

Banking Stability, Market Structure and Financial System in Emerging Countries

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Abstract

The literature wisdom shows that both theoretical and empirical studies provide contradictory predictions about the relationship between market concentration or competitiveness and financial stability in the banking system. In the past two decades, the structure of banking industry of many emerging countries went through considerable changes and has shifted from traditional intermediation activities, such as term deposit and loans products, towards to activities that could generate much more non-interest income. In this paper, we analyze theories of bank stability on market concentration, financial deepening, bank income structure and international debt situation by using panel data for 18 emerging countries. Our results show that alternative financial system plays an important role in the bank risk behavior. The potentially important policy implication is that policies supporting financial deepening or promoting liquidity in the banking industry might not necessarily improve banking stability. One needs to take into consideration of banks competitiveness incorporates with degrees of financial depth and macroeconomic factors evolvement. Liberalized financial system analogously is not necessarily the ultimate solution.

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1 Introduction

Since the financial deregulation that took place in the seventies and in the eighties, the banking industry has experienced a fundamental change in its market structure. Numerous financial innovations, advance information technology and globalization in financial market enhance banks to react by adopting much more aggressive and competitive strategy. While investigation on the leading role played by institutional banks in the

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unprecedented 2007-2009 global crisis and still ongoing Eurozone debt crisis is essential, we can't afford to ignore emerging markets.

The competition impact of banks has long been a public policy debate issue. Economic theory and empirical studies provide contradictory predictions about the relationship between market concentration or competitiveness and financial stability in the banking system. There are two major viewpoints of the literature related. One is the "concentration-stability" view which argues that comparing to a more competitive banking system with many banks, a concentrated banking structure with a few banks is less prone to financial crises. Another one is the "concentration-fragility" view that depicts a less competitive or a more concentrated banking sector may decrease market power and profit of the bank and then enhance fragility of the bank sector.

The key mechanisms identified in the "concentration-stability" literature are that a concentrated bank industry may enhance market power and profit of the bank, reduce incentives for managers to take excessive risk, and thus reduce the likelihood of banking failure. From this perspective, a more competitive banking industry would bring bank managers more incentives to benefit shareholders at the expense of depositors. Additionally, monitoring lots of banks in a more competitive banking sector will be less effective, thus may increase the probability of banking failure and financial contagion.

In this paper, we test the theories by using panel data analysis of bank stability on market concentration, financial deepening, bank income structure and international debt situation for 18 emerging countries. Our study differs from previous approaches in a number respects. First, the impact of market concentration on financial stability of banking has been analyzed intensely. However, possible relationships between market structure, financial depth and international debt situation have been analyzed far less.

This paper extends the literature by examining these latter issues in greater depth. Second, by alternatively constructing Z_SCORE and three HHI indexes covering asset, loan, and deposit data for banks other than extracting data directly, we try to shed more light on the traditional debate on the relationship between concentration and bank stability for emerging countries.

The remainder of the paper is organized as follows. Section II reviews the extensive literature on market competition and banking stability, financial system and financial depth. Section III describes the data, sample selection process, and empirical model design. In section IV the major empirical results are presented and discussed. We conclude in Section V.

2 Literature Review

There is a large body of literature that examines how the market structure of banking industry impact the bank risk taking behavior. Based on the structure-conduct-performance paradigm, the market structure that the firm stays will influence the conduct decision of the firm, and then influence the firm's performance. However it is not clear whether the direction of causality is running from market structure to conduct and then to performance or not. Such debates exist also in the banking industry.

The seminal article by Keeley (1990) illustrates the relationship between market power and risk taking behavior in banking. He argues that increases in competition in the U.S. in the 1980s may have reduced banks' incentives to act prudently, and cause banks to take

more risk actions through reductions in capital and increases in asset risk. He demonstrates a relationship among the increase in competition, the decline in bank charter values, and the increase in bank failures. Hellmann et al. (2000) argue that financial liberalization itself could be part of the reason that increases the risk of the banking. Such the Savings and Loans crisis in the U.S., the 1997 financial crises in East Asian, and the weakened Japanese banking system as examples, they point out that the problems arose at least in part is because the financial-market liberalization which encourages banks to take excessive risk action. Berger et al. (2009) retrieve over 8,235 banks in 23 developed countries bank-level financial data for the years 1999-2005. Their findings suggest that banks with a higher degree of market power have less overall risk exposure, and consistent with the traditional “competition-fragility” view.

Beck et al. (2006a) investigate the effect of concentration in banking industry on the likelihood of suffering a systemic banking crisis for 69 countries during 1980-1997, and demonstrate empirically that a concentrated national banking system tends to reduce the likelihood that the country will suffer a systemic banking crisis. But they also point out that in terms of regulations and institutions, the data do not support the view that more competition increases fragility.

