increases the credit risk and stability in models 2 and 4 consistent with Fu et al. (2014).

4.1.5 Bank Size and Financial Stability in Emerging Asian Economies

In this sub-section, this study presents the results of the relationship between bank size and stability using the data of banks from nine emerging economies of Asia from 2001 to 2017. These results are estimated with panel data estimator (i.e. fixed effect estimator), which considers the panel structure of the data unlike the pooled estimator which ignores the panel structure of the data (Beck et al., 2006). In using a fixed-effect estimator, this study calculates the standards errors clustered at the bank level (rather using simple or robust standard errors). This allows us to control from correlations of error term which is assumed to be correlated within cluster and independent across clusters (Soedarmono and Tarazi, 2016). In this estimation, this study controls for a variety of bank-level and macro-economic variables. These variables include the measures related to income diversification, liquidity, level of financial intermediation, cost efficiency, loan quality, bank profitability, solvency, money supply, economic growth, inflation, exchange rate, economic freedom, and concentration. Table 4.6 presents the results of this analysis. In specification 1, bank size (LTA) is regressed on income volatility and the sign is negative and is significant at 1% level. It shows a positive relationship between bank size and stability. In model 2, this study regresses bank size on first credit risk measure (NPL) and finds a negative association significant at 1% level. This relationship is found to be insignificant in model 3. In model 4 and 5, this study regresses bank size on bank stability measures (BZS and LBZS) and observe positive association significant at 1% level. These results show that an increase in bank size leads to higher stability and lower credit risk. This stance is also observed in literature as too-small-to-have-scale-economies. It postulates that banks can benefit from economies of scale when bank size increases due to reduced costs, improved monitoring and efficient financial intermediation (Beccalli et al.,

TABLE 4.5: Impact of bank competition on financial stability - Asia

	(1)	(2)	(3)	(4)	(5)
	SROA	**NPL**	**LLP**	**BZSB**	**LBZS**
LER	-8.354***	-5.577***	.303	10.136**	1.26***
	(1.296)	(.809)	(.347)	(4.569)	(.187)
NII	.018*	.012**	.018***	-.054*	.001
	(.009)	(.005)	(.002)	(.032)	(.001)
DPT	-1.428	-4.507***	-.585	-.308	.379*
	(1.505)	(.931)	(.399)	(5.282)	(.216)
LNG	.004**	0.001	-.001	-.021**	-.001**
	(.002)	(.002)	(.001)	(.01)	(0.001)
CIR	.238***	.011***	.005***	-.049**	-.016***
	(.006)	(.004)	(.002)	(.023)	(.001)
LLR	.222***	.926***	.208***	-.299***	-.034***
	(.031)	(.019)	(.008)	(.109)	(.005)
NIM	.234*	-.491***	.179***	1.681***	.062***
	(.128)	(.079)	(.034)	(.45)	(.018)
ETA	.05	-.06***	-.064***	.362***	.05***
	(.031)	(.019)	(.008)	(.108)	(.004)
MSP	.027*	-.065***	.008**	.186***	.014***
	(.015)	(.009)	(.004)	(.052)	(.002)
AGR	.047	-.175***	-.136***	.056	.006
	(.048)	(.03)	(.013)	(.169)	(.007)
INF	.029	.025*	.079***	-.359***	-.015***
	(.022)	(.014)	(.006)	(.079)	(.003)
EXR	0.001	0.001	0.001**	.002**	0
	(0.002)	(0.002)	(0.001)	(.001)	(0)
EFR	-.065	-.007	-.132***	.644***	.021**
	(.059)	(.037)	(.016)	(.209)	(.008)
CR5	.013	.06***	-.004	-.082*	0
	(.013)	(.008)	(.003)	(.044)	(.002)
_cons	-7.177	2.036	-7.868***	-56.39***	-.848
	(4.377)	(2.735)	(1.173)	(15.4)	(.624)
Obs.	5152	5247	5244	5136	5073
_id	630	632	631	630	626
R-squared	.292	.391	.249	.224	.258
Chi-Sq.	38.57	114.84	114.07	102.16	120.08
d.f.	14	14	14	14	14
p-value	0.0004	0.000	0.000	0.000	0.000
F	132.68	211.25	108.67	7.99	59.61
p-value	0.000	0.000	0.000	0.000	0.000

*Above Table shows the results of fixed effect regression for Asian countries. In this Table, SROA is the std. deviation of ROA, BZSB is the log of bank Z-score, LBZS is the log of bank Z-score, NPL is the non-performing loan ratio, LLP is the loan loss provisions to total loans, LER is the Lerner index, LTA is the log of total assets, NII is the non-interest revenue to total revenue, DPT is the ratio of total deposits to total assets, LNG is the loan growth rate, CIR is the cost to income ratio, LLR is the loan loss reserve ratio, NIM is the net interest margin, CTA is the capital asset ratio, MSP is the money supply growth, AGR is the annual GDP growth, INF is the inflation rate, EXR is the exchange rate, EFR is the economic freedom index, CR5 is the concentration ratio. Standard errors are shown in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

2015) and contribute to bank stability. These findings and the opposite view of literature collectively lend to the existence of a possible bi-directional relationship

between bank size and stability (which is given in the next section). All the specifications of models 1 to 5 of Table 4.6 are significant as F-values (joint-significance of coefficients) of all models are significant at a 1% level and the Hausman test reveals the appropriate use of fixed effect estimator.

4.1.6 Bank Competition, Bank Size on Financial Stability in Asia: Test of the non-linear relationship

In this sub-section, this study presents the results of the non-linear relationship between bank competition, size, and stability using the data of banks from five emerging economies of Asia from 2001 to 2017. These results are estimated with panel data estimator (i.e., fixed effect estimator) which considers the panel structure of the data. In using fixed-effect estimator, this study calculates the standards errors clustered at the bank level. In this estimation, this study control for a variety of bank-level and macro-economic variables. These variables include the ratio of non-interest revenue to total revenue, deposits of total assets ratio, loan growth, net interest margin, equity to asset ratio, money supply growth, GDP growth, inflation, exchange rate, and concentration ratio. Table 4.7 presents the results of this analysis. In this Table, model 1-5 shows the non-linear relationship between bank competition and stability measures. A quadratic term of the Lerner index (LERˆ2) is added in the estimation. It is observed that LERˆ2 is insignificant. This implies that competition affects bank stability in models 1, 2, 4, and 5. However, it is marginally significant in model 3. All specifications of models 1 to 5 of Table 4.7 are significant as F-values (joint-significance of coefficients) in all models are significant at 1% level and the Hausman test reveals the appropriate use of fixed effect estimator. In models 1-5, this study analysis the non-linear relationship between bank size and stability measures. A quadratic term of bank size (LTAˆ2) is added in the estimation. In models 6 and 7, both (LTA and LTAˆ2) coefficients of size are significant at 1% and 5% levels respectively. In polynomial regression, the squared term is used to capture the non-linear relationship. The significance of the squared term is used to assess the presence of a non-linear relationship. The sign of the relationship is merely used to shape of the curvilinear relationship that

TABLE 4.6: Impact of bank competition and financial stability - Asia

	(1)	(2)	(3)	(4)	(5)
	SROA	**NPL**	**LLP**	**BZS**	**LBZS**
LTA	-.919***	-1.025***	-.067	3.374***	.334***
	(.211)	(.132)	(.057)	(.744)	(.03)
NII	.016*	.01*	.018***	.065**	.001
	(.009)	(.005)	(.002)	(.032)	(.001)
DPT	-2.163***	-4.262***	-.631	1.702	.688***
	(0.506)	(.931)	(.4)	(5.292)	(.215)
LNG	-.002	0	-.001	-.017*	0
	(.003)	(.002)	(.001)	(.01)	(0)
CIR	.239***	.005	.005***	-.042*	-.016***
	(.006)	(.004)	(.002)	(.023)	(.001)
LLR	.233***	.858***	.204***	-.203*	-.025***
	(.032)	(.02)	(.008)	(.112)	(.005)
NIM	.213*	-.524***	.177***	1.845***	.076***
	(.128)	(.079)	(.034)	(.451)	(.018)
ETA	.008	-.082***	-.064***	.492***	.063***
	(.031)	(.019)	(.008)	(.111)	(.004)
MSP	.059***	-.013	.012**	.044	0
	(.017)	(.011)	(.005)	(.062)	(.002)
AGR	.017	-.091***	-.131***	.013	.004
	(.047)	(.03)	(.013)	(.167)	(.007)
INF	.038*	.015	.079***	-.367***	-.017***
	(.022)	(.014)	(.006)	(.078)	(.003)
EXR	0	0	0***	.002**	0
	(0)	(0)	(0)	(.001)	(0)
EFR	-.036	-.092**	.126***	.686***	.023***
	(.059)	(.037)	(.016)	(.207)	(.008)
CR5	.004	.041***	-.005	.122***	.004**
	(.013)	(.008)	(.004)	(.046)	(.002)
_cons	-5.326	12.746***	-7.181***	-74.34***	-2.494***
	(4.553)	(2.841)	(1.221)	(16.039)	(.644)
Observations	5147	5241	5243	5131	5069
_id	629	631	631	629	626
R-squared	.287	.29	.248	.28	.173
Chi-Sq.	43.45	117.63	113.5	100.86	115.35
d.f.	14	14	14	14	14
p-value	0.000	0.000	0.000	0.000	0.000
F-stat	129.59	209.57	108.49	19.16	66.36
p-value	0.000	0.000	0.000	0.000	0.000

*Above Table shows the results of fixed effect regression for Asian countries. In this Table, SROA is the std. deviation of ROA, BZSB is the log of bank Z-score, LBZS is the log of bank Z-score, NPL is the non-performing loan ratio, LLP is the loan loss provisions to total loans, LTA is log of total assets, LTA is the log of total assets, NII is the non-interest revenue to total revenue, DPT is the ratio of total deposits to total assets, LNG is the loan growth rate, CIR is the cost to income ratio, LLR is the loan loss reserve ratio, NIM is the net interest margin, CTA is the capital asset ratio, MSP is the money supply growth, AGR is the annual GDP growth, INF is the inflation rate, EXR is the exchange rate, EFR is the economic freedom index, CR5 is the concentration ratio. Standard errors are shown in parentheses with *** p<0.01, ** p<0.05, * p<0.1.*

is either the relationship is U-shape (convex) or inverted U-shape (concave). For the variables that do not have zero in its range of observed values, the negative

sign of X (linear term) and a positive sign of X^2 (square term) imply the inverted U-shape relationship and vice versa. The squared term is significant in all models and both linear and squared terms are significant in models 1 to 3. This shows the presence of a non-linear relationship between bank size and stability. However, some studies conclude that large banks are a prelude to the financial crisis (Farhi and Tirole, 2012). Arguing that big banks act in morally hazardous ways when they receive public guarantees and bailout incentives which exacerbates their risk-taking behavior. More specifically, it is termed as too-large-to-fail hypothesis for large and interconnected banks which destabilize the banking system and is also considered as a fundamental reason behind the global financial crises (Moutsianas and Kosmidou, 2016). All specifications of models 1 to 5 of Table 4.7 are significant as F-values (joint-significance of coefficients) in all models are significant at 1% level and the Hausman test reveals the appropriate use of fixed effect estimator.

TABLE 4.7: Non-linear impact of competition and size on financial stability - Asia

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
	Competition					**Bank Size**				
	SORA	**NPL**	**LLP**	**BZSB**	**LBZS**	**SORA**	**NPL**	**LLP**	**BZSB**	**LBZS**
LER	-7.048***	-.951	-1.016**	6.919	1.332***					
	(1.847)	(1.144)	(.491)	(6.549)	(.274)					
LER^2	-3.747	3.4	3.82*	9.156	-.198					
	(3.776)	(2.348)	(2.209)	(13.35)	(.55)					
LTA						-2.896***	1.307***	.288	4.385*	.121
						(.675)	(.419)	(.181)	(2.371)	(.095)
LTA^2						.137***	-.162***	-.025**	-.538***	-.031***
						(.044)	(.028)	(.012)	(.156)	(.006)
NII	.018**	.011**	.018***	.053*	.001	.015*	.011*	.018***	.06*	.001
	(.009)	(.005)	(.002)	(.032)	(.001)	(.009)	(.005)	(.002)	(.032)	(.001)
DPT	-1.396	4.396***	-.616	-3.389	-.377*	-1.783	3.788***	-.701*	-.087	-.092
	(1.505)	(.928)	(.399)	(5.283)	(.216)	(1.511)	(.93)	(.401)	(5.301)	(.215)
LNG	-.004	0	-.001	.021**	.001**	-.002	0	-.001	.017*	.001
	(.003)	(.002)	(.001)	(.01)	(0)	(.003)	(.002)	(.001)	(.01)	(0)
CIR	.238***	.011***	-.005***	-.048**	-.016***	.239***	.004	-.006***	-.039*	-.016***
	(.006)	(.004)	(.002)	(.023)	(.001)	(.006)	(.004)	(.002)	(.023)	(.001)
LLR	.226***	.912***	.204***	-.309***	-.034***	.216***	.877***	.207***	-.271**	-.029***
	(.031)	(.019)	(.008)	(.109)	(.005)	(.032)	(.02)	(.009)	(.114)	(.005)
NIM	.24*	-.51***	.173***	1.665***	.062***	.205	-.511***	.179***	1.804***	.073***
	(.128)	(.079)	(.034)	(.45)	(.018)	(.128)	(.079)	(.034)	(.45)	(.018)
ETA	.051*	-.062***	-.065***	.361***	.05***	-.007	-.065***	-.062***	.433***	.059***
	(.031)	(.019)	(.008)	(.108)	(.004)	(.032)	(.02)	(.008)	(.112)	(.005)
MSP	.03**	-.076***	.005	.178***	.014***	.03	.023*	.017***	-.079	-.007***
	(.015)	(.009)	(.004)	(.053)	(.002)	(.02)	(.012)	(.005)	(.07)	(.003)

TABLE 4.7 Continued...

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
AGR	.054	-.198***	-.142***	.04	.006	.014	-.086***	-.13***	-.001	.003
	(.049)	(.03)	(.013)	(.171)	(.007)	(.047)	(.03)	(.013)	(.167)	(.007)
INF	.027	.031**	.081***	-.354***	-.015***	.025	.03**	.081***	-.417***	-.02***
	(.022)	(.014)	(.006)	(.079)	(.003)	(.022)	(.014)	(.006)	(.08)	(.003)
EXR	0	0	0***	.002**	0	0	0	0***	.002**	0
	(0)	(0)	(0)	(.001)	(0)	(0)	(0)	(0)	(.001)	(0)
EFR	-.059	-.029	.126***	.631***	.021**	-.039	-.091**	.126***	.679***	.023***
	(.06)	(.037)	(.016)	(.21)	(.008)	(.059)	(.037)	(.016)	(.207)	(.008)
CR5	.015	.051***	-.007*	.076*	0	-.001	.047***	-.004	.102**	.003
	(.013)	(.008)	(.003)	(.045)	(.002)	(.013)	(.008)	(.004)	(.046)	(.002)
_cons	-8.006*	5.033*	-7.014***	-54.388***	-.891	4.401	1.161	-8.94***	-35.469*	-.211
	(4.456)	(2.776)	(1.193)	(15.675)	(.635)	(5.538)	(3.439)	(1.484)	(19.482)	(.782)
_id	630	632	631	630	626	629	631	631	629	626
Observations	5152	5247	5244	5136	5073	5141	5235	5237	5125	5063
R-squared	.506	.396	.301	.224	.258	.489	.395	.391	.33	.338
F-stat	123.90	200.1	202.6	7.48	55.63	121.64	199.4	101.5	9.66	63.66
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

*Above Table shows the results of fixed effect regressions for Asian countries. In this Table, SROA is the std. deviation of ROA, BZSB is the log of bank Z-score, LBZS is the Log of Bank Z-score, NPL is the Non-performing loan ratio, LLP is the loan loss provisions to total loans, LER is the Lerner index, LTA is the log of total assets, LERˆ2 and LTAˆ2 are the squared term of LER and LTA, respectively to capture the non-linear relationship, NII is the non-interest revenue to total revenue, DPT is the ratio of total deposits to total assets, LNG is the loan growth rate, CIR is the cost to income ratio, LLR is the loan loss reserve ratio, NIM is the net interest margin, CTA is the capital asset ratio, MSP is the money supply growth, AGR is the annual GDP growth, INF is the inflation rate, EXR is the exchange rate, EFR is the economic freedom index, CR5 is the concentration ratio. Standard errors are shown in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

4.2 Impact of Competition and Bank Size on Financial Stability of Banks in Emerging European Economies

This section of the study presents the results of descriptive statistics, correlation and regression for five emerging European economics using bank-level data from 2001 to 2017. These countries include Croatia, Hungary, Poland, Romania, and Ukraine. First, it presents overall descriptive statistics in section subsection 4.2.1,

followed by country-wise descriptive statistics in section 4.2.2, and correlations are presented in section 4.2.3.

4.2.1 Descriptive statistics

This sub-section (Table 4.8) presents the overall mean, standard deviation, maximum and minimum values of study variables. Table 4.8 illustrates the values of descriptive statistics for the overall European region. The results show that the mean value of bank Z-score (8.701) and log of bank Z-score (1.26) quantifies the stability of the banking system in the region. Furthermore, the value of Lerner index (0.243) shows the intensity of bank competition in Europe. For SROA, mean value (7.41%) represents the volatility of return on assets whereas, (8.291%) illustrates the NPR and (1.861%) for LLP. The annual GDP growth in Europe is reported as 3.844%. For log of total assets as a measure of size, the value is 6.218. Besides, the cost of labour prices, funding and physical capital are reported which are the inputs for Lerner index. The table 4.8 also describes the minimum and maximum values of descriptive statistics against each variable used in the study for the overall European region. Highest inflation is observed in Ukraine (23.15%) and highest exchange rate in Hungary (286.49) in 2005 and 2001, respectively (observed from dataset) and is also reported in Table 4.9 (A & B).

4.2.2 Country Wise Descriptive Statistics

This sub-section, Table 4.9(a) to 4.9(b) illustrates the mean of descriptive statistics for the banks of European region. The study includes five European countries for the bank-level analysis that are Croatia, Hungry, Poland, Romania and Ukraine. The results show that the two highest values of BZSB are in Croatia (11.432) and Poland (9.836) which attributes the bank stability of the countries in the region. Besides, the lowest values for BZSB are reported for Ukraine and Hungry (7.576 and 6.571) respectively. Furthermore, for LBZS same trend is observed for highest values in Croatia (1.524) and Poland (1.449) and lowest in Ukraine and Hungry (1.028 and 1.062) respectively. The highest values of LER

index in Croatia (0.276) and Romania (0.242) show the existence of low bank competition in the countries whereas the lowest value in the region is observed for Hungry (0.215). Moreover, hungry (0.337) and Poland (0.310) bears highest cost of labour prices, funding and physical capital. However, Croatia (0.095) and Romania (0.165) bears the low costs. For SROA, Romania (9.266%) and Ukraine (9.865%) have the highest volatility of return on assets, whereas Hungry (6.548%) and Poland (5.022%) represents the lowest SROA. Furthermore, for NPR, Romania (13.26%) and Ukraine (15.097%) illustrates the highest NPR, whereas Croatia (5.560%) and Hungry (2.209%) is having the lowest NPR. Romania and Ukraine show the highest percentages of LLP (2.745% and 3.224%) respectively whereas in contrast to this Hungry and Poland report the lowest LLP with (0.923% and 0.871%) respectively. The highest values of annual GDP growth are reported in Romania (3.844%) and Poland (3.722%), whereas Croatia (2.601%) and Hungry (2.872%) show the lowest annual GDP in the region. In the last, the table also depicts the minimum and maximum values of descriptive stats against each variable used in the study.

TABLE 4.8: Descriptive Statistics of Banks in Emerging European Economies

Variable	**Obs**	**Mean**	**Std.Dev.**	**Min**	**Max**
SROA	2539	7.41	10.688	0.07	69.99
BZSB	2531	8.701	14.968	0.142	98.74
LBZS	2499	1.26	1.48	-2.848	5.26
NPR	2473	8.219	11.816	0	65.4
LLP	2581	1.861	3.334	-2.697	23.417
LER	2611	0.243	0.059	0.049	0.357
LTA	2610	6.218	1.758	1.895	10.271
NII	2539	39.908	24.191	0	502.38
DPT	2495	0.545	0.221	0.006	0.898
LNG	2467	0.409	0.881	-0.468	6.613
CIR	2576	71.667	30.158	20	248.94
LLR	2368	7.382	7.126	0.06	44.98
NIM	2617	5.426	3.747	-1.21	24.19
CTA	2617	13.568	8.57	2.64	57.45
MSP	85	50.176	12.377	28.87	77.47
AGR	85	2.980	3.932	-6.55	11.4
INF	85	7.009	6.595	0.14	23.15
EXR	85	47.107	86.227	2.77	286.49
EFR	85	58.339	6.698	46.40	67.60
CR5	85	68.736	11.029	39.47	87.54
Input of Lerner Index					
W1	2345	0.02	0.014	0.004	0.119
W2	2411	0.181	0.478	0.021	4
W3	2593	0.031	0.027	0.003	0.199
TC	2579	0.222	0.471	0.017	4.019
P	2611	0.099	0.083	0	0.932
Q	2608	2051.256	4188.966	5.931	28893.32

This Table shows the overall descriptive statistics of banks in five emerging European economies. See Table 4.1 for description.