Schaeck et al. (2007) use cross-country data set investigating the implications of competitive bank behavior with 38 countries for the period 1980-2003. They find that competition reduces the likelihood of a crisis and increases time to observing crisis. Their empirical results confirm the findings by Beck et al. (2006a, 2006b) that both concentration and competition of the banking system is positively related to banking stability, suggests that competition and concentration might show different characteristics of banking systems and mean that concentration is an insufficient measure of bank competitiveness.

A growing body of empirical evidence supports the “concentration-fragility” view. Boyd and De Nicolo (2005) examine theoretically the relation between the number of bank competitors and the risk taking behavior of the bank. They argue that the literature concluding banks will choose more risky portfolios when they confront increased competition is fragile. They demonstrate that the result will be enormous different considering banks competing not only for deposits market but also for loans market.

Uhde and Heimeshoff (2009) investigate over 2600 banks across the EU-25 during the period from 1997 to 2005, and find the empirical results which are consistent with the “concentration-fragility” view. Their findings confirm empirical results by Schaeck et al. (2007) and Beck et al. (2006a, b). Although the European commission has revised Article 16 of the European Banking Directive in order to accelerate the bank merger review process by setting evaluation criteria in late 2006, they still argue the necessity of considering the aspect of banking systemic stability within the cross-border bank merger approval process.

Lepetit et al. (2008) study a set of European banks during the period from 1996 to 2002, and investigate the possible relationship between bank income structure and bank risk. They point out that the structure of bank income experienced a dramatic change in the past decades. In order to react to the much more competitive environment, banks adopt more progressive strategy in offering more products to their clients. Their empirical results show that banks expanding into non-interest income activities present higher risk than banks with mainly supply loans.

One important and interesting debate in the financial system related issue is whether bank-based or market-based financial systems better for promoting economic growth

(Allen 1999; La Porta et al. 1998, 2000, 2004; Levine 2002). To investigate the relationship between alternative financial systems and economic growth is beyond the scope of the paper. However, it attracts our attention whether alternative financial systems impact the bank risk taking behavior. Does bank-based financial system converge with market-based financial system after the tremendous changes in the banking industry over the past twenty years?

Regarding to the financial deepening or financial system literature, Beck et al. (2010) introduce the updated version of the Financial Development and Structure Database and depicts trends in development of financial markets and financial institutions across countries. They show that financial systems across the world deepened over the past decades, however, with much of the deepening, concentrated in high-income countries. This financial deepening has taken place as much as in stock market, bond market, and in banking as well. The Financial Development and Structure Database collects many indicators coverage several categories: indicators of the size of the financial system, the banking system - size, structure, efficiency and stability, indicators of capital markets and insurance sector, indicators of financial globalization, and indicators of financial structure. The existing literature, most based on US banks or banks in developed nations, either focuses on bank competition and bank risk or bank competition and financial crisis. Given the market structure of banking and financial deepening or financial system that banks need to face could impact the bank risk, consideration of banks competitiveness incorporates with degrees of financial system evolvement warrants essential issue to exam.

3 Data and Methodology

3.1 Data

We retrieve initial bank-level data for the years 2003-2010 from the BankScope database provided by Fitch-IBCA for 18 emerging countries. Other financial and macroeconomic variables are taken from World Bank's Financial Development and Structure Database. Because the empirical data employed in this paper is pooling time-series and cross-section data, we utilize the materials to analyze the sample by using the panel data model.

First, we construct the Z_SCORE as an indicator of banking stability. Z_SCORE is defined as ROA/σ_{ROA} plus $(EQ/TA)/\sigma_{ROA}$. ROA is the average return on assets for banks for year t , EQ/TA represents the average equity (EQ) to total assets (TA) ratio for banks, and σ_{ROA} is the standard deviation of return on assets. ROA indicates the banks' profitability. σ_{ROA} presents return volatility. EQ/TA is the bank-level capitalization ratio which is a measure of leverage risk, and a higher ratio indicates lower bank risk. Therefore, the Z_SCORE is an indicator proxies the bank's probability of failure reflecting the banks' profitability, leverage risk and volatility. The larger (less) Z_SCORE value indicates a lower (higher) probability of insolvency risk and higher (lower) bank stability. In other words, Z_SCORE is inversely related to the probability of a financial intermediary's insolvency.

As stated earlier, we denote alternative measures of traditional definition on level of market competition. Three Herfindahl-Hirschman indexes are presented here to measure the degree of market concentration. First, Herfindahl-Hirschman deposits index (HHI_DEP) is defined as $10,000\sum(Dep/TDep)^2$. Dep is bank i 's deposit and $TDep$ is total

deposit for all banks in one country. Secondly, the Herfindahl-Hirschman loans index (HHI_LOAN) is defined as $10,000\sum(\text{Loan}/\text{TLoan})^2$. The variable Loan is the amount of loan of bank *i* and TLoan is total amount of loan for all banks in one country. The third index is Herfindahl-Hirschman assets index (HHI_ASSET) which is defined as $10,000\sum(\text{Asset}/\text{TAsset})^2$. The variable Asset indicates the asset of bank *i* and TAsset is total amount of assets for all banks in one country. Those three indexes all are country-level indicators of bank concentration with higher (lower) values depicting greater (smaller) market concentration. We are aware that banking markets are not necessarily congruent with national borders, nevertheless, the calculation of the HHIs at the national level is comparatively standard as documented.

In order to investigate the degree of country’s financial deepening, we define five country- level capitalization indicators. The first is a measure of stock market capitalization to GDP (ST_CA_GDP). It is value of listed shares divided by GDP and captures the size of the stock market relative to the size of the economy. The second measure is stock market total value traded to GDP (ST_TR_GDP), and equals total shares traded on the stock market exchange divided by GDP. The third indicator is private bond market capitalization to GDP (PRI_BO_GDP), and it is a measure of the total outstanding domestic debt securities issued by private or public domestic firms divided by GDP. The fourth indicator is public bond market capitalization to GDP (PUB_BOND_GDP). It equals public domestic debt securities issued by government as a share of GDP. The fifth indicator is international debt issues divided by GDP (DEBT_GDP). This ratio depicts the net flow of international bond issues relative to economic activity of a country. These data are from Financial Development and Structure Database, and available at <http://econ.worldbank.org/programs/finance>. We construct the panel data based on whether the private bond data are completed or not, and 18 countries meet the requirements.

Additionally, we consider two variables which depict the important characters of banking industry from bank-level financial data. One is the ratio of non-interest income to gross revenue (NONII). This ratio shows the amount of fee, trading and asset sale income, rather than interest income, to total revenues. Usually, the ratio is much higher for investment banks than other types of banks. The other variable is the ratio of nonperforming loans to total loans (NPLs). This is a measure of the amount of loans that are impaired. A higher (lower) NPLs value implies a more (less) riskier loan portfolio, or depicts the worse (better) the asset quality is. In order to sustain and benefit from the panel dimension of analyzing data, we pay careful attention to drop banks and not to drop bank-year observations.

3.2 Empirical Model Design

To test the hypothesis whether banking market concentration and financial system affects banking stability, we construct the empirical panel data model as follow:

$$Z_{it} = \alpha_{it} + \sum \beta_m H_{it, m} + \sum \beta_k F_{it, k} + \sum \beta_j X_{ij, j}$$

where Z_{it} represents the Z_SCORE as measurement of bank stability or risk in country *i* at time *t*. The vector $H_{it, m}$ is the banking market concentration rate measured by Herfindahl-Hirschman indexes. The vector $F_{it, k}$ are financial deepening indexes which show the financial system is prone to market-based or bank-based financial system. The

vector $X_{ij, j}$ are depicting major characteristics of banking. To test the hypothesis that banking market concentration, financial depth, and international debt affects financial stability of banking, panel data estimations are based on a country-specific random-effects model.

4 Empirical Results

Table 1 shows descriptive statistics for the variables with the expected effect on profitability and stability for all countries. The Z_SCORE ratio displays a wide variation for banks in our sample across emerging countries over time (0.54 to 35.63). Table 2 depicts descriptive statistics for all the variables included for 18 countries respectively. All bank-level and country-level variables are averaged likewise by bank and by country over the period of 2003-2010. China has the highest average Z_SCORE , an indicator of banking stability, followed by Chile, Malaysia, Indonesia, and Taiwan. An advantage of utilizing Z-Score is that it can be applied for financial institutions in our analysis for emerging countries such as China for which more sophisticated, market-based data are rarely available. Allen et al. (2012) investigate the privatization process of Industrial and Commercial Bank of China (ICBC) and find it has better performance with comparing banks from emerging and developed countries. In addition, they argue that the efficient privatizing and effective monitoring of “Chinese model” could be coupled with investors of various levels of sophistication in underdeveloped markets. Chile has the highest three HHI indexes covering asset, loan, and deposit data, which indicates higher concentration. South Africa, Peru, and Hungary have relatively higher degrees of market power and hence a less competitive environment. South Africa and Taiwan have relatively high financial deepening country-level capitalization indicators measure stock market size relative to the economy (2.31 and 1.54) and stock market turnover proxy for liquidity (1.54 and 3.16). Chile has the lowest non-performing loan ratio, and while Argentina has the largest non-interest income ratio. Lastly, the indicator of financial globalization depicts the net flow of international bond issues. Argentina has the highest international debt ratio, followed by Philippines and Malaysia. Moreover, China has the lowest international debt ratio, followed by India and Indonesia.