TABLE 4.9A: Country-Wise Descriptive Statistics of European Banks in Emerging Economies

Croatia			Hungry			Poland		
Variable, (Obs)	Mean (Std.Dev.)	(Min, Max)	Variable, (Obs)	Mean (Std.Dev.)	(Min, Max)	Variable, (Obs)	Mean (Std.Dev.)	(Min, Max)
SROA (489)	7.255 (11.588)	(0.07 ,56.97)	SROA (432)	6.548 (6.982)	(0.155 ,32.1)	SROA (686)	5.022 (6.072)	(0.105 ,29.985)
BZSB (487)	11.432 (18.953)	(0.01 ,98.74)	BZSB (432)	7.576 (13.011)	(0.042 ,68.533)	BZSB (684)	9.836 (16.2)	(0.068 ,82.05)
LBZS (485)	1.524 (1.58)	(-2.59 ,5.26)	LBZS (429)	1.062 (1.484)	(-2.713 ,4.368)	LBZS (680)	1.449 (1.362)	(-1.452 ,4.778)
NPR (501)	5.56 (8.031)	(0 ,33.18)	NPR (429)	2.209 (5.902)	(0 ,28.18)	NPR (627)	10.18 (7.357)	(0.66 ,34.86)
LLP (500)	1.718 (2.494)	(-1.921 ,12.021)	LLP (421)	0.923 (1.662)	(-0.383 ,7.843)	LLP (693)	0.871 (1.587)	(-2.697 ,7.143)
LER (501)	0.276 (0.023)	(0.229 ,0.316)	LER (436)	0.215 (0.052)	(0.095 ,0.291)	LER (698)	0.240 (0.089)	(0.049 ,0.347)
LTA (501)	5.866 (1.66)	(3.165 ,9.513)	LTA (433)	5.105 (1.473)	(1.895 ,7.868)	LTA (698)	7.195 (1.636)	(3.851 ,10.271)
NII (490)	34.568 (14.272)	(0 ,116.99)	NII (417)	45.907 (25.506)	(0 ,183.96)	NII (680)	41.336 (24.543)	(0 ,301.18)
DPT (495)	0.63 (0.17)	(0.198 ,0.888)	DPT (392)	0.464 (0.227)	(0.012 ,0.824)	DPT (657)	0.521 (0.261)	(0.006 ,0.889)
LNG (493)	0.202 (0.307)	(-0.257 ,1.35)	LNG (390)	0.258 (0.566)	(-0.429 ,2.87)	LNG (648)	0.38 (0.859)	(-0.41 ,5)
CIR (493)	74.167 (33.206)	(26.26 ,211.54)	CIR (436)	73.504 (28.113)	(26.28 ,176.98)	CIR (693)	66.265 (19.363)	(29.44 ,123.13)
LLR (474)	8.256 (5.695)	(0.98 ,25.89)	LLR (371)	4.586 (4.685)	(0.06 ,18.86)	LLR (622)	4.948 (4.03)	(0.15 ,17.94)
NIM (501)	4.581 (2.002)	(1.18 ,10.38)	NIM (442)	5.282 (4.394)	(-0.44 ,21.63)	NIM (698)	3.978 (2.469)	(0 ,11.5)
CTA (501)	14.674 (8.208)	(3.55 ,43.14)	CTA (442)	12.893 (10.715)	(2.72 ,57.45)	CTA (698)	11.498 (6.765)	(2.64 ,39.33)
MSP (17)	64.669 (7.896)	(54.86 ,77.47)	MSP (17)	54.205 (6.486)	(45.15 ,62.77)	MSP (17)	49.788 (7.092)	(39.79 ,61.56)
AGR (17)	2.601 (3.743)	(-6.55 ,5.64)	AGR (17)	2.872 (3.970)	(-6.55 ,4.82)	AGR (17)	3.722 (2.249)	(1.25 ,7.03)
INF (17)	2.903 (1.633)	(0.14 ,5.56)	INF (17)	4.622 (2.430)	(2.18 ,11.05)	INF (17)	2.452 (1.395)	(0.29 ,4.91)
EXR (17)	6.032 (0.976)	(4.94 ,8.34)	EXR (17)	216.420 (29.264)	(172.11 ,286.49)	EXR (17)	3.305 (0.445)	(2.77 ,4.09)
EFR (17)	55.657 (3.996)	(50.7 ,61.3)	EFR (17)	65.542 (1.653)	(62.7 ,67.6)	EFR (17)	62.1 (2.849)	(58.1 ,67)
CR5 (17)	74.449(2.649)	(69.356 ,78.392)	CR5 (17)	70.091 (2.195)	(67.004 ,73.494)	CR5 (17)	60.119 (14.293)	(46.572, 7.544)
Input of Lerner Index								
W1 (477)	0.017 (0.008)	(0.006 ,0.045)	W1 (344)	0.021 (0.022)	(0.005 ,0.119)	W1 (578)	0.015 (0.008)	(0.004 ,0.043)
W2 (490)	0.054 (0.036)	(0.021 ,0.248)	W2 (362)	0.321 (0.728)	(0.026 ,3.796)	W2 (645)	0.286 (0.712)	(0.022 ,4)
W3 (501)	0.024 (0.015)	(0.004 ,0.082)	W3 (434)	0.044 (0.041)	(0.007 ,0.199)	W3 (696)	0.023 (0.015)	(0.003 ,0.076)
TC (501)	0.095 (0.047)	(0.047 ,0.313)	TC (428)	0.337 (0.681)	(0.032 ,3.797)	TC (690)	0.31 (0.704)	(0.017 ,4.019)
P (501)	0.078 (0.04)	(0.022 ,0.22)	P (434)	0.132 (0.157)	(0.023 ,0.932)	P (698)	0.076 (0.033)	(0.017 ,0.167)
Q (501)	1497 (2982)	(24 ,13539)	Q (436)	415 (570)	(5.931 ,2613.456)	Q (698)	4212 (6448)	(47.025 ,28893.32)

This Table shows the overall descriptive statistics of banks in five emerging European economies. In this Table, SROA is the volatility of earnings, BZSB is the bank Z-score, LBSZ is the log of BZSB, NPR is the non-performing loan ratio, LLP is the ratio of loan loss reserve, LER is the Lerner index, LTA is the Log of Total Assets, NII is the non-interest revenue, DPT is the Ratio of total deposits to total assets, LNG is the Loan growth rate, CIR is the Cost to Income ratio, LLR is the Loan Loss reserve ratio, NIM is the Net interest margin, CTA is the capital asset ratio, MSP is the Money Supply Growth, AGR is the Annual GDP Growth, INF is the Inflation Rate, EXR is the Exchange Rate, EFR is the Economic Freedom Index, and CR5 is the Concentration Ratio.

TABLE 4.9B: Country-Wise Descriptive Statistics of European Banks in Emerging Economies (Continued...)

	Romania			**Ukarine**	
Variable, (Obs)	**Mean (Std.Dev.)**	**(Min, Max)**	**Variable, (Obs)**	**Mean (Std.Dev.)**	**(Min, Max)**
SROA (339)	9.266 (12.772)	(0.105 ,64.88)	SROA (593)	9.865 (13.876)	(0.26 ,69.99)
BZSB (334)	7.633 (13.944)	(0.036 ,72.762)	BZSB (594)	6.571 (10.643)	(0.142 ,56.429)
LBZS (334)	1.145 (1.489)	(-2.169 ,5.122)	LBZS (571)	1.028 (1.46)	(-2.848 ,4.128)
NPR (352)	13.26 (14.191)	(0.08 ,58.46)	NPR (564)	15.097 (17.474)	(0.07 ,65.4)
LLP (347)	2.745 (4.184)	(-1.997 ,21.453)	LLP (620)	3.224 (4.777)	(-2.204 ,23.417)
LER (352)	0.242 (0.045)	(0.122 ,0.325)	LER (626)	0.240 (0.054)	(0.151 ,0.357)
LTA (352)	6.251 (1.866)	(2.521 ,9.906)	LTA (626)	6.16 (1.495)	(2.934 ,8.89)
NII (341)	38.416 (30.969)	(0 ,502.38)	NII (611)	39.34 (23.907)	(0 ,183)
DPT (332)	0.578 (0.192)	(0.153 ,0.898)	DPT (619)	0.536 (0.197)	(0.089 ,0.857)
LNG (329)	0.539 (1.049)	(-0.377 ,5.877)	LNG (607)	0.636 (1.176)	(-0.468 ,6.613)
CIR (344)	78.31 (38.318)	(32.6 ,248.94)	CIR (610)	70.722 (32.722)	(20 ,190.6)
LLR (306)	5.923 (6.195)	(0.14 ,26.23)	LLR (595)	10.489 (9.813)	(0.58 ,44.98)
NIM (350)	7.344 (4.701)	(1.5 ,24.19)	NIM (626)	6.744 (4.01)	(-1.21 ,20.26)
CTA (350)	15.058 (8.146)	(4.545 ,44.08)	CTA (626)	14.637 (8.714)	(3.16 ,47.76)
MSP (17)	34.339 (3.679)	(28.87 ,39.14)	MSP (17)	47.877 (11.188)	(28.87 ,62.04)
AGR (17)	3.844 (4.384)	(-5.52 ,10.43)	AGR (17)	3.222 (7.862)	(-6.55 ,11.4)
INF (17)	11.391 (8.075)	(1.74 ,23.15)	INF (17)	13.676 (6.317)	(4.34 ,23.15)
EXR (17)	3.106 (0.241)	(2.77 ,3.47)	EXR (17)	6.672 (2.000)	(5.05 ,11.89)
EFR (17)	58.542 (6.690)	(48.7 ,65.5)	EFR (17)	49.85 (3.163)	(46.4 ,55.8)
CR5 (17)	73.093 (5.277)	(67.109 ,83.829)	CR5 (17)	65.926 (15.988)	(39.474 ,86.100)
Input of Lerner Index					
W1 (324)	0.026 (0.016)	(0.005 ,0.073)	W1 (622)	0.024 (0.014)	(0.007 ,0.065)
W2 (314)	0.109 (0.104)	(0.022 ,0.529)	W2 (600)	0.126 (0.074)	(0.025 ,0.391)
W3 (350)	0.038 (0.033)	(0.01 ,0.179)	W3 (612)	0.034 (0.024)	(0.007 ,0.117)
TC (350)	0.165 (0.126)	(0.036 ,0.677)	TC (610)	0.18 (0.085)	(0.044 ,0.466)
P (352)	0.112 (0.068)	(0.029 ,0.358)	P (626)	0.112 (0.068)	(0.019 ,0.335)
Q (352)	2177 (3997)	(12.437 ,20051.28)	Q (621)	1147 (1544)	(18.8 ,6738.416)

See Table 4.9a for description.

Table 4.10: Pairwise correlations of study variables - Europe

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
(1) SROA	1								
(2) LBZS	-0.688***	1							
(3) NPL	0.105***	-0.095***	1						
(4) LLP	0.170***	-0.100***	0.393***	1					
(5) LER	-0.041**	0.081***	-0.011	0.109***	1				
(6) LTA	-0.202***	0.083***	0.277***	0.028	0.146***	1			
(7) NII	0.079***	-0.120***	-0.076***	-0.005	-0.093***	-0.018	1		
(8) DPT	-0.054***	0.038*	0.02	-0.032*	0.038*	0.099***	0.060***	1	
(9) LNG	0.123***	-0.076***	-0.070***	-0.036*	-0.064***	-0.081***	-0.02	-0.016	1
(10) CIR	0.543***	-0.432***	0.093***	0.033*	-0.103***	-0.230***	0.092***	0.087***	-0.008
(11) LLR	0.303***	-0.168***	0.549***	0.578***	0.033	-0.009	-0.047**	0.001	-0.117***
(12) NIM	-0.019	0.157***	-0.01	0.255***	-0.011	-0.235***	-0.303***	-0.02	0.096***
(13) CTA	0.093***	0.246***	-0.047**	0.043**	0.021	-0.420***	-0.067***	-0.202***	0.065***
(14) MSP	-0.067***	0.012	0.01	-0.082***	0.209***	0.210***	-0.061***	0.039*	-0.141***
(15) AGR	-0.063***	0.067***	-0.173***	-0.250***	-0.068***	-0.047**	0.01	0.031	0.091***
(16) INF	0.095***	-0.036*	0.024	0.205***	-0.035*	-0.157***	-0.002	0.023	0.159***
(17) EXR	-0.032*	-0.061***	-0.283***	-0.125***	-0.273***	-0.296***	0.104***	-0.145***	-0.076***
(18) EFR	-0.175***	0.034*	-0.184***	-0.222***	-0.082***	0.141***	0.070***	-0.098***	-0.124***
(19) CR5	-0.001	0.051**	-0.150***	0.086***	-0.127***	-0.306***	-0.001	0.071***	0.032*

TABLE 4.10 Continued

Variables	**(10)**	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**	**(16)**	**(17)**	**(18)**	**(19)**
(10) CIR	1									
(11) LLR	0.149***	1								
(12) NIM	0.112***	0.364***	1							
(13) CTA	0.051**	-0.290***	-0.124***	1						
(14) MSP	-0.223***	0.03	-0.016	-0.353***	1					
(15) AGR	-0.033	0.385***	0.116***	-0.408***	0.072***	1				
(16) INF	-0.116***	-0.015	-0.035*	0.134***	-0.095***	-0.107***	1			
(17) EXR	-0.266***	-0.282***	-0.180***	0.208***	-0.113***	-0.417***	0.481***	1		
(18) EFR	-0.057**	0.219***	0.114***	-0.397***	0.045**	0.325***	0.015	-0.066***	1	
(19) CR5	0.0165	-0.0569**	0.2188***	0.1141***	-0.3973***	0.0452**	0.3254***	0.0151	-0.0665***	1

*This Table shows the pairwise correlations among study variables for Asian countries. In this Table, SROA is the std. deviation of ROA, LBZS is the log of bank z-score, NPL is the non-performing loan ratio, LLP is the loan loss provisions to total loans, LER is the Lerner index, LTA is the log of total assets, NII is the non-interest revenue to total revenue, DPT is the ratio of total deposits to total assets, LNG is the loan growth rate, CIR is the cost to income ratio, LLR is the loan loss reserve ratio, NIM is the net interest margin, CTA is the capital asset ratio, MSP is the money supply growth, AGR is the annual GDP growth, INF is the inflation rate, EXR is the exchange rate, EFR is the economic freedom index, CR5 is the concentration ratio, *** p<0.01, ** p<0.05, * p<0.1*

4.2.3 Pairwise Correlations

Table 4.10 shows the pairwise correlation among dependent, explanatory, and control variables of banks in five emerging economies of Europe. The results of this analysis show that correlation is not beyond 0.7 (between minimum -0.688 and maximum 0.578). It shows that multi-collinearity problem is less likely to be present in this analysis. This study further calculates the variance inflation factor (VIF) and tolerance statistics (1/VIF) using a pooled estimator command. The results of VIF and tolerance statistics are reported in Table 4.11. These results also show that multi-collinearity issue is less likely to occur as the value of VIF is observed at 2.32 (corresponding tolerance stat = 0.43) which is less than the threshold of 5.0 (this VIF is sometimes compared with 10 as a relaxed threshold).

4.2.4 Bank Competition and Financial Stability in Emerging European Economies

This sub-section presents the results of the competition stability relationship using the data of banks from five emerging economies of Europe from 2001 to 2017. These results are estimated with fixed effect estimator as in section 4.1.4. Table 4.12 presents the results of this analysis in which competition measure (Lerner index) is regressed on five measures of financial stability. In specification 1, income volatility is used as the dependent variable and it is found that competition measure is negatively associated with income volatility. It shows that low bank competition reduces the standard deviation of return on assets. In specification 2 and 3, this study regresses credit risk measures on the Lerner index (non-performing loan ratio and loan loss provisions, respectively). The results show that credit risk is positively associated with competition (or lower market power). In specification 4 and 5, the Lerner index is regressed on bank Z-score and its log-transformed series which are the direct measures of bank financial stability in contrast to the dependent variables (SROA, NPL, and LLP) in model 1 to 3 which are the inverse measures of bank stability. The results of models 4 and 5 show that competition is negatively associated with bank Z-score and its log-transformed values. All the

TABLE 4.11: Variance inflation factor and tolerance of study variables - Europe

	Variable	VIF	1/VIF
(1)	LER (Lerner index)	1.34	0.748521
(2)	LTA (Log of Total Assets)	2.03	0.492706
(3)	NII (non- interest revenue to total revenue)	1.36	1.3
(4)	DPT (Ratio of total deposits to total assets)	2.31	0.4321
(5)	LNG (Loan growth rate)	1.63	0.6152
(6)	CIR (Cost to Income ratio)	1.29	0.773588
(7)	LLR (Loan Loss reserve ratio)	1.36	0.735459
(8)	NIM (Net interest margin)	2.32	0.430124
(9)	CTA (capital asset ratio)	1.63	0.615221
(10)	MSP (Money Supply Growth)	1.86	0.537889
(11)	AGR (Annual GDP Growth)	1.29	0.777264
(12)	INF is the Inflation Rate	1.71	0.583826
(13)	EXR is the Exchange Rate	1.69	0.592661
(14)	EFR is the Economic Freedom Index	1.97	0.508646
(15)	CR5 is the Concentration Ratio	1.37	0.72814

This Table shows the VIF and tolerance of explanatory variable using an auxiliary regression for European countries. In this Table, LER is the Lerner index, LTA is the Log of Total Assets, NII is the no- interest revenue to total revenue, DPT is the Ratio of total deposits to total assets, LNG is the Loan growth rate, CIR is the Cost to Income ratio, LLR is the Loan Loss reserve ratio, NIM is the Net interest margin, CTA is the capital asset ratio, MSP is the Money Supply Growth, AGR is the Annual GDP Growth, INF is the Inflation Rate, EXR is the Exchange Rate, EFR is the Economic Freedom Index, and CR5 is the Concentration Ratio.

relationships are significant at 1% level except model 4 where this relationship is significant at 5% level.

These results show that higher market power promotes the financial stability of banks. These findings support the charter (franchise) value paradigm of the competition fragility relationship. These findings are opposite of the recent stance of competition stability which is related to Latin America (Yeyati and Micco, 2007); developed European countries (Fiordelisi and Mare, 2014); who studied the banks in five developed countries, i.e. Austria, France, Germany, Italy, and Spain; and Korea (Jeon and Lim, 2013) among others. However, these findings are intuitive for banks in emerging countries. Emerging countries adopt finance for growth regulation for a much longer period and priority sectors are being financed by large

banks in concentrated banking systems in emerging countries which ultimately brands them (the borrowers) to reach too-big-to-fail status. Therefore, banks end up with high levels of non-performing loans due to the loss of maintaining a good credit culture (Fu et al., 2014). Further, bank moral hazard serves as a major problem in emerging countries. The major investment vehicle of public saving in emerging countries is bank deposits which leads them to be too-systemically-important-to-fail as a consequence of bank moral hazard (Sheng, 2009).

The results of the study are supported by the finding of Fu et al. (2014) and Berger et al. (2017). The former studies the competition stability relationship in Asia-Pacific countries and later studies 23 developed countries. More recently, Yusgiantoro et al. (2019) find support for the competition-fragility paradigm in Indonesia. Elzinga and Mills (2011) describe that the Lerner index is a superior measure of price-setting discretion of a firm to sustain monopoly rents. Therefore, the results of the study imply that banks in emerging markets are able to obtain premium profits due to higher discretion in terms of price-setting which creates a capital buffer and reduce insolvency risk. This capital buffer enables banks to be more resilient at the times of macro-shock, financial crisis, and liquidity shocks. All the specifications of models 1 to 5 of Table 4.12 are significant as F-values (joint-significance of coefficients) of all models are significant at 1% level and the Hausman test reveals the appropriate use of fixed effect estimator.

For control variables, non-interest income (NII) is insignificant in all models except model 2 (significant at 1%). It is positively associated with credit risk measure of loan loss provision (LLP) meaning that involvement in non-interest income increases the use of provision for lost loans implying the greater risk of non-interest income activities. It is consistent with the international evidence of the positive relationship between non-interest income and risk-taking (Williams, 2016).

Deposits to assets ratios (DPT) is found to be positively associated with financial stability. However, it is insignificant for models 2 and 4 and significant for models 1,3 and 5. It shows that deposits ratio reduces the income volatility (SROA) and loan loss provision (LLP) and bank stability (BZS, LBZS) as deposits increases the liquidity of banks (Foos et al., 2010; Yusgiantoro et al., 2019). Moreover, it

boosts stability due to higher loans, which increases the riskiness due to increased financial intermediation (Soedarmono et al., 2017).

For loan growth rate (LNG), it is observed that it increases the volatility of earnings (SROA) and reduces bank stability (BZS, LBZS). This finding is in line with the finding of Kasman and Kasman (2015) who found that higher loan growth upturns the credit risk. This may be due to the weaker screening standards, relaxed collateral requirements, and lower interest rates (Ogura, 2006; Dell'Ariccia and Marquez, 2006).

For operational efficiency measure (CIR), which directly measures cost inefficiency, it is observed to have a positive association with the volatility of earnings and credit risk (NPL) and negative association with solvency measures (BZS, LBZS). These results are significant at 1% level. It shows that cost inefficiency increases credit risk and reduces stability. According to Kwan and Eisenbeis (1997), inefficiency enhances the risk-taking due to the moral hazard problem (showing greater risk-taking incentives for poorly managed banks). These are consistent with the finding of Abedifar et al. (2018), who find that negative association between cost inefficiency and solvency as these banks earn reduced interest margins due to inefficacy and search for high profits to compensate their losses exacerbating risk-taking incentives.

For loan quality measure (LLR), it is economically and statistically significant in all models at 1% except model 4 where it is significant at 10% (higher values of LLR indicate poor quality of loan portfolio). These results show that poor loan quality is positively associated with higher credit risk and lower stability as it increases the volatility of earning (SROA), loan loss provision (LLP) and credit risk (NPL) and reduces solvency (BZS, LBZS). These results are supported by the findings of Fang et al. (2014) and Laeven and Levine (2009). LLR enhances the risk of default of non-performing loans reduces stability as it comprises the loans which are provided for but not actually charged off.

For profitability measure (NIM), results reveal that NIM is positively and significantly associated with stability in model 1 and 5. But it is found to be increasing the NPL at a marginal level. The results of solvency measures are also mixed. On

the one hand, it increases the stability (as it reduces the SROA in model 1 and increases BZSB and LBZS in models 3 and 4), and on the other hand, it reduces the credit risk (as it is negatively associated with NPL in model 3). These results may be explained as higher equity can reduce the moral hazard problem and escalate monitoring incentives (Diamond and Dybvig, 1983) and it may exacerbate the risk-taking incentives for banks, as mentioned by Abedifar et al. (2013). Economic freedom is positively associated with stability. Concentration increases the credit risk in model 3 consistent with (Fu et al., 2014).

4.2.5 Bank Size and Financial Stability in Emerging European Economies

In this sub-section, this study presents the results of the relationship between bank size and stability using the data of banks from five emerging economies of Europe from 2001 to 2017. These results are estimated with fixed effect estimator. In using fixed-effect estimator, this study calculates the standards errors clustered at the bank level. This allows us to control from correlations of error term which is assumed to be correlated within cluster and independent across clusters (Soedarmono and Tarazi, 2016). In this estimation, this study control for a variety of bank-level and macro-economic variables. These variables include the measures related to income diversification, liquidity, level of financial intermediation, cost efficiency, loan quality, bank profitability, solvency, money supply, economic growth, inflation, exchange rate, economic freedom and concentration. Table 4.13 presents the results of this analysis. In specification 1, bank size (LTA) is regressed on income volatility and the sign is negative with insignificant p values. In model 2 and 3, this study regress bank size on credit risk measure (NPL and LLP, respectively) and find insignificant results. Yusgiantoro et al. (2019) find no association between bank size and stability. In model 4 and 5, this study regress bank size on bank stability measures (BZS and LBZS) and observe insignificant results in model 4 and a positive association in model 5 at 5% level. These results show that the increase in bank size leads to higher credit risk. There is an ongoing debate in the literature that discusses bank size importance for banking stability

TABLE 4.12: Impact of bank competition on financial stability - Europe

Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Variables	**SROA**	**NPL**	**LLP**	**BZSB**	**LBZS**
LER	-6.973***	-0.271***	-5.114***	2.097**	0.590***
	(2.561)	(4.383)	(1.326)	(1.008)	(0.223)
NII	-0.010	0.001	0.017***	-0.043	-0.001
	(0.018)	(0.021)	(0.006)	(0.038)	(0.003)
DPT	-6.050***	-3.692	-2.263***	6.177**	0.689**
	(1.876)	(2.382)	(0.644)	(3.101)	(0.304)
LNG	1.213***	-0.410	-0.105	-0.275**	-0.103**
	(0.251)	(0.311)	(0.087)	(0.121)	(0.041)
CIR	0.179***	0.014***	-0.014	-0.070***	-0.018***
	(0.010)	(0.003)	(0.012)	(0.021)	(0.002)
LLR	0.202***	1.100***	0.276***	-0.144*	-0.038***
	(0.039)	(0.045)	(0.014)	(0.081)	(0.007)
NIM	-0.332***	-0.162	0.270*	0.285	0.057***
	(0.121)	(0.152)	(0.141)	(0.252)	(0.020)
ETA	0.168***	0.037	-0.080***	0.485***	0.065***
	(0.044)	(0.053)	(0.015)	(0.093)	(0.007)
MSP	-0.105***	0.288***	0.002	0.092	0.016***
	(0.028)	(0.031)	(0.010)	(0.059)	(0.005)
AGR	-0.078	-0.313***	-0.200***	0.107	0.024**
	(0.057)	(0.064)	(0.019)	(0.117)	(0.009)
INF	0.092***	0.165***	0.014	-0.103	-0.016***
	(0.033)	(0.039)	(0.010)	(0.068)	(0.005)
EXR	-0.023	0.044*	0.006	0.007	-0.001
	(0.023)	(0.025)	(0.008)	(0.048)	(0.004)
EFR	-0.147**	-0.045	-0.037*	0.160	0.032***
	(0.063)	(0.082)	(0.022)	(0.132)	(0.010)
CR5	-0.009	0.063**	0.031***	-0.007	-0.002
	(0.025)	(0.027)	(0.008)	(0.051)	(0.004)
_cons	7.913*	-3.725	0.409	-6.630	-0.829
	(4.331)	(4.886)	(1.479)	(9.009)	(0.698)
Obs.	1731	1408	1743	1714	1706
_id	232	206	233	233	231
R-squared	0.272	0.496	0.380	0.245	0.206
Chi-Sq.	40.07489	105.8583	60.32568	32.074	35.34868
d.f.	14	14	14	14	14
p-value	0.0002	0.000	0.000	.1091	0.0914
F-stat	39.61	83.56	65.5	14.94	27.11
p-value	0.000	0.000	0.000	0.000	0.000

*Above Table shows the results of fixed effect regression for European countries. In this Table, SROA is the std. deviation of ROA, BZSB is bank Z-score, LBZS is the log of bank Z-score, NPL is the non-performing loan ratio, LLP is the loan loss provisions to total loans, LER is the Lerner index, LTA is the log of total assets, NII is the non-interest revenue to total revenue, DPT is the ratio of total deposits to total assets, LNG is the loan growth rate, CIR is the cost to income ratio, LLR is the loan loss reserve ratio, NIM is the net interest margin, CTA is the capital asset ratio, MSP is the money supply growth, AGR is the annual GDP growth, INF is the inflation rate, EXR is the exchange rate, EFR is the economic freedom index, CR5 is the concentration ratio. Standard errors are shown in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

and considers large banks as a prelude to the financial crisis (Farhi and Tirole,

2012). It postulates that big banks act in morally hazardous ways when they receive public guarantees and bailout incentives which exacerbates their risk-taking behavior. More specifically, it is termed as too-large-to-fail hypothesis for large and interconnected banks that destabilize the banking system and is also considered as a fundamental reason behind the global financial crises Moutsianas and Kosmidou (2016). This finding is supported with the by the studies of Vallascas and Keasey (2012) who find that imposing a cap on the bank size stabilizes the banking system in Europe and Laeven et al. (2016) who also confirms the increase in bank instability with increase in bank size in a sample of banks from 56 countries. All specifications of models 1 to 5 of Table 4.13 are significant as F-values (joint-significance of coefficients) in all models are significant at 1% level and the Hausman test reveals the appropriate use of fixed effect estimator.