Table 1: Descriptive statistics summary for all 18 emerging countries

| | Z_SCORE | ASSET | DEPOSIT | LOAN | HHI_DEP | HHI_LOAN | HHI_ASSET |
|-----------|-----------|-----------|------------|------------|---------|----------|-----------|
| Mean | 6.55 | 12692.25 | 9258.85 | 7412.47 | 1648.68 | 1494.02 | 1484.49 |
| Maximum | 35.63 | 132257.1 | 96356.02 | 71706.55 | 9702.14 | 10000 | 9417.21 |
| Minimum | 0.54 | 296.91 | 205.64 | 120.25 | 620.88 | 487.55 | 543.25 |
| Std. Dev. | 4.93 | 17944.69 | 12880.13 | 10208.51 | 1545.86 | 1472.27 | 1411.32 |
| Obs. | 141 | 144 | 144 | 144 | 143 | 143 | 143 |
| | ST_CA_GDP | ST_TR_GDP | PRI_BO_GDP | PUB_BO_GDP | NPL | NONII | DEBT_GDP |
| Mean | 0.77 | 0.61 | 0.15 | 0.3 | 6.43 | 39.28 | 0.12 |
| Maximum | 3.38 | 6.67 | 0.69 | 0.53 | 43.83 | 83.83 | 0.89 |
| Minimum | 0.14 | 0 | 0 | 0.05 | 0.61 | 5.5 | 0.01 |
| Std. Dev. | 0.66 | 0.96 | 0.17 | 0.11 | 5.21 | 14.9 | 0.12 |
| Obs. | 142 | 134 | 138 | 144 | 143 | 144 | 144 |

Variable definition: $Z_SCORE = ROA/\sigma_{ROA} + (EQ/TA)/\sigma_{ROA}$. ROA is the average return on assets for banks for year t, EQ/TA represents the average equity (EQ) to total assets (TA) ratio for banks, and σ_{ROA} is the standard deviation of return on assets. ROA indicates the banks' profitability. σ_{ROA} presents return volatility. EQ/TA is the bank-level capitalization ratio. $HHI_DEP = \sum (Dep/TDep)^2 \times 10,000$. This is Herfindahl-Hirschman

deposits index in which Dep is bank *i*'s deposit and TDep is total deposit for all banks in one country. $HHI_LOAN = \sum (Loan/TLoan)^2 \times 10,000$. This is Herfindahl-Hirschman loans index in which Loan is loan of bank *i* and TLoan is total amount of loan for all banks in one country. $HHI_ASSET = \sum (Asset/TAsset)^2 \times 10,000$. This is Herfindahl-Hirschman assets index in which Asset indicates the asset of bank *i* and TAsset is total amount of assets for all banks in one country. NPLs = Nonperforming loans / Total loans. This is a measure of the amount of loans that are impaired. NONII = Non-interest income / Gross revenue. This ratio shows the amount of fee, trading and asset sale income, rather than interest income, to total revenues. ST_CA_GDP = Stock market capitalization / GDP. This indicator is the ratio of listed shares to GDP, and measures the stock market size relative to the size of the country's economy. ST_TR_GDP = Stock market total value traded / GDP. This is the ratio of total stock shares traded to GDP, and indicates the degree of liquidity of stock markets. PRI_BO_GDP = Private bond market capitalization / GDP. This is one indicator measuring the size of the domestic bond market. PUB_BO_GDP = Public bond market capitalization / GDP. This indicator is the ratio of domestic debt securities issued by public domestic entities to one country's economic activity. DEBT_GDP = International debt issues / GDP. This ratio depicts the net flow of international bond issues relative to economic activity of a country.