4.2.6 Bank Competition, Bank Size, and Financial Stability in Europe: Test of the non-linear relationship

In this sub-section, this study presents the results of the non-linear relationship between bank competition, size, and stability using the data of banks from five emerging economies of Europe from 2001 to 2017. These results are estimated with a panel data estimator (i.e., fixed effect estimator) which considers the panel structure of the data, unlike the pooled estimator. In using fixed-effect estimator, this study calculates the standards errors clustered at bank level. In this estimation, this study control for a variety of bank-level and macro-economic variables. These variables include the ratio of non-interest revenue to total revenue, deposits of total assets ratio, loan growth, net interest margin, equity to asset ratio, money supply growth, GDP growth, inflation, exchange rate and concentration ratio. Table 4.14 presents the results of this analysis. In this Table, model 1-5 shows the non-linear relationship between bank competition and stability measures. A quadratic term of the Lerner index (LERˆ2) is added in the estimation. It is observed that all squared terms are insignificant. This implies that competition affects bank stability in a unidirectional way. All specifications of models 1 to 5 of Table 4.14 are significant as F-values (joint-significance of coefficients) in all

TABLE 4.13: Impact of bank size on financial stability - Europe

Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Variables	**SROA**	**NPL**	**LLP**	**BZSB**	**LBZS**
LTA	-0.569	0.450	0.371**	-0.533	-0.023
	(0.417)	(0.301)	(0.145)	(0.872)	(0.068)
NII	-0.013	-0.001	0.019***	-0.046	-0.001
	(0.019)	(0.022)	(0.006)	(0.039)	(0.003)
DPT	-6.723***	-1.721	-1.940***	5.644*	0.719**
	(1.925)	(2.466)	(0.662)	(3.005)	(0.312)
LNG	1.168***	-0.299	-0.139	-0.261	-0.099**
	(0.250)	(0.315)	(0.086)	(0.519)	(0.041)
CIR	0.174***	-0.004	0.012***	-0.073***	-0.018***
	(0.010)	(0.012)	(0.004)	(0.022)	(0.002)
LLR	0.202***	1.110***	0.268***	-0.138*	-0.038***
	(0.039)	(0.046)	(0.014)	(0.082)	(0.007)
NIM	-0.350***	-0.204	0.301***	0.251	0.057***
	(0.123)	(0.160)	(0.041)	(0.257)	(0.020)
ETA	0.148***	0.077	-0.069***	0.468***	0.065***
	(0.046)	(0.056)	(0.016)	(0.097)	(0.008)
MSP	-0.077**	0.258***	-0.013	0.116	0.015***
	(0.034)	(0.039)	(0.012)	(0.071)	(0.005)
AGR	-0.080	-0.321***	-0.200***	0.105	0.024**
	(0.057)	(0.065)	(0.020)	(0.117)	(0.009)
INF	0.092***	-0.189***	0.019*	-0.109	-0.016***
	(0.033)	(0.040)	(0.010)	(0.068)	(0.005)
EXR	-0.031	0.061**	0.006	0.005	-0.000
	(0.023)	(0.026)	(0.008)	(0.048)	(0.004)
EFR	-0.097	-0.224***	-0.032	0.172	0.029***
	(0.064)	(0.080)	(0.022)	(0.133)	(0.010)
CR5	-0.029	0.112***	0.030***	-0.014	-0.001
	(0.025)	(0.028)	(0.009)	(0.052)	(0.004)
_cons	12.124**	-7.570	-0.928	-3.899	-1.034
	(4.904)	(5.838)	(1.682)	(10.211)	(0.793)
Obs.	1731	1408	1743	1714	1706
_id	232	206	233	233	231
R-squared	0.271	0.480	0.377	0.245	0.206
Chi-Sq.	42.56144	111.4534	58.30294	36.788256	38.80356
d.f.	14	14	14	14	14
p-value	0.0001	0.00	0.00	0.0981	0.0807
F-stat	39.47	78.41	64.56	14.97	27.06
p-value	0.000	0.000	0.000	0.000	0.000

*Above Table shows the results of fixed effect regression for European countries. In this Table, SROA is the std. deviation of ROA, BZSB is bank Z-score, LBZS is the log of bank Z-score, NPL is the non-performing loan ratio, LLP is the loan loss provisions to total loans, LTA is log of total assets, NII is the non-interest revenue to total revenue, DPT is the ratio of total deposits to total assets, LNG is the loan growth rate, CIR is the cost to income ratio, LLR is the loan loss reserve ratio, NIM is the net interest margin, CTA is the capital asset ratio, MSP is the money supply growth, AGR is the annual GDP growth, INF is the inflation rate, EXR is the exchange rate, EFR is the economic freedom index, CR5 is the concentration ratio. Standard errors are shown in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

models are significant at 1% level and the Hausman test reveals the appropriate use of fixed effect estimator. In models 1-5, this study analysis the non-linear

relationship between bank size and stability measures. A quadratic term of bank size (LTA^2) is added in the estimation. In model 1 to model 3, both (LTA and LTA^2) coefficients of size are significant at 1% level.

In polynomial regression, the squared term is used to capture the non-linear relationship. The significance of the squared term is used to assess the presence of a non-linear relationship. The sign of the relationship is merely used to assess the shape of the curvilinear relationship that is either the relationship is U-shape (convex) or inverted U-shape (concave). For the variables that do not have zero in its range of observed values, the negative sign of X (linear term) and a positive sign of X^2 (square term) imply the inverted U-shape relationship and vice versa. The squared term is found significant in models 1 to 3 showing the presence of a non-linear relationship between stability and bank size. All specifications of models 1 to 5 of table 4.14 are significant as F-values (joint-significance of coefficients) in all models are significant at 1% level, and the Hausman test reveals the appropriate use of fixed effect estimator.

TABLE 4.14: Non-linear impact of competition and size on financial stability - Europe

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
	Competition					**Bank Size**				
	SORA	**NPL**	**LLP**	**BZSB**	**LBZS**	**SORA**	**NPL**	**LLP**	**BZSB**	**LBZS**
LER	-2.89	-56.3***	-9.25**	40.02**	2.3**					
	(5.59)	(19.42)	(4.04)	(19.51)	(2.86)					
LER^2	9.15	67.02	-9.26	-94.5	-6.4					
	(38.6)	(43.5)	(13.2)	(80.1)	(6.3)					
LTA						-4.5***	9.8***	-1.2***	-1.73	.291
						(1.24)	(1.54)	(.432)	(2.59)	(.202)
LTA^2						.302***	-.690***	.120***	.092	-.020
						(.090)	(.108)	(.031)	(.187)	(.014)
NII	-.010	-.001	.017***	-.040	-.001	-.019	.005	.016**	-.048	-.000
	(.019)	(.021)	(.006)	(.038)	(.003)	(.019)	(.021)	(.006)	(.039)	(.003)
DPT	-5.9***	-3.31	-2.3***	5.63	.653**	-6.2***	-2.83	-1.72***	5.80	.688**
	(1.89)	(2.39)	(.648)	(3.93)	(.306)	(1.93)	(2.44)	(.662)	(4.03)	(.313)
LNG	1.21***	-.408	-.104	-.270	-.102**	1.18***	-.403	-.133	-.257	-.100**
	(.251)	(.310)	(.087)	(.521)	(.041)	(.249)	(.310)	(.086)	(.519)	(.041)
CIR	.179***	-.013	-.014***	-.071***	-.018***	.174***	-.005	-.012***	-.072***	-.018***
	(.010)	(.012)	(.003)	(.021)	(.002)	(.010)	(.012)	(.004)	(.022)	(.002)
LLR	.202***	1.09***	.276***	-.144*	-.038***	.208***	1.11***	.271***	-.136*	-.038***
	(.039)	(.045)	(.014)	(.081)	(.007)	(.039)	(.045)	(.014)	(.082)	(.007)
NIM	-.332***	-.167	.270***	.291	.058***	-.368***	-.135	.295***	.246	.058***
	(.121)	(.152)	(.041)	(.252)	(.020)	(.123)	(.158)	(.041)	(.257)	(.020)

TABLE 4.14 Continued...

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
ETA	.169***	.042	-.080***	.479***	.064***	.099**	.155***	-.088***	.454***	.069***
	(.044)	(.053)	(.015)	(.093)	(.007)	(.048)	(.057)	(.017)	(.102)	(.008)
MSP	-.106***	.283***	.003	.099*	.016***	-.069**	.234***	-.010	.118*	.014**
	(.028)	(.031)	(.010)	(.059)	(.005)	(.034)	(.038)	(.012)	(.071)	(.006)
AGR	-.074	-.287***	-.204***	.066	.021**	-.082	-.296***	-.200***	.105	.024***
	(.059)	(.066)	(.020)	(.122)	(.010)	(.057)	(.064)	(.019)	(.118)	(.009)
INF	.091***	-.169***	.014	-.101	-.016***	.089***	-.175***	.018*	-.109	-.016***
	(.033)	(.039)	(.010)	(.068)	(.005)	(.033)	(.039)	(.010)	(.068)	(.005)
EXR	-.023	.046*	.006	.007	-.001	-.030	.059**	.006	.005	-.000
	(.023)	(.025)	(.008)	(.048)	(.004)	(.023)	(.025)	(.008)	(.048)	(.004)
EFR	-.146**	-.050	-.037*	.156	.032***	-.115*	-.194**	-.039*	.168	.030***
	(.063)	(.082)	(.022)	(.132)	(.010)	(.064)	(.079)	(.022)	(.134)	(.010)
CR5	-.010	.056**	.032***	.007	-.001	-.009	.057**	.039***	-.008	-.002
	(.025)	(.028)	(.009)	(.053)	(.004)	(.026)	(.029)	(.009)	(.054)	(.004)
_cons	8.40*	-.196	-.083	-11.57	-1.17	23.84***	-34.53***	3.68*	-0.47	-1.81*
	(4.80)	(5.39)	(1.63)	(9.93)	(0.77)	(5.99)	(7.16)	(2.05)	(12.46)	(.971)
Obs.	1731	1408	1743	1714	1706	1728	1405	1740	1711	1703
_id	232	206	233	233	231	232	206	233	233	231
R-Sq.	.272	.497	.380	.246	.207	.277	.497	.383	.245	.206
Chi-Sq.	40.7	104.7	60.8	142.9	27.5	52.3	102.9	67.9	161.1	31.1
d.f.	15	15	15	14	15	15	15	15	15	15
p-value	.000	.000	.000	.000	.082	.000	.000	.000	.000	.085
F-stat	36.95	78.23	61.15	14.71	25.38	37.78	78.12	61.68	14.63	25.25
p-value	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

*Above Table shows the results of fixed effect regressions for Asian countries. In this Table, SROA is the std. deviation of ROA, BZSB is bank Z-score, LBZS is the Log of Bank Z-score, NPL is the Non-performing loan ratio, LLP is the loan loss provisions to total loans, LER is the Lerner index, LTA is the log of total assets, LERˆ2 and LTAˆ2 are the squared term of LER and LTA, respectively to capture the non-linear relationship, NII is the non-interest revenue to total revenue, DPT is the ratio of total deposits to total assets, LNG is the loan growth rate, CIR is the cost to income ratio, LLR is the loan loss reserve ratio, NIM is the net interest margin, CTA is the capital asset ratio, MSP is the money supply growth, AGR is the annual GDP growth, INF is the inflation rate, EXR is the exchange rate, EFR is the economic freedom index, CR5 is the concentration ratio. Standard errors are shown in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

4.3 Further Investigation: Regulations and Bank Stability

This section reports the results of the relationship between regulations and bank stability. First, it presents the country-wise descriptive statistics of regulations in

sample countries in sub-section 4.3.1 and then it shows the results of regression in sub-section 4.3.2.

4.3.1 Descriptive Statistics

Table 4.15 shows the mean, standard deviation, maximum, and minimum values of regulation variables. For capital adequacy ratio (which is measured at bank level), the highest mean ratio is observed in Indonesia, Saudi Arabia, and UAE (23.01%, 30.32%, 23%), and the lowest mean ratio is observed in China, Hungary, and India (13.79%, 14.83%, 13.73%). While observing the overall minimum and maximum values, Pakistan is observed with the lowest CAR (4.06%, which is observed for a specific bank in 2008 from dataset), followed by Poland (4.88%), and Ukraine (4.84%). Although the minimum CAR is 8%, some countries have adopted Basel standard later (during the sample period of study) or have gradually attained the desired benchmark. For deposit insurance (DIN), it is observed that UAE does not have explicit deposit insurance schemes over the sample period, China, Saudi Arabia and Pakistan have recently introduced these schemes in 2015, 2016 and 2018, respectively.

However, all European countries have introduced such systems prior to the sample period. For activities restriction, China, India, and Thailand have the highest index values at (9.29, 8.79, and 8.5) whereas Philippines, Ukraine, and UAE have the lowest index values (5, 3.57, 4.71). For capital stringency measure (CRG), India, Indonesia, and Pakistan stood at the top (7.43, 6.36, 6.57) whereas China, Malaysia, and Saudi Arabia have the lowest index values (5, 3.71, 3.07). Hungary, Indonesia, and Pakistan have the most supervisory powers (13.82, 14.57, 13.71) whereas India, Poland, and Romania are observed with lowest scores (9.8, 9.72, 10.43) closer to the median value. For private monitoring measure, Hungary, Malaysia, and Thailand stood at the top (8.43, 9.64, 8.36) whereas Indonesia, Ukraine, and UAE are lowest ranked (5.07, 5.14, 3.93). China and Romania have no external governance scores whereas Croatia, Malaysia, and Philippines have the highest scores of external governance (13.14, 16.36, 10.43).

Table 4.15: Descriptive statistics of regulation variables

Variable	CAR	DIN	ART	CRG	SPW	PMN	EXG	CAR	DIN	ART	CRG	SPW	PMN	EXG
				China							**Philippines**			
Obs	977	17	17	17	17	17	17	330	17	17	17	17	17	17
Mean	13.79	3.18	9.29	5	11.29	6.07	0	20.79	1	5	6.14	11.63	6.29	10.43
Std. Dev.	6.95	0	1.82	3.28	0.68	4.80	0	10.69	0	0	1.56	1.24	3.54	5.97
Min	5.01	0	7	3	10	0	0	10.59	1	5	4	11	0	0
Max	39.16	1	11	10	11.85	11	0	61.87	1	5	8	13.92	10	16
				Croatia							**Poland**			
Obs	229	17	17	17	17	17	17	266	17	17	17	17	17	17
Mean	18.70	1	6	5.71	11.86	6.64	13.14	16.09	1	7.93	6.07	9.72	7.93	6
Std. Dev.	7.45	0	0	1.54	1.10	2.84	5.59	8.20	0	2.13	1.86	1.16	0.83	7.25
Min	6.5	1	6	4	10	0	0	4.88	1	6	3	8.62	7	0
Max	45.78	1	6	8	13	8	16	61.02	1	11	8	11	9	15
				Hungary							**Romania**			
Obs	149	17	17	17	17	17	17	205	17	17	17	17	17	17
Mean	14.83	1	7.07	5.71	13.82	8.43	9	30.32	1	7.5	5.57	10.43	6.29	0
Std. Dev.	6.48	0	1.64	2.55	0.58	0.76	6.96	34.40	0	2.38	1.79	1.49	0.47	0
Min	8.5	1	5	4	13	7	0	9.77	1	4	4	9	6	0
Max	47	1	9	10	14.5	9	14	270.3	1	10	8	12	7	0
				India							**Saudi Arabia**			
Obs	866	17	17	17	17	17	17	180	17	17	17	17	17	17
Mean	13.73	1	8.79	7.43	9.80	7.93	6.14	20.93	0	5.93	3.07	13.50	7.50	3.43
Std. Dev.	3.93	0	0.43	1.09	0.50	1.49	7.79	7.21	0	3.91	2.06	0.52	4.94	6.81
Min	8.7	1	8	6	8.62	6	0	12.76	0	0	0	13	0	0
Max	27.69	1	9	9	10	10	17	41	1	9	5	14	11	16

TABLE 4.15 Continued...

Variable	CAR	DIN	ART	CRG	SPW	PMN	EXG	CAR	DIN	ART	CRG	SPW	PMN	EXG
	Indonesia							**Thailand**						
Obs	770	17	17	17	17	17	17	276	17	17	17	17	17	17
Mean	23.01	0.79	5.79	6.36	14.57	5.07	7.43	16.32	0.5	8.50	5.86	11.03	8.36	3.00
Std. Dev.	15.16	0.43	4.73	3.05	1.74	3.99	7.74	6.17	0.52	1.29	2.21	1.95	1.22	5.96
Min	8.31	0	0	3	12	0	0	8.79	0	6	4	9.69	7	0
Max	73.44	1	11	10	16	9	16	34.04	1	10	9	14	10	14
	Malaysia							**Ukraine**						
Obs	674	17	17	17	17	17	17	351	17	17	17	17	17	17
Mean	22.33	0.71	7.29	3.71	13.13	9.64	16.36	21.32	1	3.57	5.79	11.50	5.14	4.57
Std. Dev.	16.60	0.46	0.91	0.83	1.66	0.50	0.74	17.19	0	1.99	2.49	0.78	3.98	7.50
Min	9.96	0	6	3	11	9	15	4.84	1	1	3	10.5	0	0
Max	84.8	1	8	5	15.5	10	17	166.1	1	5	9	12.6	8	16
	Pakistan							**UAE**						
Obs	248	17	17	17	17	17	17	287	17	17	17	17	17	17
Mean	17.56	0.06	8.07	6.57	13.71	7.64	8.79	23.00	0	4.71	5.86	12.04	3.93	9.29
Std. Dev.	11.07	0..4	2.27	3.18	0.47	3.34	9.12	9.71	0	3.315	2.248	2.231	5.470	7.248
Min	4.06	0	3	0	13	0	0	11.37	0	1	3	9	0	0
Max	51.8	1	10	10	14	10	18	54.8	0	9	8	14	11	16

Above Table shows the mean, std. deviations, maximum and minimum values for nine Asian and five European countries for regulatory variables. CAR is the capital adequacy ratio (at bank level), DIN is the deposit insurance which is a dummy variable equal 1 from the date of introduction of deposit insurance in each country and zero otherwise, ART is the index of activity restriction, CRG is the index of capital stringency regulations, OSP is the index of supervisory powers, PMN is the index of private monitoring, and EXG is the index of external governance.

4.3.2 Regulation and Financial Stability in Emerging Asian and European Economies

This sub-section examines the relationship of various regulatory measures on the financial stability of banks. These measures include capital adequacy ratio (CAR), deposit insurance (DIN), activity restriction (ART), CRG (capital stringency regulation), official supervision (OSP), private monitoring (PMN), and external governance (EXG). These results are estimated with a panel data estimator (i.e., fixed effect estimator), which considers the panel structure of the data, unlike the pooled estimator. In using fixed-effect estimator, this study calculates the standards errors clustered at bank level and time dummies are also included. In this estimation, this study control for a variety of bank-level and macro-economic variables. These variables include the ratio of non-interest revenue to total revenue, deposits of total assets ratio, loan growth, net interest margin, equity to asset ratio, money supply growth, GDP growth, inflation, exchange rate and concentration ratio. Lerner index and log to total assets are also included in the estimation to control the effect of competition and bank size. Table 4.16(a-g) presents the results of this analysis. All specifications of models 1 to 5 of table 4.16(a-g) are significant as F-values (joint-significance of coefficients) in all models are significant at 1% level and the Hausman test reveals the appropriate use of fixed effect estimator.

This study uses the data of fourteen countries (9 Asian and 5 European) using the data from 2001 to 2017. This study jointly estimates the regression model for both regions due to two reasons. First, to allow greater variability or variance in the observed values regulation measures. The data of regulation variables comes from survey measures of Barth et al. (2013a,b). This survey has been conducted four times (once before the sample period, and thrice during the sample period). Hence, it is not perfectly, but, partially time-invariant. So, estimation over the full sample allows greater variability. Moreover, deposit insurance is measured with a dummy variable which equals 1 since the inception of statutory deposit guarantee schemes in each country. In all European countries in the sample, the deposit insurance

scheme was in practice prior to the sample period. Hence, it was not possible to estimate the regression due to constant series. Second, both regional group of countries comprises emerging economies which is a similar economic status. The finding of the earlier sections also shows similar results among main study variables, so we jointly study all emerging countries in further investigation.

In Table 4.16(A), the results of the relationship between capital adequacy ratio and bank stability measures are presented. The coefficient of capital adequacy ratio (CAR) on NPL and LLP is negative and statistically significant at 1% level in model 4 and 5, respectively. It shows that the implementation and presence of regulatory capital reduce the credit risk of banks. These results are similar to the finding of Rahman et al. (2018) who find that capital adequacy ratio increases the bank stability in Bangladesh. This finding is also consistent with the theoretical rationale as banks reduce the share of risky assets in their portfolio (Zhang et al., 2008). As per Basel requirement, banks are required to maintain at least 8% of risk-weighted assets. A specific bank achieves this either by an increase in capital or reduction of the risky assets in its portfolio. However, the results are insignificant for models 2 and 3. Yet, some studies (Fu et al., 2014; Radić et al., 2012) also find insignificant findings on this relationship. For model 1, capital adequacy ratio is positively associated with the volatility of earnings. As discussed by Abdul Wahab et al. (2017), this finding may be supported with the capital buffer theory (Jokipii and Milne, 2011) which posits that low capitalized banks increase the stability by substituting risky assets in the portfolio to mimic around regulatory requirements (substitution effect). However, well-capitalized banks tend to maintain a target level of capital by decreasing (increasing) the risky portfolio when capital requirement decreases (increases) (Zheng et al., 2012; Lindquist, 2004). Hence, this finding may reflect the effect of regulation on stability due to the varying degree of capitalization.

In Table 4.16(b), this study regresses the deposit insurance (DIN) on five measures of stability. These results suggest that deposit insurance is negatively associated with the volatility of earnings (SROA), non-performing loans (NPL), and loan loss provisions (LLP) significant at 1% level in models 1, 4, and 5. This association

TABLE 4.16A: Impact of capital adequacy ratio on bank stability

	(1)	(2)	(3)	(4)	(5)
Variables	**SROA**	**BZSB**	**LBZS**	**NPL**	**LLP**
CAR	.059***	0.112	0.001	-.073***	-.034***
	(.021)	(.083)	(.003)	(.016)	(.006)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	5060	5033	5008	4966	5129
_id	714	711	710	693	716
R-squared	.214	.223	.165	.429	.251
F-stat	73.52	6.21	52.95	200.07	91.85
p-value	0.000	0.000	0.000	0.000	0.000

*Coefficients of controls are not reported to save space. Standard errors are shown in parentheses with *** p<0.01, ** p<0.05, * p<0.1.*

turns positive in models 2 and 3 when the dependent variable is bank stability (BZS, LBZS significant at 5% and 1% levels respectively). These results postulate that deposit insurance has a stabling effect on the banking system consistent with expectations for emerging markets and also with theory (Diamond and Dybvig, 1983). It also supports the findings of Assa and Okhrati (2018) and Anginer and Demirguc-Kunt (2014). There can be two explanations of this effect as suggested by Demirgüç-Kunt and Kane (2002). Deposit insurance decreases the bank moral hazard that prevents exacerbating risk-taking incentives for banks and enhance financial intermediation. When deposit safeguard schemes are not present, banks are prone to increase the interest rate on deposits which result in a higher moral hazard to earn high margin. On the contrary, when deposits are safeguarded by the insurance scheme, public savings are encouraged to be placed in banks. This enhances the bank's power to grant more loans and to increase its charter value and also increase the stability of the bank.

TABLE 4.16B: Impact of deposit insurance on bank stability

Variables	(1)	(2)	(3)	(4)	(5)
	SROA	**BZSB**	**LBZS**	**NPL**	**LLP**
DIN	-2.897***	3.617**	.36***	-2.189***	-.666***
	(.512)	(1.681)	(.074)	(.372)	(.147)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	6878	6845	6775	6649	6986
_id	861	862	857	837	864
R-squared	.282	.227	.282	.391	.278
F-stat	147.25	10.28	82.22	232.59	146.86
p-value	0.000	0.000	0.000	0.000	0.000

*Coefficients of controls are not reported to save space. Standard errors are shown in parentheses with *** p<0.01, ** p<0.05, * p<0.1.*

In Table 4.16(c), this study regresses the activity restrictions (ART) on five measures of stability. These results suggest that activity restriction is found insignificant on volatility of earnings (SROA), bank stability (BZS, LBZS), non-performing loans (NPL), and loan loss provisions (LLP) in models 1 to 5. In literature, some studies have found activities restriction as stability increasing (Mollah et al., 2017) on one hand and instability increasing on the other hand (Yin, 2019). Ibrahim and Rizvi (2017) mentions that activity restriction may be effective for bigger banks due to their greater risk-taking intensity. So, this finding may postulate that activity restrictions may affect bigger banks but do not affect banks in emerging markets (about 93% of G-SIBs are located in developed European countries and the US). In the recent studies, Mourouzidou-Damtsa et al. (2019) and (Berger et al., 2019) find insignificant results in full sample and Agoraki et al. (2011) also found insignificant association between credit risk and stability.

TABLE 4.16C: Impact of activities restriction on bank stability

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	SROA	**BZSB**	**LBZS**	**NPL**	**LLP**
ART	-.067	.153	.008	-.035	.005
	(.046)	(.152)	(.007)	(.034)	(.013)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	6878	6845	6775	6649	6986
_id	861	862	857	837	864
R-squared	.278	.226	.179	.387	.275
F-stat	144.65	10.05	80.55	229.17	145.11
p-value	0.000	0.000	0.000	0.000	0.000

*Coefficients of controls are not reported to save space. Standard errors are shown in parentheses with *** p<0.01, ** p<0.05, * p<0.1.*

In Table 4.16(d), this study regresses the capital stringency or strict capital regulation (CRG) on five measures of stability. These results suggest that capital regulation variable is negatively associated with volatility of earnings (SROA) and loan loss provisions (LLP) in models 1 and 5 and is significant at 1% and 5% levels respectively. This association turns positive in models 2 and 3 when the dependent variable is bank stability (BZS, LBZS) and is significant at 5% and 1% levels, respectively) but insignificant in model 2. These results suggest a similarity with the results found in table 4.16(a) for capital adequacy ratio showing that strict capital requirements improve the stability of banks. These findings are theoretically supported by Repullo (2004), who provided a theoretical model

implying that risk-based requirement of bank capital increases the market power of banks and place a limit on the risk-taking incentive of banks in competitive deposit markets. This is also in-line with the empirical finding of Yin (2019) who finds that more capital stringency bank solvency due increase in capital buffer. Shaddady and Moore (2019) finds the positive impact of capital regulation index on lower quantile of bank stability.

TABLE 4.16D: Impact of capital stringency on bank stability

	(1)	(2)	(3)	(4)	(5)
Variables	**SROA**	**BZSB**	**LBZS**	**NPL**	**LLP**
CRG	-.112**	.44**	.041***	-.035	-.056***
	(.054)	(.178)	(.008)	(.041)	(.016)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	6878	6845	6775	6649	6986
_id	861	862	857	837	864
R-squared	.279	.227	.283	.387	.277
F-stat	144.84	10.37	82.55	229.13	146.20
p-value	0.000	0.000	0.000	0.000	0.000

*Coefficients of controls are not reported to save space. Standard errors are shown in parentheses with *** p<0.01, ** p<0.05, * p<0.1.*

In Table 4.16(e), supervisory power variable (SPW) is regressed on five stability measures. These results suggest that official supervisory power is insignificant in models 1 and 3. In model 2, official supervision is significant and negative at 5% level. In models 4 and 5, official supervision is negatively associated with credit risk (NPL and LLP, respectively). These results are somewhat mixed as it reduces the stability and increases earning volatility on the one hand and also reduces credit risk on the other hand. It reduces the credit risk (NPL and LLP) as it enables the regulator to correct bank problems (Anginer and Demirguc-Kunt, 2014) as per the public interest hypothesis of (Barth et al., 2008). This view posits that the regulator acts to promote bank stability in the interest of the public. Study of Shehzad and De Haan (2015) and Agoraki et al. (2011) supports public interest view and find that official supervision powers increase the loan quality hence finding of model 4 and 5 is supported. On the other hand, the private interest view suggests the negative effect of supervisor power on stability. This view postulates that supervisory powers may exploit bank to get private benefits (Beck et al., 2006). This may lead to bank moral hazard to seek higher returns as

in model 2. The studies of Beltratti and Stulz (2012) and Chen et al. (2017) also supports this negative rent-seeking supervisors view.

TABLE 4.16E: Impact of supervisory powers on bank stability

	(1)	(2)	(3)	(4)	(5)
Variables	**SROA**	**BZSB**	**LBZS**	**NPL**	**LLP**
SPW	.018	-.76**	.008	-.417***	-.066**
	(.091)	(.297)	(.013)	(.067)	(.026)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	6878	6845	6775	6649	6986
_id	861	862	857	837	864
R-squared	.278	.227	.279	.391	.276
F-stat	144.48	10.40	80.47	233.02	145.66
p-value	0.000	0.000	0.000	0.000	0.000

*Coefficients of controls are not reported to save space. Standard errors are shown in parentheses with *** p<0.01, ** p<0.05, * p<0.1.*

In Table 4.16(f), private monitoring variable (PMN) is regressed on five stability measures. These results suggest that private monitoring variable is insignificant for volatility of earning and stability in models 1 and 2. In model 3, the coefficient of private monitoring is positive and significant for solvency measure (LBZS) at 1% level. In models 4 and 5, private monitoring is negatively associated with credit risk (NPL and LLP, respectively). These results show that private monitoring supports bank stability as it increases solvency and reduces the volatility of earnings and credit risk. These results are in line with the empirical finding of Bermpei et al. (2018) and Hoque et al. (2015) who find a positive relationship with private monitoring and bank stability. This may be due to the fact that disclosure of correct information to the public for which private agents tend to monitor the banks effectively Hay and Shleifer (1998) and Akins et al. (2016) also noted that private monitoring also provokes depositors on strict monitoring of bank for involvement in risky activities.

In Table 4.16(g), external governance index (EXG) is regressed on five stability measures. These results suggest that multiple supervision is negatively associated with volatility of earnings in model 1 at 1% significance level. This association turns positive when it is regressed on stability measures in models 2 and 3, respectively. For credit risk measures (NPL and LLP), it is negatively associated at 1% level. These results suggest that external governance system has a stabilizing

TABLE 4.16F: Impact of private monitoring on bank stability

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	SROA	**BZSB**	**LBZS**	**NPL**	**LLP**
PMN	-.054	-.069	.013***	-.052**	-.031***
	(.033)	(.109)	(.005)	(.025)	(.01)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	6878	6845	6775	6649	6986
_id	861	862	857	837	864
R-squared	.278	.226	.28	.388	.277
F-stat	144.70	10.01	80.99	229.52	146.02
p-value	0.000	0.000	0.000	0.000	0.000

*Coefficients of controls are not reported to save space. Standard errors are shown in parentheses with *** p<0.01, ** p<0.05, * p<0.1.*

effect on banks. These results are consistent with the study of Yin (2019), who find that external governance and multiple supervisors are positively associated with stability. Adequate bank supervision may restrict risk-taking incentives for banks and decreases the failures of banks. External governance systems and supervision can result in multiple supervisory approaches and supports bank stability by generating advantageous information (Llewellyn, 1999; Yin, 2019).

TABLE 4.16G: Impact of external governance on bank stability

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	SROA	**BZSB**	**LBZS**	**NPL**	**LLP**
EXG	-.069***	.141**	.011***	-.13***	-.02***
	(.02)	(.066)	(.003)	(.015)	(.006)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	6878	6845	6775	6649	6986
_id	861	862	857	837	864
R-squared	.279	.227	.281	.395	.277
F-stat	145.49	10.28	81.58	236.71	146.07
p-value	0.000	0.000	0.000	0.000	0.000

*Coefficients of controls are not reported to save space. Standard errors are shown in parentheses with *** p<0.01, ** p<0.05, * p<0.1.*

4.4 Bank Competition, Bank Size and Financial Stability using System-GMM

In this section, this study presents the results of the relationship between bank competition, bank size, and bank stability in Table 4.17 using system GMM. In models 1 to 3, it regresses competition measure (LER) on three measures of bank

stability. Being a dynamic estimation, the lag dependent variable is included as a regressor. In model 1, lag value of volatility of earning is significant at 1% level. The coefficient of Lerner index is negative and statistically significant at 1% level. This shows that lower competition (high market power) reduces the volatility of earning. This is in favor of the charter value paradigm. In model 2, the lag value of bank Z-score is statistically significant at 10% level. The coefficient of Lerner index is positive and statistically significant at 1% level, showing that high market power (low competition) is positively associated with bank stability. In model 3, the coefficient of Lerner index is negatively associated with credit risk and is significant at 1% level. It shows that an increase in the competition increases the credit risk. This study relies on a set of diagnostic tests for the validity of GMM results. The first test, the AR (2), is insignificant at 10% level showing that the first differenced error term is not serially correlated at second order. The second test, Hansen test, is also insignificant at 10% which shows that our instruments are valid. Moreover, the instruments used in the estimation are less than the number of groups. Hence, these results are valid.

In model 4 to 6, this study regresses bank size measure (LTA) on three measures of bank stability. Being a dynamic estimation, the lag dependent variable is included as regressor. In model 3, the lag value of volatility of earning is significant at 1% level. The coefficient of log of total assets (bank size) is statistically significant at 1% level. This shows that bank size is significantly related to the volatility of earning. In models 2 and 3, the lag value of bank Z-score and NPL is statistically significant at 5% and 1% levels, respectively. The coefficient of bank size is positive and statistically significant at 5% level showing that bank size significantly affects bank stability. For GMM diagnostic tests for its validity, AR (2) is insignificant at 10% level showing that the first differenced error term is not serially correlated at second order and the Hansen test is also insignificant at 10% which shows that identifying restrictions are valid. Moreover, the number of instruments is less than the number of groups. Hence, these results are valid. In this estimation, models with LBZS and LLP as dependent variable are found mis-specified and are not reported.

TABLE 4.17: Impact of competition and bank size on financial stability

	(1)	(2)	(3)	(4)	(5)	(6)
	Bank Competition			Bank Size		
Variables	**SROA**	**BZSB**	**NPL**	**SROA**	**BZSB**	**NPL**
SROA(-1)	0.802***			0.928***		
	(0.115)			(0.177)		
BZS(-1)		0.321*			0.377**	
		(0.172)			(0.189)	
NPL(-1)			0.316***			0.423***
			(0.096)			(0.116)
LER	-13.605***	33.266***	-4.925*			
	(5.023)	(12.064)	(2.695)			
LTA				1.836***	6.176***	1.211**
				(0.678)	(2.088)	(0.549)
NII	-0.021	0.059	-0.043**	-0.005	0.073**	-0.011
	(0.014)	(0.039)	(0.017)	(0.017)	(0.037)	(0.019)
DPT	-1.782	8.094	-32.873***	-1.632	6.848	-39.959***
	(1.145)	(18.374)	(8.089)	(1.407)	(4.532)	(9.461)
LNG	0.001	0.021	-0.021	-0.986*	0.257	-0.134*
	(0.002)	(0.016)	(0.022)	(0.595)	(1.034)	(0.069)
CIR	0.081*	-0.182***	0.03**	0.139***	0.002	0.096***
	(0.041)	(0.053)	(0.015)	(0.026)	(0.03)	(0.033)
LLR	0.075	-0.01	0.807***	0.043	0.233*	0.813***
	(0.049)	(0.092)	(0.119)	(0.056)	(0.121)	(0.171)
NIM	-0.304**	0.115	0.026	0.147	0.33	0.533**
	(0.121)	(0.308)	(0.145)	(0.153)	(0.426)	(0.222)
ETA	0.044	0.344	-0.427***	0.176***	0.924***	-0.425***
	(0.03)	(0.215)	(0.099)	(0.061)	(0.325)	(0.098)
MSP	0.022**	-0.057***	-0.013	0.001	0.003	0.027
	(0.011)	(0.021)	(0.008)	(0.013)	(0.045)	(0.019)
AGR	0.049	0.184	-0.146	-0.005	-0.384	0.351
	(0.042)	(0.445)	(0.112)	(0.042)	(0.722)	(0.313)
INF	0.021	-0.238**	0.011	0.061*	0.085	-0.105
	(0.032)	(0.121)	(0.034)	(0.035)	(0.346)	(0.084)
EXR	0	0.001	0.001	0	0.003**	0.002**
	(0)	(0)	(0)	(0.001)	(0.001)	(0.001)
EFR	0.067*	-0.074	0.026	-0.006	0.339**	0.297***
	(0.04)	(0.102)	(0.047)	(0.045)	(0.166)	(0.108)
CR5	-0.007	0.048	0.004	0.028	0.093	0.042
	(0.012)	(0.033)	(0.012)	(0.027)	(0.074)	(0.027)
AR (2) Test	1.53	1.14	1.04	1.62	1.07	1.54
(p-value)	0.125	0.255	0.300	0.106	0.286	0.124
Hansen Test	15.56	20.98	16.76	17.86	6.89	13.05
(p-value)	0.212	0.179	0.115	0.163	0.549	0.221
F-Value	37.77	13.65	47.5	32.19	16.46	49.8
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000

*Above Table shows the results of system GMM regressions for nine Asian and five European countries. In this Table, SROA is the std. deviation of ROA, BZSB is the bank Z-score, NPL is the Non-performing loan ratio, SROA(-1), BZSB (-1), and NPL(-1) shows the lag value of SROA, BZSB, and NPL respectively. LER is the Lerner index, LTA is the log of total bank assets. Control variables include NII which is the non-interest revenue to total revenue, DPT is the ratio of total deposits to total assets, LNG is the loan growth rate, CIR is the cost to income ratio, LLR is the loan loss reserve ratio, NIM is the net interest margin, CTA is the capital asset ratio, MSP is the money supply growth, AGR is the annual GDP growth, INF is the inflation rate, EXR is the exchange rate, EFR is the economic freedom index, CR5 is the concentration ratio. Standard errors are shown in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

4.5 Country Level Analysis in Asia: Relationship between Banking and Macro Economic Variables

This section reports the results of country-level analysis for the relationship between bank competition, financial stability and economic growth in Asian region using country-level data for 2001 to 2017. Sub-sections 4.5.1 to 4.5.6 present the results for the countries in the Asian continent.

4.5.1 Descriptive statistics of main variables for the countries in Asia

This sub-section presents the descriptive statistics of the main study variables used in this analysis over 2001 to 2017 in Table 4.18. Then sub-sections 4.5.2 to 4.5.6 report the results of regression analysis. In the results of descriptive statistics, the highest NPR is in Bangladesh (17.61%), Pakistan (13.71%), and Jordan (9.28%); the lowest NPR is in Hong Kong SAR, China (2.19%), New Zealand (1.22%), and Macao SAR, China (0.49%). For bank Z-score, Jordan (47.09%), Lebanon (31.05%), and Qatar (27.53%) have the most stable banking systems, whereas Indonesia (4.34%), Syrian Arab Republic (4.31%), Myanmar (1.97%) have the lowest bank stability scores.

For competition, Myanmar (-7.12), Iran, Islamic Rep. (-0.33), and New Zealand (-0.33) have the most competitive banking systems, whereas Korea, Rep. (0.03), Bahrain (0.04), and Israel (0.06) have the lowest competition in terms of Boone indicator. For economic growth, Myanmar, Qatar and China have the highest annual GDP growth rates (10.62%, 10.42%, 9.59% respectively); and Iran, Islamic Rep., New Zealand, and Japan have the lowest annual GDP growth rates (3.04%, 2.82%, and 0.91% respectively). Whereas, Myanmar, China, and Macao-SAR, China have the highest; and United Arab Emirates, Oman, and Bahrain have the lowest per capita GDP growth rates (9.65%, 8.98%, and 6.38%; and -2.20%, -0.26%, and -0.07% respectively).

TABLE 4.18: Descriptive statistics: Country-level information for main variables

	BNE		**BZS**		**NPR%**		**AGR%**		**CGR%**	
Country	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Bahrain	0.04	0.04	14.10	1.71	4.58	0.76	4.84	1.88	-0.01	1.92
Bangladesh	-0.06	0.02	7.04	1.13	17.61	8.39	5.79	0.87	4.39	1.10
Bhutan	-0.06	0.03	18.23	6.75	5.95	0.72	7.62	3.54	5.38	3.38
Cambodia	-0.10	0.04	13.28	1.38	2.20	0.33	7.90	2.91	6.18	2.83
China	-0.03	0.01	16.51	4.13	9.04	10.09	9.59	1.97	9.04	1.96
Hong Kong	0.03	0.02	15.22	4.88	2.19	2.23	3.98	3.10	3.40	3.01
India	-0.10	0.01	15.86	2.06	5.58	3.50	7.08	2.18	5.58	2.21
Indonesia	-0.03	0.01	4.34	0.89	8.65	10.97	5.31	0.76	3.97	0.76
Iran, Islamic Rep.	-0.33	0.05	7.74	1.40	4.67	3.06	3.04	4.14	1.83	4.09
Iraq	0.00	0.02	16.42	8.74	3.47	2.86	5.40	16.72	2.50	16.29
Israel	0.06	0.03	26.76	2.31	2.79	1.39	3.47	2.22	1.53	2.20
Japan	0.00	0.01	13.26	2.64	3.23	2.12	0.91	2.09	0.94	2.09
Jordan	-0.07	0.01	47.09	11.19	9.28	5.28	5.06	2.35	1.26	3.05
Korea, Rep.	0.03	0.05	8.43	2.64	2.23	2.93	4.27	2.08	3.74	2.04
Kuwait	-0.03	0.02	15.50	1.82	6.89	4.18	4.48	5.89	0.14	6.78
Lebanon	-0.04	0.01	31.05	3.65	8.78	4.92	4.32	3.35	0.49	4.79
Macao	-0.13	0.04	23.90	5.86	0.49	0.26	8.82	11.49	6.44	11.17
Malaysia	-0.04	0.01	14.73	2.07	7.54	5.76	5.11	2.46	3.19	2.40
Mongolia	-0.06	0.02	22.55	3.72	5.10	3.30	7.38	4.69	5.93	4.47
Myanmar	-7.12	19.51	1.97	1.69	6.53	2.54	10.62	2.71	9.71	2.64
Nepal	-0.07	0.01	21.90	2.58	4.65	2.10	4.19	1.46	2.92	1.50
New Zealand	-0.33	0.38	19.64	4.07	1.22	0.45	2.82	1.59	1.72	1.38
Oman	-0.01	0.02	18.58	2.18	5.20	3.81	3.68	3.29	-0.20	3.38
Pakistan	-0.10	0.04	9.96	2.14	13.71	4.90	4.16	1.84	2.06	1.82
Philippines	-0.05	0.04	20.31	5.24	8.92	8.21	5.10	1.75	3.31	1.79
Qatar	-0.01	0.02	27.53	3.58	2.31	2.58	10.42	7.61	0.91	4.10
Saudi Arabia	-0.02	0.01	16.18	1.75	3.67	3.22	4.13	3.96	1.36	3.80
Singapore	-0.31	0.58	21.52	5.59	3.02	2.52	5.61	4.18	3.49	4.49
Sri Lanka	-0.09	0.11	10.56	2.10	4.03	0.47	5.56	2.53	4.86	2.56
Syria	-0.03	0.05	4.31	3.20	7.50	1.54	4.94	1.44	2.26	1.34
Thailand	-0.04	0.05	5.35	1.27	7.73	5.19	4.09	2.52	3.52	2.45
UAE	-0.04	0.01	25.93	2.78	8.15	4.47	4.78	3.99	-2.14	5.99
Vietnam	-0.08	0.02	12.11	3.07	2.59	0.39	6.40	0.73	5.38	0.78

This Table shows the mean and standard deviation of competition (BNE), bank Z-score (BZS), non-performing loan ratio (NPR), annual GDP growth rate (AGR), and per capita GDP growth rate (CGR) for the sample of Asian countries.

4.5.2 Bank stability, bank competition, and economic growth

Table 4.19 shows that (i) non-performing loans, bank Z-score, and competition economically and statistically influence economic growth; and (ii) these results are not due to unobserved heterogeneity. It reports the results of the fixed-effect estimator for the effect of non-performing loan (models 1 and 4), bank Z-score (models 2 and 5), and competition (models 3 and 6) on GDP growth rate (panel A) and per capita GDP growth (panel B). Control variables (i.e., trade openness, log of gross fixed capital formation, government expenditures, and external assets and liabilities) are included to avoid omitted variable bias. In models 1 and 2, this study regresses bank stability (NPR, BZS) on annual GDP growth. The coefficient associated with NPR is statistically significant at the 1% level and shows that low NPR is associated with high economic growth. Similar results occur when per capita GDP growth is used in column 4. The coefficient associated with Z-score is positive and statistically significant, implying that stability is positively associated with economic growth. The signs of coefficients for NPR (models 1 and 4) and BZS (models 2 and 4) are opposite because they are opposite measures to proxy banking stability. NPR is the inverse measure of bank stability, so the sign is negative, implying that bank instability hinders economic growth. BZS directly measures bank stability, so the sign is positive, implying that bank stability promotes economic growth. Models 3 and 6 regress the measure of bank competition (the Boone indicator) on annual GDP and GDP per capita growth. Lower competition is associated with higher economic growth, as the coefficient of the Boone indicator is statistically and economically significant at the 1% level. The significant values of the LR test, Hausman test, and F test imply correct use of the fixed-effect estimator and model fitness.

4.5.3 Bank stability, economic growth, and financial crisis

In Table 4.20, this study includes a crisis variable in the model and analyze the growth difference in the crisis period using a dummy variable for the global financial crisis (GFC) and local banking crisis (LBC). The interactive term of bank

TABLE 4.19: Bank stability, bank competition, and economic growth

Variables	**Panel A: AGR**			**Panel B: CGR**		
Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
NPR	-0.011***			-0.0109***		
	(0.0038)			(0.00331)		
BZS		0.089**			0.091**	
		(0.00141)			(0.00141)	
BNE			1.565***			1.345***
			(0.0399)			(0.0392)
TPN	0.050***	0.069***	0.069***	0.053***	0.051***	0.051***
	(0.0057)	(0.0055)	(0.0056)	(0.0057)	(0.0055)	(0.0056)
LFF	1.148***	1.867***	2.060***	1.007***	1.659***	1.851***
	(0.2931)	(0.2363)	(0.2386)	(0.2940)	(0.2360)	(0.2393)
GEX	-1.612***	-1.710***	-1.475***	-1.329***	-1.384***	-1.131***
	(0.3947)	(0.3408)	(0.3375)	(0.3959)	(0.3403)	(0.3386)
EXT	-1.714***	-1.795***	-2.244***	-1.805***	-1.832***	-2.297***
	(0.2316)	(0.2065)	(0.2124)	(0.2324)	(0.2062)	(0.2131)
Constant	2.187	-14.551***	-15.446***	3.502	-12.638***	-13.289***
	(4.7389)	(3.6951)	(3.7324)	(4.7542)	(3.6899)	(3.7445)
LR Test	163.7248***	185.3695***	166.4033***	164.683***	187.4021***	185.835***
Hausman Test	39.03969***	33.4054***	34.8185***	37.4583***	40.0798***	33.5639***
R-Squared	0.318275	0.2945	0.3170	0.3084	0.2858	0.3099
F-Value	6.66952	6.0213	6.6793	6.3704	5.7714	6.4610
Sig.	0.000	0.000	0.000	0.000	0.000	0.000
Number of IDs	33	33	33	33	33	33

*This shows the results of the fixed-effect estimator. AGR and CGR are the Annual GDP Growth GDP per Capita Growth in panel A and B respectively. NPR is the ratio of non-performing loans to gross loans and inversely measures bank stability. BZS or bank Z-score is the ratio of ROA/CAR to ROA and measures bank stability. BNE is the measure of bank competition proxied by the Boone indicator. TPN is trade openness, measured as the ratio of exports and imports to GDP; LFF is the natural log of gross fixed capital formation; GEX is the natural log of government expenditures, and EXT is the natural log of external assets and liabilities (which measures financial integration). In models 1, 2, and 3, NPR, BZS, and BNE are regressed on AGR. In models 4, 5, and 6, NPR, BZS, and BNE are regressed on CGR, respectively. Standard errors are indicated in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

stability captures its effect during the crisis period. The effect of bank stability is still statistically and economically significant in all models. In model 1, GFC is associated with lower economic growth, significant at the 1% level. However, its interaction term is negative but statistically insignificant (model 2). In model 3, LBC is associated with statistically significant low economic growth (at the 1% level), and economic growth is negatively associated with credit risk (model 4). Models 5 and 7 show the results with the Z-score measure. Lower economic growth occurs during GFC and LBC, significant at 5% and 10% levels, respectively. The effect of the Z-score measure on economic growth is statistically and economically

significant for GFC and LBC at the 5 % and 10 % levels, respectively (models 6 and 8); this result is consistent with prior literature (Cole et al., 2008). The opposite signs for NPR in models 1 to 4 and for BZS in models 5 to 8 are consistent because both variables are inversely related. The sign of interaction term, in model 2 and 4, reveals that credit risk (bank stability) augments (counteracts) the negative effect of the crisis on economic growth during GFC and LBC. So, the negative effect of NPR on growth is strengthened during crisis period. Interaction term of BZS*Crisis shows mixed results. In model 6, interaction term of GFC and bank stability (BZS) is negative and significant and shows reduced during global financial crisis. However, it is positive in model 8 (for local crisis) showing increase in growth. This may be due to the fact that some countries are not facing local banking crisis. In fact, the effect of crisis is not able to nullify or repeal the effect of stability on growth. So, there may be probability of negative relationship in individual country. It may also be suggested that that bank stability supports economic growth during the crisis. The likelihood ratio and Hausman test support the use of the fixed-effect estimator in all models. All models in Table 4.13 are significant at the 1% level. For a robustness check, this study estimates the results using per capita GDP growth rate as a dependent variable. All of the results remain economically significant except NPR, which becomes statistically insignificant for model 4.