Table 2: Descriptive statistics for each country

| NATION | | Z_SCORE | ASSET | DEPOSIT | LOAN | HHI_DEP | HHI_LAON | HHI_ASSET |
|-----------|------|---------|----------|----------|----------|---------|----------|-----------|
| Argentina | mean | 5 | 1492.41 | 719.6 | 637.77 | 703.55 | 772.38 | 881.21 |
| | max | 9.53 | 3026.8 | 1475.28 | 1374.79 | 880.48 | 962.28 | 1075.84 |
| | min | 3.03 | 760.42 | 281.33 | 285.99 | 625.39 | 655.21 | 769.65 |
| | std | 1.98 | 685.15 | 361.85 | 339.41 | 80.45 | 105.37 | 94.9 |
| Brazil | mean | 5.81 | 12377.83 | 3909.26 | 5561.06 | 1192.81 | 1036.2 | 880.97 |
| | max | 8.09 | 32616.48 | 9334.76 | 15357.53 | 1400.07 | 1066.69 | 1049.64 |
| | min | 2.98 | 3725.39 | 1276.03 | 1510.25 | 993.92 | 991.12 | 767.85 |
| | std | 1.81 | 10074.92 | 2834.12 | 4857.52 | 157.25 | 24.8 | 108.44 |
| Chile | mean | 12.54 | 3774.73 | 2413.32 | 2641.41 | 5898.19 | 5585.34 | 5427.13 |
| | max | 30.23 | 9213.61 | 5570.29 | 6356.73 | 9702.14 | 10000 | 9417.21 |
| | min | 3.25 | 1135.34 | 692.8 | 643.39 | 1447.27 | 1404.13 | 1355.23 |
| | std | 9.63 | 3454.94 | 1997.8 | 2328.94 | 3801.13 | 3600.1 | 3428.09 |
| China | mean | 15.94 | 65570.18 | 49462.4 | 36878.77 | 1317.45 | 1038 | 1079.44 |
| | max | 35.63 | 132257.1 | 96356.02 | 71706.55 | 1706.56 | 1380.52 | 1361.01 |
| | min | 5.68 | 42568.9 | 32494.81 | 24184.78 | 1011.74 | 807.99 | 851.48 |
| | std | 8.66 | 31224.47 | 21722.81 | 15948.66 | 260.25 | 213.52 | 203.01 |
| Colombia | mean | 4.23 | 3734.62 | 2481.86 | 2418.15 | 1214.38 | 1151.11 | 1119.96 |
| | max | 6.14 | 6721.24 | 4092.7 | 4437.79 | 1629.2 | 1624.02 | 1511.35 |
| | min | 2.09 | 1109.43 | 711.57 | 663.39 | 970.54 | 825.92 | 896.82 |
| | std | 1.32 | 2007.22 | 1269.34 | 1375.56 | 208.28 | 250.78 | 196.29 |
| Czech Rep | mean | 6.97 | 7128.29 | 5280.66 | 3792.06 | 1705.82 | 1381.89 | 1537.76 |
| | max | 13.62 | 9683.88 | 7364.21 | 5891.29 | 2104.93 | 1670.1 | 1762.49 |
| | min | 3.95 | 4506.84 | 3063.01 | 1812.12 | 1547.84 | 1244.39 | 1408.31 |
| | std | 2.92 | 2241.3 | 1811.57 | 1745.26 | 177.41 | 133.23 | 106.67 |
| Hungary | mean | 3.69 | 4453.79 | 2545.69 | 3167.68 | 1830.5 | 1515.44 | 1414.23 |
| | max | 4.67 | 6941.11 | 3954.71 | 5253.76 | 2041.28 | 1853.83 | 1675.45 |
| | min | 1.67 | 2220.83 | 1344.79 | 1445.12 | 1668.03 | 1276.04 | 1206.19 |
| | std | 0.97 | 1772.94 | 923.02 | 1387.79 | 151.48 | 204.46 | 169.13 |
| India | mean | 2.41 | 10722.73 | 8494.94 | 6233.22 | 896.85 | 754.1 | 777.27 |
| | max | 4.28 | 20213.14 | 17030.25 | 12329.47 | 1090.09 | 980.21 | 922.7 |
| | min | 0.78 | 1486.62 | 681.01 | 844.36 | 734.29 | 671.33 | 674.12 |
| | std | 1.26 | 5932.48 | 5150.79 | 3778.77 | 147.97 | 101.59 | 99.25 |
| Indonesia | mean | 8.85 | 3314.13 | 2746.56 | 1775.67 | 1026 | 852.04 | 979.17 |
| | max | 17.35 | 6566.11 | 5489.66 | 4009.53 | 1191.39 | 972.01 | 1201.99 |
| | min | 1.76 | 2023.87 | 1622.33 | 855.89 | 924.76 | 769.18 | 867.97 |
| | std | 4.63 | 1522.85 | 1302.41 | 1080.54 | 98.38 | 73.64 | 127.94 |

Table 2: Descriptive statistics for each country (cont.)

| NATION | | Z_SCORE | ASSET | DEPOSIT | LOAN | HHI_DEP | HHI_LAON | HHI_ASSET |
|--------------|------|---------|----------|----------|----------|---------|----------|-----------|
| Korea | mean | 6.53 | 42797.87 | 25317.92 | 26788.02 | 1604.55 | 1469.78 | 1303.76 |
| | max | 11.21 | 63961.31 | 32095.01 | 40558.23 | 1726.52 | 1588.29 | 1398.67 |
| | min | 4.79 | 24058.46 | 15727.91 | 17495.63 | 1036.41 | 1020.87 | 926.27 |
| | std | 2.3 | 15231.15 | 5838.65 | 8719.12 | 232.87 | 189.04 | 156.4 |
| Malaysia | mean | 8.93 | 7026.15 | 4955.64 | 4182.73 | 709.63 | 749.3 | 658.71 |
| | max | 16.73 | 9841.67 | 7199.53 | 6015.85 | 746.47 | 780.92 | 684.34 |
| | min | 3.44 | 4514.68 | 3048.63 | 3030.96 | 657.44 | 705.78 | 632.37 |
| | std | 4.34 | 1659.51 | 1309.53 | 910.35 | 25.16 | 22.69 | 16.03 |
| Mexico | mean | 1.94 | 9155.48 | 5595.94 | 4945.39 | 1141.64 | 1035.95 | 1039.46 |
| | max | 3.97 | 12546.25 | 6327.06 | 5645.9 | 1327.11 | 1076.4 | 1144.92 |
| | min | 0.54 | 7653.18 | 4799.32 | 4136.44 | 1026.17 | 1007.89 | 940.29 |
| | std | 1.07 | 1805.52 | 476.26 | 470.39 | 123.46 | 28.37 | 66.92 |
| Peru | mean | 4.71 | 4624.11 | 3338.49 | 2798.15 | 2997.52 | 2998.52 | 2986.51 |
| | max | 10.82 | 7962.81 | 5396.73 | 4840.29 | 3096.01 | 3020.2 | 3049.17 |
| | min | 2.02 | 2157.06 | 1733.04 | 1373.8 | 2926.79 | 2953.64 | 2939.93 |
| | std | 3.01 | 2171.49 | 1375.06 | 1292.23 | 60.41 | 25.3 | 34.8 |
| Philippines | mean | 3.47 | 2522.13 | 1890.17 | 1114.46 | 901.74 | 915.22 | 853.18 |
| | max | 5.16 | 4164.14 | 3148.88 | 1855.45 | 984.43 | 992.59 | 897.83 |
| | min | 2.56 | 296.91 | 205.64 | 120.25 | 833.47 | 830.45 | 781.04 |
| | std | 0.98 | 1206.48 | 941.89 | 550 | 51.67 | 65.24 | 49.22 |
| South Africa | mean | 5.89 | 10654.12 | 9347.87 | 8042.99 | 3089.71 | 2837.55 | 2723.37 |
| | max | 14.59 | 17815.38 | 12793.92 | 12827.48 | 4984.31 | 5398.33 | 4485.13 |
| | min | 2.91 | 1064.95 | 765.58 | 589.19 | 2267.45 | 1924.7 | 1977.88 |
| | std | 3.72 | 4757.62 | 3724.29 | 3607.32 | 1079.71 | 1333.96 | 1053.17 |
| Taiwan | mean | 8.14 | 18546.84 | 20400.64 | 9714.23 | 677.36 | 582.18 | 626.28 |
| | max | 12.07 | 33740.3 | 28310.04 | 16512.64 | 798.13 | 722.12 | 809.83 |
| | min | 4.2 | 13562.96 | 13740.1 | 7137.22 | 620.88 | 487.55 | 543.25 |
| | std | 2.33 | 6785.89 | 4995.94 | 3080.04 | 59.05 | 79.33 | 93.99 |
| Thailand | mean | 6.13 | 9235.81 | 8579.31 | 6777.91 | 945.77 | 888.75 | 875.5 |
| | max | 8.01 | 15586.24 | 12910.87 | 11029.13 | 1012.34 | 960.81 | 941.44 |
| | min | 3.24 | 6499.19 | 6442.46 | 4642.72 | 875.49 | 830.31 | 820.91 |
| | std | 1.52 | 3086.28 | 2221.45 | 2094.69 | 50.68 | 50.45 | 46.96 |
| Turkey | mean | 6.73 | 11329.34 | 9179.08 | 5954.86 | 1729.33 | 1256.3 | 1477.94 |
| | max | 9.92 | 20390.43 | 15740.88 | 11635.99 | 4207.59 | 2147.24 | 2774.23 |
| | min | 3.37 | 2127.68 | 1579.9 | 943.77 | 1064.47 | 885.96 | 980.45 |
| | std | 2.26 | 6220.71 | 4967 | 3680.94 | 1104.05 | 494.1 | 696.84 |

Table 3 demonstrates the degree of correlation amongst dependent and explanatory variables. The matrix shows that, in general, there is a strong correlation among those three HHI indexes. Table 4 presents main regression results. Model I, model II and model III capture the possible relationship between the dependent variable, bank risk index (Z_SCORE) and the degree of financial deepening variables, stock market capitalization to GDP (ST_CA_GDP) and stock market total value traded to GDP (ST_TR_GDP), and one of the concentration measure variables (HHI indexes). Given negative significant coefficients, it is evident that the concentration indexes of degree of market concentration are closely related to the banking stability indicator of Z-Score.