4.5.4 Bank stability, competition, and economic growth using system-GMM

Table 4.21 reports the results of the Arrellano and Bond two-step system GMM estimator. This estimation uses current period values for the independent variables instead of lag values, as lagged regressors are already present in the instrument matrix. Models 1 and 2 show the results of the baseline regression for annual GDP growth. These models are estimated via non-performing loans ratio and bank Z-score, respectively, as well as with four control variables: trade openness, log of government expenditure, log of gross fixed capital formation, and external assets and liabilities excluding financial crisis. A lag-dependent variable is included in

TABLE 4.20: Bank stability, economic growth, and crisis

Variables	**Annual GDP Growth (AGR)**							
	GFC		**LBC**		**GFC**		**LBC**	
Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
NPR	-0.013***	-0.012***	-0.010***	-0.010***				
	(0.0018)	(0.0019)	(0.0019)	(0.0019)				
BZS					0.074**	0.071**	0.075*	0.071*
					(0.0014)	(0.0014)	(0.0014)	(0.0012)
TPN	0.043***	0.043***	0.042***	0.042***	0.042***	0.041***	0.040***	0.040***
	(0.0057)	(0.0057)	(0.0057)	(0.0057)	(0.0055)	(0.0055)	(0.0055)	(0.0055)
LFF	1.303***	1.324***	0.980***	0.979***	1.910***	1.923***	1.576***	1.522***
	(0.2941)	(0.2955)	(0.2910)	(0.2908)	(0.2387)	(0.2387)	(0.2337)	(0.2338)
GEX	-1.731***	-1.731***	-1.407***	-1.378***	-1.635***	-1.656***	-1.466***	-1.439***
	(0.3961)	(0.3962)	(0.3920)	(0.3921)	(0.3410)	0.3410)	(0.3368)	(0.3362)
EXT	-1.745***	-1.758***	-1.624***	-1.634***	-1.823***	-1.816***	-1.643***	-1.608***
	(0.2299)	(0.2306)	(0.2317)	(0.2317)	(0.2048)	0.2047)	(0.2057)	(0.2056)
Crisis	-1.429***	-1.291***	-2.365***	-1.709***	-1.113***	-1.669***	-2.556***	-4.131***
	(0.2176)	(0.2838)	(0.3772)	(0.5354)	(0.2008)	(0.3657)	(0.3676)	(0.6181)
Crisis*		-0.023		-0.079*				
NPR		0.0305		0.0460				
Crisis*						-0.042*		0.142***
BZS						(0.0229)		(0.0448)
Constant	-1.902	-2.259	2.531	2.458	-17.039***	-17.152***	-12.006***	-11.176***
	(4.7709)	(4.7946)	(4.7070)	(4.7046)	(3.7494)	(3.7478)	(3.6507)	(3.6525)
LR Test	164.820	164.815	164.831	164.852	184.476	184.473	184.536	184.537
Hausman Test	55.673	57.200	51.651	54.948	53.985	54.094	49.782	47.830
R-Squared	0.325	0.325	0.323	0.324	0.296	0.297	0.302	0.305
F-Value	6.808	6.758	6.764	6.742	6.019	6.007	6.184	6.236
Sig.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of IDs	33	33	33	33	33	33	33	33

*This Table shows the results for the fixed-effect estimator. NPR, BZS, and Crisis (both GFC and LBC) are regressors in both estimations. Odd-numbered models are estimated without an interactive term for crisis and bank stability; even-numbered models include the interaction term as an explanatory variable. Standard errors are shown in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

the model to capture the persistence of economic growth, which is significant at the 1% level. The economic effect of the lag term shows the persistence of growth. In model 3, economic growth is negatively associated with non-performing loans at 1% level, implying that bank instability (insolvency risk) harms economic growth. The results are consistent with earlier studies (Tabak et al., 2012; Caggiano and Calice, 2016; Gaffeo and Mazzocchi, 2014; Claessens and Laeven, 2005). Further, economic growth falls by about 1% on average during the crisis. Bank instability further augments this negative effect on annual GDP growth during the crisis

period, as shown by the coefficient of the interaction term in model 4.

Models 5 and 6 report the results for the Z-score measure of bank stability. The coefficients of bank Z-score in models 5 and 6 are statistically and economically significant at the 1% level, showing that higher economic growth is associated with higher bank stability. The coefficient of the interaction term in model 6 is consistent with models 6 in Table 4.20, showing that economic growth is reduced during the global financial crisis. Finally, model 7 estimates the effect of competition on bank stability. The coefficient of competition is economically large and statistically significant, implying that a less competitive banking sector positively contributes to economic growth. These results are consistent with the literature (Pradhan et al., 2017; Jayakumar et al., 2018) and with intuition. The AR (2) test examines the null hypothesis that the error term in the first differenced equation is not second-order correlated. This study does not reject this hypothesis at the 10% level.

The results in the above Table 4.20 are checked for robustness and are not reported. In the robustness check, we use per capita GDP growth as the dependent variable instead of annual GDP growth. Further, instead of a global financial crisis, we use a local banking crisis dummy variable. The equation uses the two-step system GMM estimator. Careful examination shows that the results do not suffer much in these variations.

4.5.5 Impact of competition on bank stability

Table 4.22 shows the results using the two-step system GMM estimator and fixed-effect estimator for the competition and stability relationship, which enables us to control unobserved heterogeneity, endogeneity, and the dynamic relationship. The study estimates models 1 and 2 with the nonperforming loans ratio and bank Z-score as dependent variables. In model 3, the coefficient of lagged bank stability shows that bank risk is persistent at 1% level. The coefficient of competition (the Boone indicator proxy) is negative, implying that lower competition in the banking sector reduces credit risk (non-performing loans) in the financial system and favors

TABLE 4.21: Bank stability and economic growth using system-GMM

Variables	**Without Interaction**		**NPR Interaction**		**BZS Interaction**		**Competition**
Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
AGR(-1)	0.363***	0.195**	0.515***	0.526***	0.234**	0.224**	0.168**
	(0.118)	(0.098)	(0.153)	(0.147)	(0.104)	(0.099)	(0.013)
NPR	-0.320***		-1.028***	-1.035***			
	(0.095)		(0.035)	(0.039)			
BZS		4.065***			4.110***	4.086***	
		(0.051)			(0.077)	(0.082)	
BNE							-2.204***
							(0.006)
TPN	0.655***	0.601***	0.600***	0.600***	0.601***	0.601***	0.600***
	(0.021)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
GEX	-3.256***	-2.052***	-2.011***	-0.010	-0.051**	-0.053**	-0.033
	(0.090)	(0.025)	(0.015)	(0.008)	(0.024)	(0.023)	(0.021)
LFF	0.124**	0.170***	0.115***	0.116***	0.165***	0.167***	0.159***
	(0.060)	(0.043)	(0.031)	(0.030)	(0.041)	(0.042)	(0.038)
EXT	-6.736***	-6.442***	-6.202***	-6.191***	-6.362***	-6.362***	-6.346***
	(0.970)	(0.213)	(0.187)	(0.180)	(0.217)	(0.219)	(0.191)
GFC			-0.912***	-1.536***	-0.779**	-3.460***	-0.853**
			(0.334)	(0.372)	(0.377)	(1.435)	(0.417)
GFC*NPR				-0.093***			
				(0.060)			
GFC*BZS						-0.299***	
						(0.109)	
AR (2) Test	1.34	1.1	1.09	1.1	1.36	1.3	1.45
(p-Value)	0.189	0.272	0.276	0.271	0.174	0.193	0.148
Hansen Test	20.84	27.77	20.99	20.44	22.9	22.02	25.15
(p-Value)	0.19	0.58	0.49	0.48	0.42	0.42	0.32
Wald χ^2	30.42	50.48	164.57	173.37	42.07	47.53	199.27
(p-Value)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No. of							
Instruments	28	30	28	28	20	20	26
GMM Style	2,2	2,2	2,2	2,2	2,2	2,2	2,2
IV Style	1-5	1-5	1-5	1-5	1-5	1-5	1-5

*This Table shows the results of the two-step system GMM estimator. In the estimation, AGR is a dependent variable in all models, and GFC is a dummy variable for the global financial crisis. GFC*NPR and GFC*BZS are interaction terms of financial crisis with non-performing loans and bank Z-score, respectively. Standard errors are in parentheses with ***p<0.01, **p<0.05, *p<0.1..*

the competition-fragility hypothesis. Here, the study uses trade openness, the log of government expenditure, the log of gross fixed capital formation, and financial integration to control for country-level economic dynamics as in earlier estimations.

Model 4 replaces the dependent variable and use bank Z-score. The coefficient of the lag term shows persistence in bank stability at the 1% level. The coefficient

of competition is significant and supports the competition-fragility view of the literature. Its positive value shows that reductions in competition intensity enhance bank stability at the 1% level. In both models, this study is unable to reject the null hypothesis of AR (2) at the 10% level (recall that AR (2) tested the null hypothesis that the error term in the first differenced equation is not second-order correlated). Further, this study is not able to reject the null hypothesis of the Hansen test at the 10% level in both models (recall that the Hansen test tested the joint validity of instruments that instruments are not correlated with the error term). The maximum two lags of independent variables are instruments in the estimation process. Models 1 and 2 show similar results using the fixed-effect estimator. Both analyses show that the results of the system-GMM estimator and fixed-effect estimator are reliable. These findings are consistent with Fu et al. (2014), who support the competition-fragility view.

4.5.6 Bank stability, bank competition, and economic growth - disentangling the channel

This section concentrates on how bank stability affects the relationship between bank competition and economic growth. The premise is that bank market power creates stability among banks and that this stability leads to greater economic growth. More specifically, lower bank competition increases bank stability, which makes the financial sector more stable and in turn boosts economic growth. To quantify these indirect effects of bank competition on economic growth through bank stability, this study uses the methodology of (Preacher and Hayes, 2004), which requires estimating the following equations in three steps (Eq. 3.35 to 3.37).

The literature frequently uses this approach[3]. First introduced by Baron and Kenny (1986), it appears in reputable business and finance journals such as Management (Rungtusanatham et al., 2014), Entrepreneurship (Semrau and Sigmund, 2012), and Finance (Fedaseyeu et al., 2018; Ferris et al., 2017).

[3]See Darlington and Hayes (2016) for statistical explanation and Ferris et al. (2017) for an application.

TABLE 4.22: Impact of competition on bank stability

Variables	**FE Estimation**		**GMM Estimation**	
	NPR	**BZS**	**NPR**	**BZS**
Model	**(1)**	**(2)**	**(3)**	**(4)**
BST(-1)			0.640***	0.596***
			(0.140)	(0.124)
BNE	-2.184***	1.536***	-2.014***	1.959***
	(1.087)	(0.051)	(0.142)	(0.037)
TPN	-0.014*	0.806***	-0.798**	0.648***
	(0.008)	(0.009)	(0.388)	(0.025)
GEX	0.862***	-0.901***	5.043***	-5.022***
	(0.040)	(0.035)	(0.463)	(0.025)
LFF	-0.530***	0.221***	-7.223***	7.045***
	(0.062)	(0.053)	(0.252)	(0.043)
EXT	0.501**	0.339**	1.464**	-1.200**
	(0.273)	(0.133)	(0.676)	(0.707)
Constant	10.141*	-5.991		
	(6.067)	(4.263)		
F-Stat [χ^2]	22.245	77.328	[462.47]	[465.06]
(p-Value)	0.000	0.000	0.000	0.000
R-Squared Overall	0.41	0.43		
Number of IDs	33	33		
Hansen Test			16.62	27.67
(p-Value)			0.420	0.375
# of Instruments			22	22
GMM Style			2,2	2,2
IV Style			1-5	1-5

*This Table shows the results of the fixed-effect estimator. The ratio of non-performing loans to gross loans (NPR) (resp. bank Z-score (BZS)) is the dependent variable in model 1 (resp. model 2). BNE is the measure of bank competition proxied by the Boone indicator. Standard errors are shown in parentheses, with ***p<0.01, **p<0.05, *p<0.1.*

This study performs the first step of the analysis (equation 3.35) in Table 4.19 (models 3 and 6) by establishing the significant effects of competition on economic growth (annual GDP growth and per capita GDP growth). Further, it discusses the results of the second step (equation 3.36) in the previous section (Table 4.22, models 1 and 2), where bank competition significantly affects bank stability (BZS and NPR). The third and final step (equation 3.37) is to include bank stability in the regression of bank competition on economic growth. We estimate this equation with a fixed-effect estimator. The main variable of interest is the reduction in the effects of bank competition on economic growth.

The results of this analysis are in Table 4.23. In models 1 and 2, the dependent variable is annual GDP growth rate. In these models, the coefficient of the Boone indicator is positive and statistically significant at the 1% level; bank stability supports economic growth, and decreases in the competition are associated with increases in economic growth. Including the measure of bank stability reduces the effect of bank competition on economic growth. In relation to the total effect, this decrease is equal to 5.33 % in model 1 and 2.9% in model 3 significant at 1% and 5 % levels respectively. Models 3 and 4 replace the growth proxy with per capita GDP growth rate and observe the decrease of 13.70% and 15.3% significant at 1% levels respectively.

TABLE 4.23: Effect of bank competition and financial stability on economic growth

Variables	**Panel A: AGR**		**Panel B: CGR**	
Model	**(1)**	**(2)**	**(3)**	**(4)**
BNE	1.482***	1.351***	1.306***	1.139***
	(0.0834)	(0.0471)	(0.3435)	(0.0491)
NPR	-0.0381***		-0.0180***	
	(0.0113)		(0.0012)	
BZS		0.139**		0.134***
		(0.0202)		(0.0201)
TPN	0.616***	0.612***	0.619***	0.616***
	(0.0389)	(0.0309)	(0.0391)	(0.0391)
GEX	-0.107***	-0.089***	-0.103***	-0.083**
	(0.0317)	(0.0330)	(0.0391)	(0.0341)
LFF	0.048*	0.088*	0.097*	0.053**
	(0.0287)	(0.0490)	(0.0512)	(0.0216)
EXT	-1.667***	-0.824***	-1.744***	-0.927***
	(0.4015)	(0.3130)	(0.4279)	(0.3277)
Constant	3.847***	8.889*	3.860**	8.180
	(1.2413)	(4.8820)	(1.9138)	(5.1098)
Hausman Test	42.923***	44.582***	42.437***	44.985***
F-Stat	7.569	7.907	9.872	10.410
Indirect Effect	0.083*	0.214***	0.039**	0.206***
p-Value	0. 095	0.000	0.048	0.000
% of Total Effect	5.3%	13.70%	2.9%	15.3%
Number of IDs	33	33	33	33

*This Table shows the results of the indirect effect of bank competition on economic growth through bank stability. AGR and CGR are the Annual GDP Growth GDP per Capita Growth in panel A and B respectively. Standard errors are shown in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

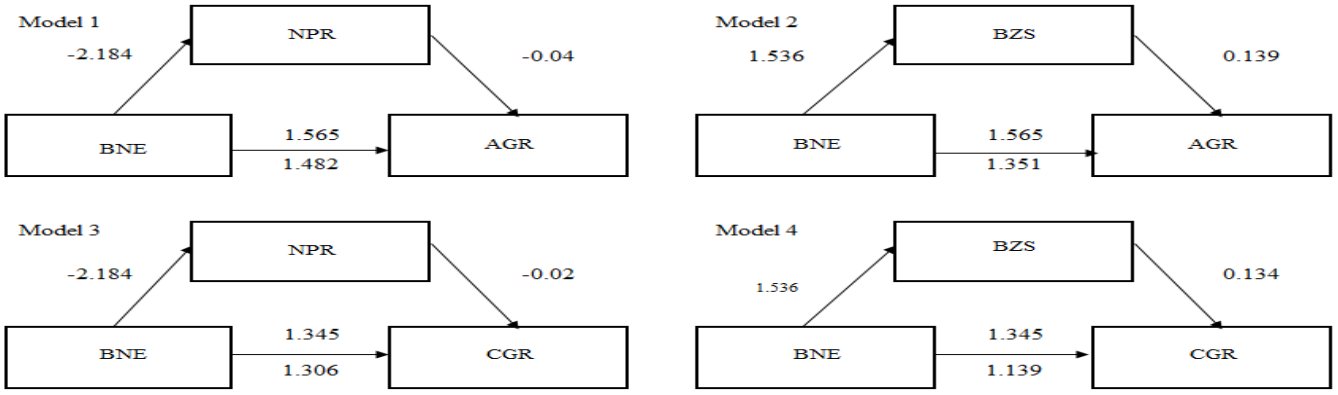

FIGURE 4.1: Channeling effect of competition on growth in Asia

This figure shows the total effect (TE) and direct effect (DE) of competition on economic growth (bottom path). Left side path shows the impact of competition on stability (path A). Right side path shows the impact of competition on stability (path B). Indirect Effect (IE) is the difference of total effect and direct effect (TE-DE) and shows the channeling effect of competition on growth through stability which is also calculated by multiplying path A with B. These estimations have been made fixed effect estimator. These results are presented in section 4.5 Table 4.19 (models 3 and 6), Table 4.22 (models 1 and 2) and Table 4.23 (models 1 to 4). The indirect effect is tested using Preacher and Hayes methodology following Fedaseyeu et al. (2018) and Ferris et al. (2017).

Statistics related to Figure 4.1

	(1)	(2)	(3)	(4)
TE	1.565	1.565	1.345	1.345
- DE	1.482	1.351	1.306	1.139
IE	**0.083**	**0.214**	**0.039**	**0.206**
A	-2.184	1.536	-2.184	1.536
B	-0.038	0.139	-0.018	0.134
AxB	**0.083**	**0.214**	**0.039**	**0.207**
%of TE	5.30%	13.64%	2.92%	15.38%
t -value	1.67	6.70	1.99	6.51
p -value	0.095	0.000	0.048	0.000

4.6 Country Level Analysis in Europe: Relationship between Banking and Macro Economic Variables

This section reports the results of the country-level analysis for the relationship between bank competition, financial stability and economic growth in European region using country-level data for 2001 to 2017. Sub-sections 4.6.1 to 4.6.6 present the results for the countries in European continent.

4.6.1 Descriptive statistics of main variables for the countries in Europe

This sub-section presents the descriptive statistics of the main study variables used in this analysis in Table 4.24. Then sub-sections 4.6.1 to 4.6.6 report the regression results. In the results of the descriptive statistics, the highest NPR is in Malta (21.65%), Serbia (18.21%), and Ukraine (16.97%); the lowest NPR is in Finland (0.48%), Luxembourg (0.34%), and Sweden (0.98%). For bank Z-score, Luxembourg (28.38%), Austria (20.82%), and Spain (19.42%) have the most stable banking systems, whereas Belarus (3.92%), Slovenia (2.52%), and Iceland (1.43%) have the lowest bank stability scores. For competition, Luxembourg (-8.58), Macedonia FYR (-5.01), and Belarus (-1.57) have the most competitive banking systems, whereas Netherlands (0.12), Norway (0.07), and Finland (0.03) have the lowest Boone indicators. For economic growth, Azerbaijan, Armenia, and Georgia have the highest annual GDP growth rates and per capita GDP growth rates (10.95%, 6.93%, and 5.61%; 9.65%, 7.33%, and 6.81%, respectively) whereas Greece, Italy, and Portugal have the lowest annual GDP growth rates and per capita GDP growth rates (1.09%, 0.92%, and 0.44%; 0.20%, 0.12%, and 0.35%, respectively).

TABLE 4.24: Descriptive statistics: Country-level information for main variables-Europe

	BNE		**BZS**		**NPR%**		**AGR%**		**CGR%**	
Country	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Armenia	-0.13	0.02	10.98	3.22	6.36	5.06	6.93	7.15	7.33	7.81
Austria	-0.02	0.01	20.82	5.42	3.13	0.60	1.62	1.83	1.05	2.46
Azerbaijan	-0.08	0.03	8.60	2.32	5.71	1.43	10.95	10.27	9.65	10.03
Belarus	-1.57	0.46	3.92	1.78	5.75	4.49	6.01	4.79	6.61	4.98
Belgium	-0.04	0.02	11.01	3.67	2.96	0.96	2.23	2.06	0.99	2.18
Bosnia and Herzegovina	-0.03	0.01	15.82	3.34	10.14	5.06	3.80	3.94	4.35	3.13
Bulgaria	-0.05	0.10	8.56	2.29	8.83	7.20	4.55	3.81	5.00	4.19
Croatia	-0.10	0.03	5.21	1.69	10.31	4.11	2.59	3.75	2.38	4.51
Czech Republic	-0.12	0.06	12.75	2.94	7.48	7.12	3.79	3.59	3.61	3.42
Denmark	-0.10	0.03	17.58	3.31	2.79	2.17	1.37	2.55	1.46	2.49
Estonia	-0.16	0.07	6.99	2.23	1.87	2.44	4.09	6.93	4.80	7.39
Finland	0.03	0.18	12.68	5.46	0.48	1.11	1.71	4.15	1.51	4.04
France	-0.02	0.01	17.87	3.85	4.95	0.90	1.37	1.99	0.99	2.22
Georgia	-0.01	0.07	6.59	1.88	4.74	3.42	5.61	4.65	6.81	4.76
Germany	-0.04	0.01	16.94	4.37	4.21	1.39	1.98	3.29	2.27	3.12
Greece	-0.01	0.12	5.21	3.12	14.30	11.26	1.09	4.85	0.20	5.30
Hungary	-0.16	0.07	5.84	0.89	7.52	6.68	2.87	3.97	2.96	3.24
Iceland	-0.37	0.46	1.43	1.60	5.20	6.13	3.18	4.01	2.16	4.12
Ireland	-0.07	0.53	5.53	4.27	8.49	10.06	5.23	7.60	3.91	6.87
Italy	-0.03	0.04	14.20	4.85	9.93	5.05	0.92	3.14	0.12	2.77
Latvia	-0.23	0.06	6.23	1.42	6.22	6.17	4.08	6.76	5.41	7.13
Luxembourg	-8.58	58.33	28.38	6.60	0.34	0.35	3.20	3.90	1.56	3.56
Macedonia, FYR	-5.01	0.02	6.00	1.60	14.21	6.08	3.33	3.12	3.46	3.25
Moldova	-0.07	0.04	8.16	1.77	11.05	4.93	5.34	5.02	5.69	4.56
Malta	-0.06	0.04	7.47	2.98	21.65	13.71	2.31	3.47	1.23	4.05
Netherlands	0.12	0.08	12.62	8.94	2.64	1.54	1.60	2.18	1.82	2.46
Norway	0.07	0.06	8.46	1.40	2.07	0.86	2.66	1.75	1.41	2.21
Poland	-0.10	0.04	7.81	2.31	10.22	6.82	3.73	2.25	4.79	1.79
Portugal	-0.59	0.56	10.90	3.50	5.51	4.30	0.44	2.69	0.35	2.05
Romania	-0.10	0.06	7.87	2.63	15.94	4.08	3.84	4.38	4.80	4.66
Serbia	-0.17	0.23	14.08	3.09	18.21	4.28	3.53	3.65	4.63	3.57
Slovak Republic	0.00	0.03	16.29	1.92	5.95	3.83	4.16	3.94	3.96	3.86
Slovenia	-0.57	0.00	2.52	1.22	7.82	5.02	2.83	4.00	2.82	3.80
Spain	-0.70	0.19	19.42	2.53	4.02	3.10	2.56	2.81	1.34	2.98
Sweden	-0.07	0.01	10.84	2.79	0.98	1.16	2.91	2.85	2.14	3.54
Switzerland	-0.07	0.01	11.74	3.73	1.44	1.64	2.39	1.93	1.02	2.07
Ukraine	-0.11	0.10	6.10	1.54	16.97	10.17	3.21	7.87	3.98	7.41
United Kingdom	-0.07	0.03	9.43	4.35	3.12	1.18	2.66	2.19	1.69	2.91

This Table shows the mean and standard deviation of competition (BNE), bank Z-score (BZS), non-performing loan ratio (NPR), annual GDP growth rate (AGR), and per capita GDP growth rate (CGR) for sample countries.