Table 3: Correlation

| | Z_SCORE | ASSET | DEPOSIT | LOAN | HHI_DEP | HHI_LOAN | HHI_ASSET | ST_CA_GDP | ST_TR_GDP | PRI_BO_GDP | PUB_BO_GDP | NPL | NONII | DEBT_GDP |
|------------|---------|-------|---------|-------|---------|----------|-----------|-----------|-----------|------------|------------|-------|-------|----------|
| Z_SCORE | 1 | 0.37 | 0.43 | 0.38 | 0.09 | 0.07 | 0.08 | 0.06 | 0.1 | 0.13 | -0.18 | -0.07 | -0.08 | -0.2 |
| ASSET | 0.37 | 1 | 0.95 | 0.99 | -0.11 | -0.13 | -0.15 | 0.23 | 0.56 | 0.49 | 0.16 | -0.14 | -0.13 | -0.27 |
| DEPOSIT | 0.43 | 0.95 | 1 | 0.94 | -0.13 | -0.15 | -0.16 | 0.29 | 0.61 | 0.41 | 0.07 | -0.13 | -0.14 | -0.33 |
| LOAN | 0.38 | 0.99 | 0.94 | 1 | -0.09 | -0.11 | -0.12 | 0.25 | 0.54 | 0.52 | 0.16 | -0.11 | -0.09 | -0.27 |
| HHI_DEP | 0.09 | -0.11 | -0.13 | -0.09 | 1 | 0.99 | 0.99 | 0.11 | -0.14 | -0.01 | -0.21 | -0.2 | -0.01 | -0.11 |
| HHI_LOAN | 0.07 | -0.13 | -0.15 | -0.11 | 0.99 | 1 | 0.99 | 0.11 | -0.15 | 0 | -0.24 | -0.2 | 0.01 | -0.07 |
| HHI_ASSET | 0.08 | -0.15 | -0.16 | -0.12 | 0.99 | 0.99 | 1 | 0.1 | -0.16 | -0.03 | -0.26 | -0.21 | 0 | -0.08 |
| ST_CA_GDP | 0.06 | 0.23 | 0.29 | 0.25 | 0.11 | 0.11 | 0.1 | 1 | 0.63 | 0.35 | -0.05 | -0.03 | 0.16 | -0.01 |
| ST_TR_GDP | 0.1 | 0.56 | 0.61 | 0.54 | -0.14 | -0.15 | -0.16 | 0.63 | 1 | 0.45 | 0.14 | -0.16 | 0.1 | -0.18 |
| PRI_BO_GDP | 0.13 | 0.49 | 0.41 | 0.52 | -0.01 | 0 | -0.03 | 0.35 | 0.45 | 1 | 0.27 | 0.06 | 0.27 | 0.03 |
| PUB_BO_GDP | -0.18 | 0.16 | 0.07 | 0.16 | -0.21 | -0.24 | -0.26 | -0.05 | 0.14 | 0.27 | 1 | 0.18 | 0.01 | 0.02 |
| NPL | -0.07 | -0.14 | -0.13 | -0.11 | -0.2 | -0.2 | -0.21 | -0.03 | -0.16 | 0.06 | 0.18 | 1 | 0.1 | 0.26 |
| NONII | -0.08 | -0.13 | -0.14 | -0.09 | -0.01 | 0.01 | 0 | 0.16 | 0.1 | 0.27 | 0.01 | 0.1 | 1 | 0.44 |
| DEBT_GDP | -0.2 | -0.27 | -0.33 | -0.27 | -0.11 | -0.07 | -0.08 | -0.01 | -0.18 | 0.03 | 0.02 | 0.26 | 0.44 | 1 |

Variable definition: $Z_SCORE = ROA/\sigma_{ROA} + (EQ/TA)/\sigma_{ROA}$. ROA is the average return on assets for banks for year t, EQ/TA represents the average equity (EQ) to total assets (TA) ratio for banks, and σ_{ROA} is the standard deviation of return on assets. ROA indicates the banks' profitability. σ_{ROA} presents return volatility. EQ/TA is the bank-level capitalization ratio. $HHI_DEP = \sum (Dep/TDep)^2 \times 10,000$. This is Herfindahl-Hirschman deposits index in which Dep is bank i's deposit and TDep is total deposit for all banks in one country. $HHI_LOAN = \sum (Loan/TLoan)^2 \times 10,000$. This is Herfindahl-Hirschman loans index in which Loan is loan of bank i and TLoan is total amount of loan for all banks in one country. $HHI_ASSET = \sum (Asset/TAsset)^2 \times 10,000$. This is Herfindahl-Hirschman assets index in which Asset indicates the asset of bank i and TAsset is total amount of assets for all banks in one country. NPLs = Nonperforming loans / Total loans. This is a measure of the amount of loans that are impaired. NONII = Non-interest income / Gross revenue. This ratio shows the amount of fee, trading and asset sale income, rather than interest income, to total revenues. ST_CA_GDP = Stock market capitalization / GDP. This indicator is the ratio of listed shares to GDP, and measures the stock market size relative to the size of the country's economy. ST_TR_GDP = Stock market total value traded / GDP. This is the ratio of total stock shares traded to GDP, and indicates the degree of liquidity of stock markets. PRI_BO_GDP = Private bond market capitalization / GDP. This is one indicator measuring the size of the domestic bond market. PUB_BO_GDP = Public bond market capitalization / GDP. This indicator is the ratio of domestic debt securities issued by public domestic entities to one country's economic activity. DEBT_GDP = International debt issues / GDP. This ratio depicts the net flow of international bond issues relative to economic activity of a country.