4.6.2 Bank stability, bank competition, and economic growth

Table 4.25 shows that (i) non-performing loans, bank Z-score, and competition economically and statistically influence economic growth; and (ii) these results are not due to unobserved heterogeneity. It reports the results of the fixed-effect estimator for the effect of non-performing loan (models 1 and 4), bank Z-score (models 2 and 5), and competition (models 3 and 6) on GDP growth rate (panel A) and per capita GDP growth (panel B). Control variables (i.e., trade openness, log of gross fixed capital formation, government expenditures, and external assets and liabilities) are included to avoid omitted variable bias. In models 1 and 2, this study regresses bank stability (NPR, BZS) on annual GDP growth. The coefficient associated with NPR is statistically significant at the 1% level and shows that low NPR is associated with high economic growth. Similar results occur when per capita GDP growth is used in column 4. The coefficient associated with Z-score is positive and statistically significant, implying that stability is positively associated with economic growth. The signs of coefficients for NPR (models 1 and 4) and BZS (models 2 and 4) are opposite because they are opposite measures to proxy banking stability. NPR is the inverse measure of bank stability, so the sign is negative, implying that bank instability hinders economic growth. BZS directly measures bank stability, so the sign is positive, implying that bank stability promotes economic growth. Models 3 and 6 regress the measure of bank competition (the Boone indicator) on annual GDP and GDP per capita growth. Lower competition is associated with higher economic growth, as the coefficient of the Boone indicator is statistically and economically significant at the 1% level. The significant values of the LR test, Hausman test, and F test imply correct use of the fixed-effect estimator and model fitness.

4.6.3 Bank stability, economic growth, and financial crisis

In Table 4.26, we include a crisis variable in the model and analyze the growth difference in the crisis period using a dummy variable for the global financial crisis (GFC) and local banking crisis (LBC). The interactive term of bank stability

TABLE 4.25: Bank stability, bank competition and economic growth-Europe

Variables	**Panel A: AGR**			**Panel B: CGR**		
Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
NPR	-0.114***			-0.093***		
	(0.0180)			(0.0210)		
BZS		0.057**			0.051**	
		(0.0137)			(0.0195)	
BNE			2.934***			2.841***
			(0.773)			(0.7614)
TPN	0.029***	0.029***	0.027***	0.031***	0.030***	0.028***
	(0.0056)	(0.0054)	(0.0055)	(0.0056)	(0.0054)	(0.0055)
LFF	1.090***	1.745***	1.821***	0.882***	1.472***	1.554***
	(0.2928)	(0.2442)	(0.2462)	(0.2946)	(0.2446)	(0.2479)
GEX	-1.205***	-1.221***	-1.052***	-1.068***	-1.038***	-0.860***
	(0.3855)	(0.3376)	(0.3351)	(0.3879)	(0.3382)	(0.3375)
EXT	-1.372***	-1.280***	-1.773***	-1.629***	-1.477***	-1.980***
	(0.2688)	(0.2388)	(0.2414)	(0.2704)	(0.2392)	(0.2431)
Constant	-1.570	-18.997***	-15.939***	4.047	-12.914**	-9.803*
	(6.5228)	(5.5664)	(5.6479)	(6.5629)	(5.5756)	(5.6876)
LR Test	23.8640***	24.9599***	24.6146***	23.8640***	24.9599***	24.6146***
Hausman Test	47.0960***	48.1261***	48.1488***	46.7879***	48.7718***	48.2479***
R-Squared	0.4322	0.4004	0.4261	0.4206	0.3892	0.4157
F-Value	9.6343	8.6844	9.5498	9.1880	8.2882	9.1507
Sig.	0.000	0.000	0.000	0.000	0.000	0.000
Number of IDs	38	38	38	38	38	38

*The table shows the results of the fixed-effect estimator. AGR and CGR are the Annual GDP Growth GDP per Capita Growth in panel A and B respectively. NPR is the ratio of non-performing loans to gross loans and inversely measures bank stability. BZS or bank Z-score is the ratio of ROA/CAR to ROA and measures bank stability. BNE is the measure of bank competition proxied by the Boone indicator. TPN is trade openness, measured as the ratio of exports and imports to GDP; LFF is the natural log of gross fixed capital formation; GEX is the natural log of government expenditures, and EXT is the natural log of external assets and liabilities (which measures financial integration). In models 1, 2, and 3, NPR, BZS, and BNE are regressed on AGR. In models 4, 5, and 6, NPR, BZS, and BNE are regressed on CGR, respectively. Standard errors are indicated in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

captures its effect during the crisis period. The effect of bank stability is still statistically and economically significant in all models. In model 1, GFC is associated with lower economic growth, significant at the 1% level. However, its interaction term is negative but statistically insignificant (model 2). In model 3, LBC is associated with statistically significant low economic growth (at the 1% level), and economic growth is negatively associated with credit risk (model 4). Models 5 and 7 show the results with the Z-score measure. Lower economic growth occurs during GFC and LBC, significant at the 1% level. The effect of the Z-score measure on economic growth is statistically and economically significant for GFC and LBC

at the 10% and 1% levels, respectively (models 6 and 8); this result is consistent with prior literature (Cole et al., 2008). The opposite signs for NPR in models 1 to 4 and for BZS in models 5 to 8 are consistent because both variables are inversely related. The sign of interaction term reveals that credit risk (bank stability) augments (counteracts) the negative effect of the crisis on economic growth during GFC and LBC. Interaction term of BZS*Crisis shows mixed results. In model 6, interaction term of GFC and bank stability (BZS) is negative and significant and shows reduced during global financial crisis. However, it is positive in model 8 (for local crisis) showing increase in growth. So, there may be probability of negative relationship in individual country. The likelihood ratio and Hausman test support the use of the fixed-effect estimator in all models. All models in Table 4.26 are significant at the 1% level. For a robustness check, this study estimates the results using per capita GDP growth rate as a dependent variable. All of the results remain economically significant except NPR, which becomes statistically insignificant for model 4.

4.6.4 Bank stability, competition, and economic growth using system-GMM

This study further uses the generalized method of moment (GMM) dynamic panel estimator to analyze the dynamic relationships among bank stability, competition, and economic outcome. Table 4.27 reports the results of the Arrellano and Bond two-step system GMM estimator. This estimation uses current period values for the independent variables instead of lag values, as lagged regressors are already present in the instrument matrix. Models 1 and 2 show the results of the baseline regression for annual GDP growth. These models are estimated via non-performing loans ratio and bank Z-score, respectively, as well as with four control variables: trade openness, log of government expenditure, log of gross fixed capital formation, and external assets and liabilities excluding financial crisis. A lag-dependent variable is included in the model to capture the persistence of economic growth, which is significant at the 1% level. The economic effect of the

TABLE 4.26: Bank stability, economic growth, and crisis-Europe

	Annual GDP Growth (AGR)							
Variables	**GFC**		**LBC**		**GFC**		**LBC**	
Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
NPR	-0.135***	-0.132***	-0.112***	-0.104***				
	(0.0183)	(0.0187)	(0.0185)	(0.0191)				
BZS					0.043*	0.037***	0.034***	0.026***
					(0.0204)	(0.0143)	(0.0104)	(0.0099)
TPN	0.040***	0.040***	0.039***	0.039***	0.040***	0.039***	0.038***	0.038***
	(0.0057)	(0.0057)	(0.0057)	(0.0057)	(0.0055)	(0.0055)	(0.0055)	(0.0055)
LFF	1.433***	1.462***	1.120***	1.120***	2.103***	2.116***	1.782***	1.729***
	(0.2934)	(0.2947)	(0.2900)	(0.2898)	(0.2392)	0.2392)	(0.2340)	(0.2341)
GEX	-1.998***	-1.999***	-1.690***	-1.663***	-1.947***	-1.969***	-1.794***	-1.767***
	(0.3952)	(0.3952)	(0.3906)	(0.3908)	(0.3418)	(0.3418)	(0.3372)	(0.3366)
EXT	-1.656***	-1.674***	-1.531***	-1.540***	-1.787***	-1.780***	-1.604***	-1.569***
	(0.2293)	(0.2300)	(0.2309)	(0.2309)	(0.2052)	(0.2051)	(0.2060)	(0.2058)
Crisis	-1.378***	-1.190***	-2.386***	-1.758***	-1.048***	-1.619***	-2.591***	-4.161***
	(0.2170)	(0.2831)	(0.3759)	(0.5336)	(0.2012)	(0.3665)	(0.3680)	(0.6188)
Crisis*		-0.031		-0.076*				
NPR		(0.0304)		(0.0458)				
Crisis*						-0.043*		0.142***
BZS						(0.0229)		(0.0449)
Constant	-3.021	-3.506	1.207	1.137	-18.694***	-18.811***	-13.910***	-13.083***
	(4.7593)	(4.7823)	(4.6906)	(4.6885)	(3.7578)	(3.7562)	(3.6549)	(3.6567)
LR Test	24.907***	24.913***	24.643***	24.651***	24.478***	24.474**	24.355**	24.339**
Hausman Test	58.459***	58.590***	47.189***	48.361***	53.179***	54.038***	42.749***	40.707***
R-Squared	0.333	0.334	0.333	0.334	0.303	0.304	0.310	0.314
F-Value	7.079	7.032	7.079	7.052	6.236	6.225	6.450	6.500
Sig.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of IDs	38	38	38	38	38	38	38	38

*This Table shows the results for the fixed-effect estimator. NPR, BZS, and Crisis (both GFC and LBC) are regressors in both estimations. Odd-numbered models are estimated without an interactive term for crisis and bank stability; even-numbered models include the interaction term as an explanatory variable. Standard errors are shown in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

lag term shows the persistence of growth. In model 3, economic growth is negatively associated with non-performing loans at the 1% level, implying that bank instability (insolvency risk) harms economic growth. The results are consistent with earlier studies (Tabak et al., 2012; Caggiano and Calice, 2016; Gaffeo and Mazzocchi, 2014; Claessens and Laeven, 2005). Further, economic growth falls by 2.8% on average during the crisis. Bank instability further augments this negative

effect on annual GDP growth during the crisis period, as shown by the coefficient of the interaction term in model 4.

Models 5 and 6 report the results for the Z-score measure of bank stability. The coefficients of bank Z-score in models 5 and 6 are statistically and economically significant at the 1% level, showing that higher economic growth is associated with higher bank stability. The coefficient of the interaction term in model 6 is consistent with models 6 in this Table 4.26, showing that economic growth is reduced during the crisis. Finally, model 7 estimates the effect of competition on bank stability. The coefficient of competition is economically large and statistically significant, implying that a less competitive banking sector positively contributes to economic growth. These results are consistent with the literature (Pradhan et al., 2017; Jayakumar et al., 2018) and with intuition. The AR (2) test examines the null hypothesis that the error term in the first differenced equation is not second-order correlated. This study does not reject this hypothesis at the 10% level.

The Hansen test is the test of the joint validity of instruments; it examines the null hypothesis that instruments are not correlated with the error term. This study uses maximum two lags of independent variables as instruments. It is unable to reject the null hypothesis with the Hansen test at 10% level in all models. Both statistics show that the results of the system-GMM estimator are reliable. The results in Table 4.27 are checked for robustness but are not reported in this paper. In the robustness check, we use per capita GDP growth as the dependent variable instead of annual GDP growth. Further, instead of a global financial crisis, we use a local banking crisis dummy variable. The equation uses the two-step system GMM estimator. Careful examination shows that the results do not suffer in these variations.

4.6.5 Impact of competition on bank stability

Table 4.28 shows the results using the two-step system GMM estimator and fixed-effect estimator for the competition and stability relationship, which enables us

TABLE 4.27: Bank stability and economic growth using system-GMM in Europe

Variables	**Without Interaction**		**NPR Interaction**		**BZS Interaction**		**Competition**
Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
AGR(-1)	0.565***	0.562***	0.584***	0.636***	0.308***	0.314**	0.166***
	(0.102)	(0.102)	(0.0909)	(0.166)	(0.0753)	(0.158)	(0.0540)
NPR	-2.195***		-2.155***	-2.146***			
	(0.546)		(0.486)	(0.621)			
BZS		2.147***			2.555***	3.090***	
		(0.546)			(0.666)	(0.789)	
BNE							6.76***
							(1.923)
TPN	0.416***	0.416***	0.412***	0.460***	0.394***	0.449***	0.00693
	(0.0875)	(0.0880)	(0.0763)	(0.146)	(0.0592)	(0.127)	(0.00575)
GEX	8.505	8.889	8.376	8.022	-10.88***	-15.24***	-0.878***
	(6.381)	(6.466)	(5.488)	(9.046)	(3.030)	(4.789)	(0.130)
LFF	-18.32***	-18.33***	-17.21***	-18.19**	2.628	1.863	1.334***
	(5.056)	(5.077)	(4.675)	(7.606)	(2.780)	(4.497)	(0.301)
EXT	3.825**	3.613*	3.134*	3.366	-2.195	-0.861	-1.131***
	(1.909)	(1.938)	(1.725)	(2.090)	(1.633)	(2.002)	(0.264)
GFC			-2.808	-2.384*	-3.449	-2.157**	-7.855***
			(2.429)	(1.317)	(3.191)	(.874)	(1.143)
GFC*NPR				-0.669***			
				(0.204)			
GFC*BZS						-0.172*	
						(0.105)	
AR (2) Test	0.59	0.71	0.56	0.56	0.57	0.76	0.52
(p-Value)	0.555	0.479	0.575	0.573	0.566	0.444	0.536
Hansen Test	12.82	13.38	14.62	10.31	12.38	16.90	12.82
(p-Value)	0.462	0.419	0.263	0.503	0.439	0.261	0.445
Wald χ^2	83.66	83.06	112.07	80.54	123.11	112.66	546.28
(p-Value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No. of							
Instruments	33	35	34	32	33	32	34
GMM Style	2,2	2,2	2,2	2,2	2,2	2,2	2,2
IV Style	1-5	1-5	1-5	1-5	1-5	1-5	1-5

*This Table shows the results of the two-step system GMM estimator. In the estimation, AGR is a dependent variable in all models, and GFC is a dummy variable for the global financial crisis. GFC*NPR and GFC*BZS are interaction terms of financial crisis with non-performing loans and bank Z-score, respectively. Standard errors are in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

to control unobserved heterogeneity, endogeneity, and the dynamic relationship. The study estimates models 1 and 2 with the nonperforming loans ratio and bank Z-score as dependent variables. In model 3, the coefficient of lagged bank stability

shows that bank risk is persistent at the 1% level. The coefficient of competition (the Boone indicator proxy) is negative, implying that lower competition in the banking sector reduces credit risk (non-performing loans) in the financial system and favors the competition-fragility hypothesis. Here, the study uses trade openness, the log of government expenditure, the log of gross fixed capital formation, and financial integration to control for country-level economic dynamics as in earlier estimations.

Model 4 replaces the dependent variable and uses bank Z-score. The coefficient of the lag term shows persistence in bank stability at the 1% level. The coefficient of competition is significant and supports the competition-fragility view of the literature. Its positive value shows that reductions in competition intensity enhance bank stability at the 1% level. In both models, this study is unable to reject the null hypothesis of AR (2) at the 10% level (recall that AR (2) tested the null hypothesis that the error term in the first differenced equation is not second-order correlated). Further, this study is not able to reject the null hypothesis of the Hansen test at the 10% level in both models (recall that the Hansen test tested the joint validity of instruments that instruments are not correlated with the error term). The maximum two lags of independent variables are instruments in the estimation process. Models 1 and 2 show similar results using the fixed-effect estimator. Both analyses show that the results of the system-GMM estimator and fixed-effect estimator are reliable. These findings are consistent with Fu et al. (2014), who support the competition-fragility view.

4.6.6 Bank stability, bank competition, and economic growth - disentangling the channel

This section concentrates on how bank stability affects the relationship between bank competition and economic growth. The premise is that bank market power creates stability among banks and that this stability leads to greater economic growth. More specifically, lower bank competition increases bank stability, which makes the financial sector more stable and in turn boosts economic growth. To

TABLE 4.28: Impact of competition on bank stability-Europe

	FE Estimation		**GMM Estimation**	
	NPR	**BZS**	**NPR**	**BZS**
Variables	**(1)**	**(2)**	**(3)**	**(4)**
Constant [BST(-1)]	12.46**	1.461	[0.408]***	[0.414]**
	(5.349)	(1.021)	(0.0753)	(0.158)
BNE	-8.752***	5.312***	-3.838***	4.828***
	(2.202)	(1.821)	(0.356)	(0.785)
TPN	-0.00708**	0.762***	-0.650**	0.766**
	(0.00359)	(0.168)	(0.311)	(0.349)
GEX	0.459*	-0.832***	4.144	-4.208
	(0.249)	(0.0777)	(2.987)	(2.943)
LFF	-0.439*	0.103	-9.130***	8.606***
	(0.238)	(0.0705)	(3.342)	(2.543)
EXT	0.0383	-0.142	3.490	-3.356
	(0.165)	(0.1773)	(2.800)	(1.950)
F-Stat [Wald χ^2]	435.67	372.54	[114.07]	[127.67]
(p-Value)	0.000	0.000	0.000	0.000
R-Squared Overall	0.35	0.41		
Number of IDs	38	38		
Hansen Test			15.59	17.71
(p-Value)			0.464	0.452
No. of Instruments			32	34
GMM Style			2,2	2,2
IV Style			1-5	1-5

*The table shows the results of the fixed-effect estimator. The ratio of non-performing loans to gross loans (NPR) (resp. bank Z-score (BZS)) is the dependent variable in model 1 (resp. model 2). BNE is the measure of bank competition proxied by the Boone indicator. Standard errors are shown in parentheses, with ***p<0.01, **p<0.05, *p<0.1.*

quantify these indirect effects of bank competition on economic growth through bank stability, this study uses the three step methodology of Preacher and Hayes (2004).

This study performs the first step of the analysis (equation 3.35) in Table 4.25 (models 3 and 6) by establishing the significant effects of competition on economic growth (annual GDP growth and per capita GDP growth). Further, it discusses the results of the second step (equation 3.36) in the previous section (Table 4.28, models 1 and 2), where bank competition significantly affects bank stability (BZS and NPR). The third and final step (equation 3.37) is to include bank stability in the regression of bank competition on economic growth. We estimate this equation

TABLE 4.29: Effect of bank stability and competition on economic growth-Europe

Variables	**Panel A: AGR**		**Panel B: CGR**	
Model	**(1)**	**(2)**	**(3)**	**(4)**
BNE	2.119**	2.636***	2.313**	2.562***
	(0.0964)	(0.0913)	(0.0972)	(0.0916)
NPR	-0.093***		-0.060***	
	(0.018)		(0.019)	
BZS		0.056***		0.053*
		(0.017)		(0.027)
TPN	0.042***	0.039***	0.044***	0.041***
	(0.006)	(0.006)	(0.006)	(0.006)
GEX	-1.498***	-1.501***	-1.202***	-1.157***
	(0.390)	(0.337)	(0.393)	(0.338)
LFF	1.167***	2.033***	1.008***	1.824***
	0.295)	0.239)	0.297)	0.239)
EXT	-1.927***	-2.207***	-2.022***	-2.260***
	0.231)	0.213)	0.233)	0.214)
Constant	2.645*	-15.757***	4.418	-13.601***
	(4.850)	(3.732)	(4.890)	(3.744)
Hausman Test	22.332	24.592	22.792	24.150
F-Stat	7.039***	6.675***	6.861***	6.458***
Indirect Effect	0.816***	0.298***	0.528**	0.279*
p-Value	[0.002]	[0.006]	[0.016]	[0.071]
% of Total Effect	27.80%	10.17%	18.57%	9.82%
Number of IDs	38	38	38	38

*This Table shows the results of the indirect effect of bank competition on economic growth through bank stability. AGR and CGR are the Annual GDP Growth GDP per Capita Growth in panel A and B respectively. Standard errors are shown in parentheses with ***p<0.01, **p<0.05, *p<0.1.*

with a fixed-effect estimator. The main variable of interest is the reduction in the effects of bank competition on economic growth.

The results of this analysis are in Table 4.29. In models 1 and 2, the dependent variable is annual GDP growth rate. In these models, the coefficient of the Boone indicator is positive and statistically significant at the 5% and 1% levels; bank stability supports economic growth, and decreases in the competition are associated with increases in economic growth. Including the measure of bank stability reduces the effect of bank competition on economic growth. In relation to the total effect, this decrease is equal to 27.80% in model 1 and 10.17% in model 2 significant at 10% and 1% levels respectively. Models 3 and 4 replace the growth proxy with per capita GDP growth rate and obtain similar results.

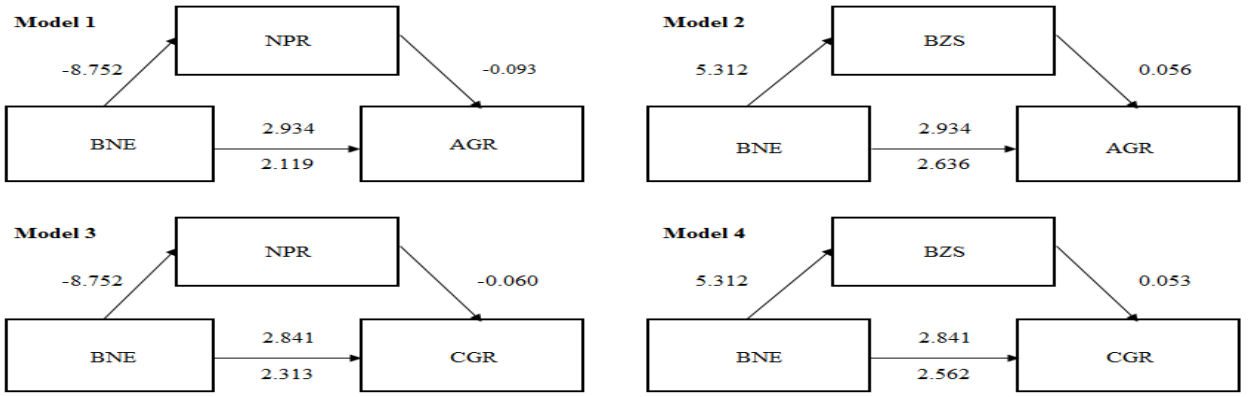

FIGURE 4.2: Channeling effect of competition on growth in Europe

This figure shows the total effect (TE) and direct effect (DE) of competition on economic growth (bottom path). Left side path shows the impact of competition on stability (path A). Right side path shows the impact of competition on stability (path B). Indirect Effect (IE) is the difference of total effect and direct effect (TE-DE) and shows the channeling effect of competition on growth through stability which is also calculated by multiplying path A with B. These estimations have been made fixed effect estimator. These results are presented in section 4.6 Table 4.25 (models 3 and 6), Table 4.28 (models 1 and 2) and Table 4.29 (models 1 to 4). Indirect effect is tested using Preacher and Hayes methodology following Fedaseyeu et al. (2018) and Ferris et al. (2017).

Statistics related to Figure 4.2

	(1)	(2)	(3)	(4)
TE	2.934	2.934	2.841	2.841
- DE	2.119	2.636	2.313	2.562
IE	**0.815**	**0.298**	**0.528**	**0.279**
A	-8.752	5.312	-8.752	5.312
B	-0.093	0.056	-0.060	0.053
AxB	**0.814**	**0.297**	**0.528**	**0.279**
% of TE	27.74%	10.14%	18.59%	9.80%
t-stat	3.11	2.75	2.43	1.81
p-value	0.002	0.006	0.016	0.071

4.7 Comparison of Asian and European Regions

This section of the study presents the comparison of the finding of competition, stability and growth relationships from the Asian and European regions emerged in country-level analysis. First, it calculates mean for each year by taking the average of country observations to observe significant differences in sub-section 4.7.1. Then, it compares mean values (of country index mean or cross-sectional mean, presented in Tables 4.18 and 4.24), as well as time index mean (presented in Table 4.30) of the main variables in Tables 31 (panel A and B) for two continents along with the statistical difference in each year (between time index of countries in two continents). During the calculation of year index average, it ignores country dimension and during the calculation of country index average, it ignores year dimention. Then, it compares the regression coefficients of the relationship between bank competition, stability and economic growth presented in sections 4.5 and 4.6 (sub-sections 4.5.2 to 4.5.4 and 4.6.2 to 4.6.5, respectively).

4.7.1 Mean Comparison - year on year averages

Table 4.30 shows the year-wise average of main variables used for country-level analysis. There are total 71 countries (33 Asian and 38 European) in the analysis which are analyzed for 17 years. This study calculates the mean difference test across countries in each year and report t-statistics in that specific each year. We calculate the mean difference test across countries in each year and report t-statistics in each year. These results show that the mean differences are significant in many year observations. Further, the differences between variable scores of Asian and European regions are more prominent after the global financial crisis of 2008.

4.7.2 Comparison of regional means - time and country

In this sub-section, this study presents the year specific and country-specific grand mean of Asian and European regions. To calculate the regional means, this study

initially winsorize the input variables of Asian and European regions separately at 1% on both tails for meaningful comparison. Moreover, missing values are not replaced with mean to calculate more realistic estimates of the regional means with respect to time and country. Ideally, both time and country-specific means shall produce similar values. However, due to separately winsorizing and presence of missing values, this study calculates and compares the regional means across both dimensions.

The results of this analysis are presented in Table 4.31. In panel A, country-wise mean is calculated ignoring the time dimension of the two regional data sets and in panel B, year-wise mean is calculated ignoring the country dimension of the two regional data sets. The results of this analysis show that banking systems in Europe are more competitive than Asia (as the value of BNE is greater in Europe in absolute, as negative absolute values indicate greater competition). This finding is significant at 10% (t = 1.684, df = 69, column 2). This finding is confirmed with similar results in panel B for year specific mean, where the difference between two regions is significant at 5% level (t = -2.195, df = 32, column 2) implying greater competition intensity in Europe.

In columns 3 and 4, mean values for measures of bank stability are presented. For BZS (being the measure of stability), mean value is significantly higher in Asia at 1% level (t = 3.394, df = 69, panel A) and is consistent with the results of panel B. For NPR (high values indicating higher credit risk), mean value is significantly higher in Europe, indicating height credit risk in this region, at 10% level and is similar with the results presented in panel B. These values collectively indicate that Asian banks are more stable as compared to European banks in term of credit risk.

In columns 5 and 6, results show that Asian economies are growing rapidly as compared to European economies during the sample period. However, the difference between two regions for annual GDP growth (AGR) is significantly higher in Asian at 1% level in panel A and B (t = 4.396, df = 69 and t = 3.135, df = 32, respectively). However, no significant difference is observed in per capita growth rate (CGR) across both regions.

TABLE 4.30: Year averages of Asian and European regions for main variables

	AGR%			CGR%			NPR%			BZS			BNE		
Year	**Europe**	**Asia**	**t-stat**	**Europe**	**Asia**	**t-stat**	**Europe**	**Asia**	**t-stat**	**Europe**	**Asia**	**t-stat**	**Europe**	**Asia**	**t-stat**
2001	3.98	3.35	0.26	4.38	-0.01	2.83***	7.53	12.28	0.38	10.03	13.97	-2.40**	-0.41	-0.08	-2.19**
2002	4.19	4.23	-0.61	4.59	4.39	1.61	7.06	10.80	-2.36**	10.72	14.13	-1.94*	-2.29	-0.04	-1.94*
2003	4.42	4.88	-0.65	4.82	5.38	0.66	6.53	9.18	1.94*	11.39	14.44	-1.55	-0.98	-0.05	-1.97*
2004	5.68	9.37	-2.60**	5.45	6.18	-1.20	5.49	7.62	-2.23**	11.14	15.56	-2.42**	-0.94	-0.04	-1.97*
2005	5.73	6.40	-1.20	5.45	9.04	1.13	4.39	6.30	0.59	10.12	16.78	-3.30***	-0.70	-0.04	-1.98*
2006	6.66	7.42	-1.02	6.34	3.40	1.21	3.82	5.50	-2.21**	10.78	16.86	-2.72***	-1.00	-0.09	-1.95*
2007	6.51	7.56	-1.47	6.16	5.58	0.97	3.84	4.76	0.65	10.29	16.90	-3.23***	-0.76	-0.06	-1.98*
2008	2.76	5.21	-3.29***	2.41	3.97	-0.42	3.94	4.33	-1.92*	8.66	16.01	-3.79***	-1.53	-1.92	-1.27
2009	-4.34	2.63	-6.79***	-4.64	1.83	-4.56***	6.81	4.84	2.86***	9.63	16.44	-3.30***	-0.21	-0.05	-1.97**
2010	2.52	7.11	-5.15***	2.33	2.50	-2.60**	7.52	4.82	-0.39	9.98	17.19	-3.55***	-0.24	-1.74	-0.91
2011	2.68	6.07	-4.22***	2.60	1.53	-1.48	8.03	4.15	3.90***	9.81	17.61	-3.92***	-0.28	-0.04	-1.97*
2012	0.75	5.30	-6.60***	0.54	0.94	-3.47***	8.95	4.19	-0.35	10.61	17.51	-3.40***	-0.31	-0.04	-1.98*
2013	1.94	4.81	-5.64***	1.67	1.26	-1.95**	9.20	4.06	3.73***	11.17	17.80	-3.12***	-0.18	-0.04	-1.99**
2014	2.65	4.26	-3.60***	2.48	3.74	-0.17*	8.97	3.75	-0.23	11.31	17.43	-3.04***	-0.12	-0.04	-1.96*
2015	3.14	3.36	-0.59	2.77	0.14	0.81	8.82	3.99	3.29***	12.23	18.09	-2.93***	-0.12	-0.04	-1.96*
2016	3.25	4.52	-1.44	2.53	2.13	1.60	8.88	4.57	-2.64**	12.40	17.74	-2.49*	-0.05	-0.10	-1.95*
2017	2.75	3.91	-1.93*	2.39	1.91	-2.04**	8.90	4.10	-1.81*	11.98	17.75	-3.25***	-0.02	-0.09	-1.73*
Mean	*3.25*	*5.32*		*3.07*	*3.17*		*6.98*	*5.84*		*10.72*	*16.60*		*-0.60*	*-0.26*	
Obs.	*645*	*559*		*645*	*559*		*646*	*561*		*646*	*561*		*644*	*559*	
IDs	*38*	*33*		*38*	*33*		*38*	*33*		*38*	*33*		*38*	*33*	
t	*17*	*17*		*17*	*17*		*17*	*17*		*17*	*17*		*17*	*17*	

*This Table shows the differences of main variables among Asian and European economies in each year. t-stat is calculated form the regional countries differences in each year. Significant differences are mentioned as ***p<0.01, **p<0.05, *p<0.1.*

TABLE 4.31: Mean comparison across time and cross-section for main variables

Panel A: country index average

(1) Mean	(2) BNE	(3) BZS	(4) NPR%	(5) AGR%	(6) CGR%
Europe (From Table 4.24)	-0.5103	10.6013	7.1976	3.3334	3.1647
Asia (From Table 4.18)	-0.2773	16.6018	5.7424	5.4812	3.1842
Difference	-0.2330	-6.0005	1.4552	-2.1478	-0.0195
	Asian > European	Asian > Asian	European > European	Asian > Asian	Asian > Asian
t-statistics	1.684*	3.394***	-1.943*	4.396***	-1.271
Observations (degree of freedom)	71 (69)	71 (69)	71 (69)	71 (69)	71 (69)
p-value	0.0967	0.001	0.0561	0.000	0.2082

Panel B: year index average

(1) Mean	(2) BNE	(3) BZS	(4) NPR%	(5) AGR%	(6) CGR%
Europe (From Table 4.30)	-0.5965	10.7169	6.9804	3.2512	3.0743
Asia (From Table 4.30)	-0.2647	16.6018	5.8359	5.3166	3.1708
Difference	-0.3318	-5.8849	1.1445	-2.0654	-0.0966
	Asian > European	Asian > European	European > Asian	Asian > European	Asian > European
t-statistics	-2.195**	-14.605***	1.989*	-3.135***	-1.543
Observations (degree of freedom)	34 (32)	34 (32)	34 (32)	34 (32)	34 (32)
p-value	0.0355	0.0000	0.0553	0.0038	0.3049

*This Table shows the comparison of regional means i.e. the mean of Asian and European economies. Panel A shows the regional means w.r.t to time and panel B shows the regional means w.r.t cross-section. Differences in means are indicated as ***p<0.01, **p<0.05, *p<0.1.*

4.7.3 Regression Weights Comparison Fixed Effect Models

The findings of this analysis further provide important insights. Earlier findings show that countries in the Asian region is growing at a higher rate as compared to the countries in the European region. However, European banking is more unstable yet more competitive than Asian banking systems.

Table 4.32 shows the effect of NPR, BZS and BNE on AGR (model 1 to3) and CGR model (4 to 5). Panel A presents the coefficients for European countries whereas panel B shows the coefficients of Asian countries. Model 1 and 2 (in both regions) show that financial stability positively affects AGR. The sign of

coefficients of NPR (BZS) is negative (positive) as it measures credit risk and inversely related to BZS. Further, panel C shows the difference in the coefficients of two regions. Here, this study deducts the absolute values of Asian coefficients from European. Results show that the coefficient of NPR is higher (lower) for European (Asian) countries and whereas the coefficient of BZS is higher (lower) for Asian (European) countries. This finding is intuitive as European countries are characterized by low AGR and higher credit risk, NPR greatly effects AGR in Europe. Further, this study calculates and compares the confidence intervals of regional coefficients to assess the significance of the difference. Confidence intervals are calculated at 10%, 5%, and 1% level of significance and overlapping confidence interval is observed to find the significance of the difference. Assessment of the confidence interval provides that the difference between NPR-Europe and NPR-Asia is significant at 1% level. For BZS coefficient, which is greater in Asia, the effect is significant at 5% level. This can be due to the higher stability of Asian banking system and high AGR in this region. These results and differences remain consistent when we change the dependent variable (AGR) with CGR in models 4 and 5. For competition measure (model 3 and 6), BNE negatively affects AGR (as high absolute values show high competition intensity) and its effect size is greater in Europe as it is characterized with low growth along-with its high competitive banking sector. The difference between the effect of BNE across two regions is significant at 10% level as overlapping coefficients of BNE-Asia and BNE-Europe are observed at 5% confidence interval.

Table 4.33 shows the effect of NPR (models 1 to 4) and BZS (models 5-8) on AGR. These models are estimated with crisis (both GFC and LBC) where even-numbered models include interaction term of crisis and stability (both NPR and BZS) and odd number models do not include it. In Panels A, models 1-4 presents the coefficients of NPR for European regions whereas panel B, models 1-4 shows the coefficients of NPR for Asian countries. In models 1 to 4 (in both regions), NPR negatively affects AGR. It implies that grater credit risk hinders economic growth. Further, panel C shows the difference in the coefficients of two regions. Here, this study deducts the absolute values of Asian coefficients from European.

TABLE 4.32: Comparison of Bank stability, bank competition, and economic growth relationships

Panel A: Regression Weights in Europe (From Table 4.25)

Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variables	**Annual GDP Growth (AGR)**			**GDP per Capita Growth (CGR)**		
NPR	-0.114			-0.093		
	(0.0180)			(0.021)		
BZS		0.057			0.051	
		(0.0137)			(0.0195)	
BNE			2.934			2.841
			(0.773)			(0.7614)

Panel B: Regression Weights in Asia (From Table 4.19)

Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variables	**Annual GDP Growth (AGR)**			**GDP per Capita Growth (CGR)**		
NPR	-0.0113			-0.0109		
	(0.00381)			(0.00331)		
BZS		0.089			0.091	
		(0.00141)			(0.00141)	
BNE			1.565			1.345
			(0.0399)			(0.0392)

Panel C: Confidence Intervals of Regression Weights

Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variables	**NPR**	**BZS**	**BNE**	**NPR**	**BZS**	**BNE**
Difference	-0.103	-0.032	1.369	-0.082	-0.040	1.496
E-A	E>A	A>E	E>A	E>A	A>E	A>E
E: CI @ 10%	-0.144, -0.084	0.034, 0.08	1.661, 4.207	-0.128, -0.058	0.019, 0.083	1.587, 4.095
E: CI @ 5%	-0.15, -0.078	0.03, 0.084	1.416, 4.452	-0.134, -0.052	0.013, 0.089	1.346, 4.336
E: CI @ 1%	-0.161, -0.067	0.022, 0.092	0.937, 4.931	-0.147, -0.039	0.001, 0.101	0.874, 4.808
A: CI @ 10%	-0.018, -0.005	0.087, 0.091	1.499, 1.631	-0.016, -0.005	0.089, 0.093	1.280, 1.410
A: CI @ 5%	-0.019, -0.004	0.086, 0.092	1.487, 1.643	-0.017, -0.004	0.088, 0.094	1.268, 1.422
A: CI @ 1%	-0.021, -0.001	0.085, 0.093	1.462, 1.668	-0.019, -0.002	0.087, 0.095	1.244, 1.446
	sig @ 1%	sig @ 5%	sig @ 10%	sig @ 1%	sig @ 5%	sig @ 10%

This Table compares the impact of bank stability, bank competition on economic growth using confidence intervals.

Results show that the coefficient of NPR is higher for European countries. This finding is intuitive as European countries are characterized by low AGR and higher credit risk, so NPR greatly effects AGR in Europe. Further, this study calculates and compares the confidence intervals of regional coefficients to assess the significance of the difference. Confidence intervals are calculated at 10%, 5%, and 1% level of significance and overlapping confidence intervals are observed to find the significance of the difference. Assessment of the confidence interval provides that the difference between NPR-Europe and NPR-Asia is significant at 1% level.

TABLE 4.33: Comparison of bank stability, economic growth, and crisis relationships

Panel A: Regression Weights in Europe (From Table 4.26)

Variables	**Annual GDP Growth (AGR)**							
	NPR				**BZS**			
	GFC		**LBC**		**GFC**		**LBC**	
Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
NPR	-0.135	-0.132	-0.112	-0.104				
	(0.0183)	(0.0187)	(0.0185)	(0.0191)				
BZS					0.043	0.037	0.034	0.026
					(0.0204)	(0.0143)	(0.0104)	(0.0099)

Panel B: Regression Weights in Asia (From Table 4.20)

Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
	GFC		**LBC**		**GFC**		**LBC**	
NPR	-0.0127	-0.0124	-0.0104	-0.0095				
	(0.0018)	(0.0019)	(0.0019)	(0.0019)				
BZS					0.074	0.071	0.075	0.071
					(0.0014)	(0.0014)	(0.0014)	(0.0012)

Panel C: Confidence Intervals of Regression Weights

Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
	GFC		**LBC**		**GFC**		**LBC**	
Difference	-0.1223	-0.1196	-0.1016	-0.0945	-0.031	-0.034	-0.041	-0.045
Europe-Asia	E>A	E>A	E>A	E>A	A>E	A>E	A>E	A>E
E: CI @ 10%	-0.165, -0.105	-0.163, -0.101	-0.142, -0.082	-0.135, -0.073	0.009, 0.077	0.013, 0.061	0.017, 0.051	0.01, 0.042
E: CI @ 5%	-0.171, -0.099	-0.169, -0.095	-0.148, -0.076	-0.142, -0.066	0.003, 0.083	0.009, 0.065	0.014, 0.054	0.007, 0.045
E: CI @1%	-0.182, -0.088	-0.18, -0.084	-0.16, -0.064	-0.153, -0.055	-0.01, 0.096	0, 0.074	0.007, 0.061	0, 0.052
A: CI @ 10%	-0.016, -0.01	-0.015, -0.009	-0.013, -0.007	-0.013, -0.006	0.072, 0.076	0.069, 0.073	0.073, 0.077	0.069, 0.073
A: CI @ 5%	-0.016, -0.009	-0.016, -0.009	-0.014, -0.007	-0.013, -0.006	0.071, 0.077	0.068, 0.074	0.072, 0.078	0.069, 0.073
A: CI @ 1%	-0.017, -0.008	-0.017, -0.008	-0.015, -0.006	-0.014, -0.005	0.07, 0.078	0.067, 0.075	0.071, 0.079	0.068, 0.074
	sig @ 1%	sig @ 1%	sig @ 1%	sig @ 1%	Insig	sig @ 5%	sig @ 1%	sig @ 1%

This Table compares the impact of bank stability on economic growth for crises models using confidence intervals.

In Panels A (Table 4.33), models 4-8 presents the coefficients of BZS for European regions whereas panel B, models 1-4 shows the coefficients of BZS for Asian countries. In model 5 to 8 (in both regions), BZS positively affects AGR. It implies that greater stability promotes economic growth. Further, panel C shows the difference in the coefficients of two regions. Here, this study subtracts the absolute values of Asian coefficients from European. Results show that the coefficient of BZS is higher for Asian countries. This finding is intuitive as Asian countries are characterized by high AGR and stable banking systems, so BZS greatly effects AGR in Asia. Further, this study calculates and compares the confidence intervals of regional coefficients to assess the significance of the difference. Confidence intervals are calculated at 10%, 5%, and 1% level of significance and overlapping confidence intervals are observed to find the significance of the difference. Assessment of the confidence interval provides that the difference between BZS-Europe and BZS-Asia is significant in model 6 (at 5% level), 7, and 8 (at 1% level) but insignificant in model 5.

Table 4.34 shows the effect of BNE on NPR and BZS (models 1 and 2, respectively). In model 1, the coefficient of BNE is negative implying that competition positively affects NPR (being the negative values of BNE by construction, smaller (large absolute) value represents higher competition). Panel A presents the coefficients for European countries whereas panel B shows the coefficients of Asian countries. Further, panel C shows the difference in the coefficients of two regions. Here, this study subtracts the absolute values of Asian coefficients from European. Results show that the coefficient of BNE is higher (but negative) for European countries and lower for Asia. This finding is intuitive as competition positively affects NPR and this effect of CMP on NPR is higher in Europe as this region is characterized by higher competition and higher credit risk. Further, this study calculates and compares the confidence intervals of regional coefficients to assess the significance of the difference. Confidence intervals are calculated at 10%, 5%, and 1% level of significance and overlapping confidence interval is observed to find the significance of the difference. Assessment of the confidence interval provides that the difference between BNE-Europe and BNE-Asia is significant at 5% level.

TABLE 4.34: Comparison of Impact of competition on bank stability

Panel A: Regression Weights in Europe (From Table 4.28)		
	FE Estimation	
Variables	**NPR**	**BZS**
Model	**(1)**	**(2)**
BNE	-8.752	5.312
	(2.202)	(1.821)
Panel B: Regression Weights in Asia (From Table 4.22)		
Variables	**NPR**	**BZS**
Model	**(1)**	**(2)**
BNE	-2.184	1.536
	(1.087)	(0.051)
Panel C: Confidence Intervals of Regression Weights		
Variables	**NPR**	**BZS**
Model	**(1)**	**(2)**
Difference Europe-Asia	-6.568 Europe> Asia	3.776 Europe> Asia
Europe CI @ 10%	-12.38, -5.124	2.312, 8.312
Europe CI @ 5%	-13.077, -4.427	1.736, 8.888
Europe CI @ 1%	-14.442, -3.062	0.606, 10.018
Asia CI @ 10%	-3.975, -0.393	1.452, 1.62
Asia CI @ 5%	-4.319, -0.049	1.436, 1.636
Asia CI @ 1%	-4.993, 0.625	1.404, 1.668
	sig @ 5%	sig @ 5%

This Table compares the impact of bank competition on financial stability using confidence intervals.

In model 2, the coefficient of BNE is positive implying that competition negatively affects NPR (being the negative values of BNE by construction, smaller (large absolute) value represents higher competition). Panel A and B present the coefficients for European and Asian countries respectively. Panel C shows the difference in the coefficients of two regions. Here, this study subtracts the absolute values of Asian coefficients from European. Results show that the coefficient of BNE is higher (but positive, implying inverse relationship with BZS) for European countries and lower for Asia. This finding is intuitive as competition negatively affects stability and this effect of competition on BZS is lower in Asia as the Asian region is characterized by lower competition and high stability. Further, this study calculates and compares the confidence intervals of regional coefficients to assess the significance of the difference. Confidence intervals are calculated at 10%, 5%, and 1% level of significance and overlapping confidence interval is observed to find the significance of the difference. Assessment of the confidence interval provides that the difference between BNE-Europe and BNE-Asia is significant at 5% level.

Table 4.35 shows the effect of NPR, BZS and BNE on AGR (models 1 and 2) and CGR model (3 and 4). Both competition and stability are used as regressors in all models. Panel A presents the coefficients for European countries whereas panel B shows the coefficients of Asian countries. For competition measure (models 1 to 4), BNE negatively affects AGR and CGR (as high absolute values show high competition intensity) and it effect size is greater in Europe as it is characterized with low growth along-with high competitive regional banking. Further, panel C(i) shows the difference in coefficients BNE of two regions. Here, this study subtracts the absolute values of Asian coefficients from European. Then this study calculates and compares the confidence intervals of regional coefficients to assess the significance of the difference. Confidence intervals are calculated at 10%, 5%, and 1% level of significance and overlapping confidence interval is observed to assess the significance of the difference. The difference between the effect of BNE across two regions is significant at 1% level as no overlapping coefficients of BNE-Asia and BNE-Europe are observed at 1% confidence interval except in model 3 at 5% level.

For NPR, the results of models 1 and 3 respectively show that NPR negatively effects AGR and CGR. The coefficient of NPR is lower (lower) for Asian (European) countries in both models. Then this study subtracts Asian values from European (panel C(ii), columns 1 and 3). The difference of the coefficients shows that NPR greatly effects AGR in Europe. Further, this study calculates and compares the confidence intervals of regional coefficients to assess the significance of the difference. Assessment of the confidence interval provides that the difference between NPR-Europe and NPR-Asia is significant at 10% in model 1 and 5% in model 3.

For BZS, models 2 and 4 (in both regions) show that financial stability positively affects AGR. Panel C(ii) (column 2 and 4) shows the difference in coefficients of two regions. After subtracting the absolute values of Asian coefficients from European, it is observed that the coefficient of BZS is higher (lower) for Asian (European) countries. This finding is intuitive as Asian countries are characterized by higher stability. The sign of coefficients of NPR and BZS is opposite as they are inversely related. Further, this study calculates and compares the confidence intervals of

regional coefficients to assess the significance of the difference. Confidence intervals are calculated at 10%, 5%, and 1% level of significance and overlapping confidence interval is observed to find the significance of the difference. Assessment of the confidence interval provides that the difference between BZS-Europe and BZS-Asia is significant at 10% level.

TABLE 4.35: Comparison of bank competition, stability, and economic growth relationship

Panel A: Regression Weights in Europe (From Table 4.29)

	AGR		CGR	
Variables	**NPR**	**BZS**	**NPR**	**BZS**
Model	**(1)**	**(2)**	**(3)**	**(4)**
BNE	2.119	2.636	2.313	2.562
	(0.0964)	(0.0913)	(0.0972)	(0.0916)
NPR	-0.093		-0.06	
	(0.0180)		(0.0190)	
BZS		0.056		0.053
		(0.0170)		(0.0270)

Panel B: Regression Weights in Asia (From Table 4.23)

	NPR	**BZS**	**NPR**	**BZS**
Model	**(1)**	**(2)**	**(3)**	**(4)**
BNE	1.482	1.351	1.306	1.139
	(0.0834)	(0.0471)	(0.3435)	(0.0491)
NPR	-0.038		-0.018	
	(0.0113)		(0.0012)	
BZS		0.139		0.134
		(0.0202)		(0.0201)

Panel C(i): Confidence Intervals of Regression Weights - Boone

	NPR	**BZS**	**NPR**	**BZS**
Model	**(1)**	**(2)**	**(3)**	**(4)**
Difference	0.637	1.285	1.007	1.423
Europe-Asia	E>A	E>A	E>A	E>A
Europe @ 10%	1.960, 2.278	2.486, 2.786	2.153, 2.473	2.411, 2.713
Europe @ 5%	1.930, 2.308	2.457, 2.815	2.122, 2.504	2.382, 2.742
Europe @ 1%	1.871, 2.368	2.400, 2.872	2.062, 2.564	2.325, 2.799
Asia @ 10%	1.345, 1.619	1.273, 1.429	0.74, 1.872	1.058, 1.22
Asia @ 5%	1.318, 1.646	1.258, 1.444	0.631, 1.981	1.043, 1.235
Asia @ 1%	1.266, 1.698	1.229, 1.473	0.418, 2.194	1.012, 1.266
	sig @ 1%	sig @ 1%	sig @ 5%	sig @ 1%

Panel C(ii): Confidence Intervals of Regression Weights - Stability

	NPR	**BZS**	**NPR**	**BZS**
Model	**(1)**	**(2)**	**(3)**	**(4)**
Difference	-0.0538	-0.083	-0.0415	-0.081
Europe-Asia	E>A	A>E	E>A	A>E
Europe @ 10%	-0.123, -0.063	0.028, 0.084	-0.091, -0.029	0.009, 0.097
Europe @ 5%	-0.128, -0.058	0.023, 0.089	-0.097, -0.023	0.000, 0.106
Europe @ 1%	-0.14, -0.046	0.012, 0.1	-0.109, -0.011	-0.017, 0.123
Asia @ 10%	-0.058, -0.021	0.106, 0.172	-0.02, -0.017	0.101, 0.167
Asia @ 5%	-0.061, -0.017	0.099, 0.179	-0.021, -0.016	0.095, 0.173
Asia @ 1%	-0.068, -0.010	0.087, 0.191	-0.022, -0.015	0.082, 0.186
	sig @ 10%	sig @ 10%	sig @ 5%	sig @ 10%

This Table compares the impact of bank competition and financial stability on economic growth for indirect effect models using confidence intervals.

Chapter 5

Conclusion and Policy Implications

5.1 Conclusions

This study investigates the firm and macro-level effects of bank competition on financial stability and economic growth in Asia and Europe. Recent literature provides mixed evidence on competition-stability-growth relationships. On the one hand, charter value paradigm explains the competition fragility view and on the other hand, risk shifting paradigm explains the competition stability view in banking. Moreover, the economic and financial linkages of Asian and European countries have enormously increased after the global financial crisis. Emerging countries have also adopted financial sector deregulations especially after Asian financial crisis. This highlights the importance of these relationships which are investigated in the study.

In first analysis, this study uses the data of 736 bank (6664 bank-year observations) from nine emerging Asian countries and 309 banks (2619 bank-year observations) from five emerging European countries over 2001 to 2017. In this analysis, emerging countries are of key interest to investigate competition stability relationship as emerging economies have adopted financial sector deregulation, especially in Asia after the Asian Financial Crisis. Moreover, it also investigates size-stability and

regulation-stability relationships. In Asia, the results of this analysis show that Lerner index is negatively associated with risk proxies and positively associated with stability measures. This highlights that higher market power increases stability and reduces the credit risk and provides the support for charter value hypothesis. It means that high competition in banking systems of emerging economies may have an adverse effect on stability. The presence of non-linear relationship is not supported in Asian banks.

Bank size is also crucial for the stability of banks in emerging Asian countries as it has a positive influence on bank stability. This highlights that banks in emerging Asian markets have yet to reach economies of scale. Results of the non-linear relationship of size and stability support the presence of the threshold effect in size and stability relationship. In European countries sample, similar findings are observed. This is may be due to the similar economic status of emerging economies. However, band size affects credit risk but not solvency measures. This study uses a set of bank-level control variable and macroeconomic control variables. This study deals with the econometric problem in fixed-effect estimation and also uses system GMM estimation, as an additional tool, to increase the confidence in the results. The results of the study remain consistent when it adopts alternative econometric techniques.

The results of the regulatory environment provide interesting findings for emerging markets. Deposit insurance, capital stringency regulations, private monitoring, and external governance increase stability and reduces credit risk. Supervisory powers show mixed results, and simultaneously show the stabilizing and destabilizing effect on stability. This indicates the rent-seeking view of this relationship in emerging economies. However, restrictions on activities on the banks are not relevant for the banks in emerging countries.

In country-level analysis, this study analyzes how bank stability (viz-a-viz non-performing loans and bank Z-score) and bank competition affect economic growth. It uses country-level data in a large sample of 38 European and 33 Asian economies to reach generalizable results not previously available in the literature. By employing a fixed-effect estimator to control for cross-sectional heterogeneity and a

system-GMM estimator to control for endogeneity and the dynamic relationship of growth, this study finds robust evidence that banking stability is crucial for economic growth, especially during crisis periods. Economic growth falls during the global financial crisis, as well as during a local banking crisis period. Moreover, increased financial stability neutralizes the negative effects the crisis has on economic growth. The results of the study support the idea that decreasing competition in the banking sector increases economic growth. In particular, empirical outcomes of this study show that market power in banking may support economic growth and increases financial stability.

The overall findings of this analysis show that credit risk negatively affects growth and this effect is higher for European countries as they have more credit risk (high NPR) and low growth. On the other hand, bank stability positively affects growth and this effect is higher for Asian countries as they are characterized by more stable banking systems (high BZS). Moreover, competition negatively affects growth. However, this effect is higher in Europe due to high intensity of competition in this region (high BNE). Such patterns are also observed for competition stability relationship as competition negatively affects stability and this effect of competition on stability is lower in Asia as the Asian region is characterized by lower competition and high stability. On the other hand, competition positively affects credit risk and this effect of competition is higher in Europe as the European region is characterized by higher competition and higher credit risk.

5.2 Policy Implications

5.2.1 Bank Management

The results of the study recommend that regulatory capital (like capital adequacy ratio) enhances the stability of banks. It is helpful for the management of banks to strictly maintain the Basel regulatory capital requirement in order to enhance the financial stability of banks and to reduce credit risk in emerging Asian and

European countries, particularly. The management should also consider the expension of bank in terms of its size in emerging markets. However, extra care may be observed due ot threshold effect bank size of stability. Market competition may also jeopardize the stability of bank. Bank management must embrace the tight competition polies that will help them to increase their charter values and make them less vulnerable at the time of crisis.

5.2.2 Regulator and Government

The findings of this study also have broader implications for policymakers and regulators in Asian and European countries whose work is related to the banking competition and the financial stability of banks, helping them devise appropriate regulations, particularly deposit insurance, capital stringency regulations, private monitoring, and external governance increase stability and reduces credit risk. However, supervisory powers may need restructuring due to its rent seeking behavior in emerging markets. The stance in recent literature that competition boosts stability may not be true, as the results of this study indicate that reducing competition in banking promotes stability in the banking sector. Acting upon the stance mentioned above may therefore actually destabilize the banking system, especially during crisis periods, and policies based on that stance can hinder economic growth. Therefore, the regulator should carefully monitor the bank competition along with size of banks which may jeopardize the stability of banking system. A banking environment with greater market power allocates resources efficiently that may improve the stability of the banking system. Accordingly, national central banks should strengthen their policies about competition to strengthen the stability of their banking systems, which could boost economic growth. Governments should also encourage favorable financial environments in order to promote the linkage between banking stability, banking competition, and economic growth as banking competition and stability have implication for higher economic growth.

To optimize competition intensity, regulators must additionally embrace a relatively cautious strategy for assessing and approving mergers and acquisitions at

the indigenous level. Policymakers must also hunt for reduced policy lending by motivating banks to formulate self-governance and tighter credit cultures. The results of this confirm Craig and Dos Santos (1997) , who finds that lessening risk via bank mergers is a fundamental motive behind early bank merger waves (Carletti et al., 2002). In short, the literature posits that consolidation and reduced competition tend to increase loan rates, which increase charter value of banks and enhance bank stability and, in turn, support economic growth. This is in line with the market power-stability paradigm.

Findings of this study suggest that having formal policies around competition boost economic growth. Moreover, specific policies that endure higher economic growth must be put in place. This would spawn a righteous cycle with a positive impact on the stability of the banking sector, which in turn would lead to real growth. They must encourage financial innovation on the premise that effective risk management improves the allocation of resources in the economy, it further augments banking stability through product innovation. To keep the financial system stable, entry barriers are needed for new domestic and foreign entrants. Further, foreign bank acquisitions in European countries must be more scrutinized. Hence, it is in the best interest of banks in European and Asian countries to toughen their competition policies.

5.3 Limitations and Future Research Areas

This study is limited to the use of book based measures of bank stability. Agenda for future research could focus on the market based stability measures. It may consider the effect of bank type and local to foreign bank share in the banking sector on bank-level data using quantile regression estimator. Further, the connection between bank competition and economic growth may be influenced by competition determinants, which are not investigated in this study. Moreover, for crisis variable, results are dominant for majority of the countries. Therefore, individual country analysis may be considered for further investigations. Present study investigates the relationship between various regulatory factors and bank stability

individually. Future research may also consider the use of single aggregate factor (or index). The research may be divided in to emerging and developed countries. One important issue can be considered is the merger and acquisition activities for banks. Many acquisitions activities for financial Institutions are political orientate, which is one of the reason, to control competition against other big financial institutions.

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Annexure: Variable descriptions, symbols, definitions, proxies and data sources

Short Name	Long Name	Measure	Formula / Definition	Source	Data
Input Variables of Competition					
P	Price of total assets	Price of Output	ratio of total revenues to total assets for bank i at time t. It is the sum of interest income, non-interest operating income and other operating income.		BankScope
Q	Bank output	Total Output	Total assets of bank (Output Quality)		-do-
W1	Personnel expenses ratio	Cost of Labor	personnel expenses to total assets	Clerides et al., (2015); Kaman and Kasman, (2015)	-do-
W2	Interest expenses ratio	Cost of Fund	interest expenses to total deposits		-do-
W3	Other oper. & admin. expenses ratio	Cost of Fix Capital	other operating and administrative expenses to fix assets of the bank		-do-
TC	Total Cost	Total Cost	W1, W2 and W3 represent three input prices of labor, funding, and physical capital respectively.		-do-
Dependent Variables					
SROA	Volatility of return on assets	Volatility of Earning	Three-year rolling-window standard deviation of the return on assets.	Beck et. al., (2013); Kanagaretnam, (2013)	BankScope

BZSB	Bank Z-score	Stability	Z-score is a measure of bank's financial soundness. Higher value indicates high distance from probability of default, and lower risk and higher financial stability. It is the rolling-window Z-score which is calculated as (ROA+(equity/assets))/SROA; SROA is the standard deviation of Return on Assets.	Laeven and Levine, (2009); Goetz, (2017)	-do-
LBZS	Log of BZSB	Stability	This study also uses the natural logarithm of (ROA+(equity/assets))/SROA. Higher values indicate stability and lower values indicate insolvency risk.	Anginer et al., (2014); Hoque et al., (2015)	-do-
NPR	Non-performing loan ratio	Credit Risk	A ratio of Non-performing loan to gross loan, high value indicates riskier loan portfolio or high credit risk.	Berger et al., (2009); Schaeck & Cihk, (2014)	-do-
LLP	Loan loss provisions to total loans	Credit Risk	The ratio of loan loss provision to gross loans. Loan loss provision is the incurred cost to banks. It is a flow or an expense item that is reflected in the income statement. It is determined after management reviews its loan book to determine the appropriate level of reserves.	Soedarmono & Tarazi (2015);	-do-
AGR	Annual % growth rate of GDP	Economic Growth (ECG)	Annual percentage growth rate of GDP. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.	Soedarmono et al. (2011); Lee & Hsieh (2014); Cole et al., (2008)	WDI

CGR	Annual % growth rate of GDP per capita	Economic Growth (ECG)	Annual percentage growth rate of GDP per capita based on constant local currency.	Jayakumar et al., (2017); Coccorese (2019)	-do-
			Independent Variables		
LER LERˆ2	Lerner index	Competition	It is the measure of market power in the banking market. It is defined as the difference between output prices and marginal costs (relative to prices). Prices are calculated as total bank revenue over assets, whereas marginal costs are obtained from an estimated translog cost function with respect to output. Higher values of the Lerner index indicate less bank competition. LERˆ2 is the square of Lerner index.	Clerides et al., (2015); Fiordelisi and Mare, (2014); Beck et al., (2013)	BankScope
LTA LTAˆ2	Log of total assets	Bank Size	Natural log of total assets of bank after converting in million dollars. LTAˆ2 is the square of total assets.	Tabak et al., (2012); Ibrahim & Rizvi (2017)	-do-
BNE	Boone Index	Competition	A measure of the degree of competition based on profit efficiency in the banking market (Boone, 2008). It measures the elasticity of profits to marginal costs. More negative values of BNE (larger in absolute) represent higher intensity of competition. An increase in the Boone indicator implies deteriorating competition among financial intermediaries. It is separately estimated for each country using bank level data and time dummies are used to calculate the yearly estimates of the competition.	Tabak, Fazio, & Cajueiro, (2012); Delis, (2012)	GFDD, World Bank, BankScop, Orbis
GFC	Global Financial Crisis	Financial Crisis	A dummy variable for the global financial crisis of 2008. The variable equals 1 if the year is 2008 or 2009, and zero otherwise.	Fu et al. (2014); Kasman and Kasman (2015)	Authors specified

LBC	Local Banking Crisis	Banking Crisis	Systemic if significant signs of financial distress appear in the banking system (significant bank runs, losses in the banking system, and/or bank liquidations) and significant banking policy intervention measures occur in response to significant losses in the banking system. The crisis becomes systemic in the first year that the banking system meets both criteria. The end of a crisis is the year before both real GDP growth and real credit growth are positive for at least two consecutive years.	Beck (2006), Luginbuhl & Elbourne (2012), Bertay et al., (2015)	Laeven & Valencia (2018); GFDD
BZS	Country level Z-scores	Bank Stability (BST)	The probability of default for a country's banking system. Z-score compares the buffer of a country's banking system (capitalization and returns) with the volatility of such returns. It is estimated as (ROA+(equity/assets))/SROA; SROA is the standard deviation of Return on Assets. ROA, equity, and assets are country-level aggregate figures (calculated from underlying bank-by-bank data). This study uses the natural logarithm of (ROA+(equity/assets))/SROA. It is converted to the country level by taking a weighted average. Weights are based on the asset size of banks in each country. Higher values indicate stability and lower values indicate insolvency risk.	Nier & Baumann, (2006); Martnez-Peria & Schmukler, (2001); Fernndez et al., (2016)	GFDD, World Bank, Bankscope and Orbis
NPL	Country level NPL	Bank Instability	The ratio of non-performing loans (interest and principal past due by 90 days or more) to total gross loans. Non-performing loans and gross loans are country-level aggregate figures.	-do-	-do-
			Regulatory Variables		
CAR	Total Capital Adequacy Ratio	Regulation	Capital adequacy ratio is the ratio of total regulatory capital to risk-weighted assets. Well-capitalized banks either have maintained higher capital ratios by reducing risk-weighted assets or have an increased portfolio of risk-weighted assets due to the support of higher capital.	Rime (2001), Hussain & Hassan (2005); et. al, (2015)	BankScope / BankFocus

DIN	Deposit Insurance System	Deposit Insurance	A dummy variable is used takes value of 1 if deposit insurance is present, otherwise 0.	Fu et al., (2014)	Demirg-Kunt, Kane, & Laeven,(2014).
ART	Activities Restriction	Bank Activity Regulatory Variable	Measure the degree to which national regulations restrict banks from engaging in (1) securities activities, (2) insurance activities, and (3) real estate activities. More specifically, securities activities refer to securities underwriting, brokering, dealing, and all aspects of the mutual fund industry. Insurance activities involve insurance underwriting and selling. And real estate activities refer to real estate investment, development, and management. The index values for securities, insurance, and real estate range from 1 to 4, where larger values indicate more restrictions on banks performing each activity. In particular, 4 signifies prohibited, 3 indicates that there are tight restrictions on the provision of the activity, 2 means that the activity is permitted but with some limits, and 1 signals that the activity is permitted. The index ranges from 3 to 12 with higher values denoting more restrictions.	Mollah et al., (2017); Ibrahim & Rizvi, (2017)	Bank Regulation and Supervision Database, World Bank; Barth et al. (2013)
CRG	Capital Stringency Regulation	Capital Regulatory Variable	Measure the amount of capital banks must hold and the stringency of regulation on the nature and source of regulatory capital. It is composed of the answers from specific survey questions that are: - (1) Is the capital-asset ratio risk weighted in line with the Basel I guidelines? (2) Does the minimum capital-asset ratio vary as a function of an individual banks credit risk? (3) Does the minimum capital-asset ratio vary as a function of market risk? (4) Before minimum capital adequacy is determined, which of the following are deducted from the book value of capital? Market value of loan losses not realized in accounting book? Unrealized losses in securities portfolios? Or unrealized foreign exchange losses? (5) What fraction of revaluation gains is allowed as part of capital? (6) Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities? (7) Can the initial disbursement or subsequent injections of capita; be done with assets other than cash or government securities? And (8) Can initial disbursement of capital be done with borrowed funds? Larger values of this index of bank capital regulation indicate more stringent capital regulation. The maximum possible value is 10, while the minimum possible value is 0.	-do-	-do-

SPW	Official Supervisory Powers	Official Supervisory Action Variable	Measure the degree to which countrys bank supervisory agency has the authority to take specific actions. It is composed of the answers from specific survey questions that are: - (1) Does the supervisory agency have the right to meet the external auditors about banks? (2) Are auditors required to communicate directly to the supervisory agency about elicit activities, fraud, or insider abuse? (3) Can supervisors take legal action against external auditors for negligence? (4) Can the supervisory authority force a bank to change its internal organization structure? (5) Are off-balance sheet items disclosed to supervisors? (6) Can the supervisory agency order the banks directors or management to constitute provision to cover actual or potential losses? (7) Can the supervisory agency suspend the directors decision to distribute (a) dividends, (b) bonuses, and (c) management fees? (8) Can the supervisory agency supersede the rights of bank shareholders and declare a bank insolvent? (9) Can the supervisory agency suspend some or all ownership rights? (1) Can the supervisory agency (a) supersede shareholder rights, (b) remove and replace management, and (c) remove and replace directors? The official supervisory index has a maximum value of 14 and a minimum value of 0, where larger numbers indicate greater power.	-do-	-do-
PMN	Private Monitoring	External Governance	Measure the degree to which regulatory and supervisory policies encourage the private monitoring of banks that builds on an array of individual questions contained in the survey. Specifically, the private monitoring index is composed of information on (1) whether bank directors and officials are legally liable for the accuracy of information disclosed to the public, (2) whether banks must publish consolidated accounts, (3) whether banks must be audited by certified international auditors, (4) whether 100 percent of the largest 10 banks are rated by international rating agencies, (5) whether off-balance sheet items are disclosed to the public, (6) whether banks must disclose their risk management procedures to the public, (7) whether accrued, though unpaid interest/principal, enter the income statement while the loan is still non-performing, (8) whether subordinated debt is allowable as part of capital, and (9) whether there is no explicit deposit insurance system and no insurance was paid the last time a bank failed. Thus, the maximum value of the private monitoring index is 12 and the minimum value is 0, where larger values indicate greater regulatory empowerment of the monitoring of banks by private investors.	-do-	-do-

EXG	External Governance	External Governance Variable	Measures the external governance related to i) Strength of External Audit, ii) Financial Statement Transparency and, iii) Accounting Practices. It is composed of the answers from specific survey questions that are: - (for effectiveness of external audits of banks) (1) Is an external audit compulsory, (2) Are there specific requirements for the extent of audit, (3) Are auditors licensed or certified, (4) Is auditor's report given to supervisory agency, (5) Can supervisors meet external auditors to discuss report without bank approval, (6) Are auditors legally required to report misconduct by managers/directors to supervisory agency, and (7) Can legal action against external auditors be taken by supervisor for negligence. For transparency of bank financial statements practices: - (8) Does income statement contain accrued but unpaid interest/principal while loan is performing, (9) Are consolidated accounts covering bank and any non-bank financial subsidiaries required, (10) Are off-balance sheet items disclosed to public, (11) Must banks disclose risk management procedures to public, (12) Are directors legally liable for erroneous/misleading information, and (13) Does income statement contain accrued but unpaid interest/principal while loan is non-performing. For the type of accounting practices used and the evaluations by external rating agencies and incentives for creditors of the bank to monitor bank performance: - (14) Are accounting practices for banks in accordance with International Accounting Standards (IAS), (15) Is subordinated debt allowable as part of capital, (16) Is subordinated debt required as part of capital, (17) Do regulations require credit ratings for commercial banks, (18) What percentage of top ten banks is rated by international credit rating agencies, and(19) What percentage of the top ten banks are rated by domestic credit rating agencies. Thus, the maximum value of the governance index is 19 and the minimum value is 0, where larger values indicate greater corporate governance.	Beck et al. -do- 2013).	
			Control Variables		
NII	Ratio of non-net interest revenues	Diversification	Ratio of non-net interest revenue to total revenue	Williams (2016)	BankScope

DPT	Deposits to assets ratio	Liquidity	Ratio of total deposits to total assets	Soedemaro & Tarazi (2015)	-do-
LNG	Loan growth rate	Financial Intermediation	Annual growth rate of total loans	Soedemaro & Tarazi (2015)	-do-
CIR	Cost to Income ratio	Operational Efficiency	Cost to income ratio, the ratio of cost to income indicating managers' operational inefficiency. It inversely measures cost efficiency.	Lee and Hsieh, (2014)	-do-
LLR	Loan Loss reserve ratio	Loan Quality	Ratio of loan loss reserve to gross loan to indicate poor loan quality	Fang et al., (2014)	-do-
NIM	Net interest margin,	Profitability	Ratio of net interest income to total earning assets	Fu et al., (2014)	-do-
ETA	Capital asset ratio	Solvency	Equity to total assets ratio to measure banks solvency	Abedifar et al., (2013)	-do-
MSP	Broad money growth (% of GDP)	Money supply	It is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and travelers checks; and other securities such as certificates of deposit and commercial paper.	Thenuwara & Morgan, (2017)	WDI
INF	Inflation, GDP deflator (annual %)	Inflation	Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.	Bertay et al., (2015) Soedemaro & Tarazi (2015)	-do-

EXR	Local currency / USD	Exchange rate	Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average.	Castro (2011) and Nkusu (2011)	-do-
EFR	Economic Freedom Index	Country legal environment	We measure it based on 12 quantitative and qualitative factors, grouped into four broad categories, or pillars, of economic freedom: -(1) Rule of Law (property rights, government integrity, judicial effectiveness), (2) Government Size (government spending, tax burden, fiscal health), (3) Regulatory Efficiency (business freedom, labor freedom, monetary freedom), and (4) Open Markets (trade freedom, investment freedom, financial freedom). Each of the twelve economic freedoms within these categories is graded on a scale of 0 to 100. A countrys overall score is derived by averaging these twelve economic freedoms.	Demirgc-Kunt et al. (2004), Beck et al. (2006), Fernndez et al. (2010)	Heritage Foundation
CR5	Concentration Ratio	Concentration Ratio	The total market shares of the five biggest banks in a country. A higher ratio indicates higher concentration.	Khan et al. (2017)	BankScope, GFDD
TPN	Trade Openness	Trade Openness	Sum of exports and imports (% GDP)	Creel et al., (2015)	WDI
LFF	Fix Capital Formation	Fix Capital Formation	Gross fixed capital includes land, improvements, plant, machinery, and equipment purchases, as well as the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Data are in current U.S. dollars.	Jalilian et a., (2007)	WDI
GEX	Govt. Expenditure	Govt. Expenditure	The log of the sum of government final consumption expenditures. Data are in current U.S. dollars.	Ngare et al., (2014)	WDI