Table 4: Empirical results

| Variable | Model I | Model II | Model III | Model IV |
|--------------------|----------------------|----------------------|----------------------|---------------------|
| C | 12.1239 | 12.1107 | 12.088 | 8.2299 |
| HHI_DEP | -0.0007* (0.0004) | | | |
| HHI_LOAN | | -0.0008* (0.0004) | | -0.0007 (0.0004) |
| HHI_ASSET | | | -0.0008* (0.0004) | |
| ST_CA_GDP | -0.098 (1.4174) | -0.0725 (1.4116) | -0.1248 (1.4236) | -1.2262 (1.2396) |
| ST_TR_GDP | -0.1048 (0.8589) | -0.094 (0.8582) | -0.0866 (0.8595) | 0.0851 (0.8364) |
| PRI_BO_GDP | -7.8981 (16.2160) | -8.0819 (16.1952) | -7.5128 (16.2454) | |
| PUB_BO_GDP | -10.6069 (8.5863) | -10.4352 (8.5896) | -10.2946 (8.6516) | |
| NPL | -0.0547 (0.0917) | -0.0535 (0.0916) | -0.0532 (0.0918) | |
| NONII | 0.0061 (0.0484) | 0.0056 (0.0484) | 0.0042 (0.0486) | |
| DEBT_GDP | -1.9222 (6.0242) | -1.8444 (6.0221) | -1.9647 (6.0278) | |
| R-squared | 0.5305 | 0.5312 | 0.5297 | 0.4823 |
| Adjusted R-squared | 0.4107 | 0.4117 | 0.4098 | 0.3882 |

(1) Standard deviations are shown in parentheses.

(2) *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Variable definition: $Z_SCORE = ROA/\sigma_{ROA} + (EQ/TA)/\sigma_{ROA}$. ROA is the average return on assets for banks for year t, EQ/TA represents the average equity (EQ) to total assets (TA) ratio for banks, and σ_{ROA} is the standard deviation of return on assets. ROA indicates the banks' profitability. σ_{ROA} presents return volatility. EQ/TA is the bank-level capitalization ratio. $HHI_DEP = \sum (Dep/TDep)^2 \times 10,000$. This is Herfindahl-Hirschman deposits index in which Dep is bank i's deposit and TDep is total deposit for all banks in one country. $HHI_LOAN = \sum (Loan/TLoan)^2 \times 10,000$. This is Herfindahl-Hirschman loans index in which Loan is loan of bank i and TLoan is total amount of loan for all banks in one country. $HHI_ASSET = \sum (Asset/TAsset)^2 \times 10,000$. This is Herfindahl-Hirschman assets index in which Asset indicates the asset of bank i and TAsset is total amount of assets for all banks in one country. NPLs = Nonperforming loans / Total loans. This is a measure of the amount of loans that are impaired. NONII = Non-interest income / Gross revenue. This ratio shows the amount of fee, trading and asset sale income, rather than interest income, to total revenues. ST_CA_GDP = Stock market capitalization / GDP. This indicator is the ratio of listed shares to GDP, and measures the stock market size relative to the size of the country's economy. ST_TR_GDP = Stock market total value traded / GDP. This is the ratio of total stock shares traded to GDP, and indicates the degree of liquidity of stock markets. PRI_BO_GDP = Private bond market capitalization / GDP. This is one indicator measuring the size of the domestic bond market. PUB_BO_GDP = Public bond market capitalization / GDP. This indicator is the ratio of domestic debt securities issued by public domestic entities to one country's economic activity. DEBT_GDP = International

debt issues / GDP. This ratio depicts the net flow of international bond issues relative to economic activity of a country.

To capture the effect of financial deepening of the country's financial activity, we include stock market capitalization to GDP (ST_CA_GDP), stock market total value traded to GDP (ST_TR_GDP) in the first three models. It shows that the variable, stock market capitalization as percent of GDP, has negative impact on the bank stability. The empirical findings show that financial system appears to matter in the bank risk behavior for emerging countries. The result may help illustrating the evolving process of banking system stemming from emerging countries to developed countries. In addition, the Z-Scores allow comparing the default risk of banking system in groups of financial institutions with complex effects of liberalization and deregulation due to various ownership and objectives presented between emerging and developed countries. Our results at least reveal a desirable impact on financial stability due to different financial system, inevitably when banks reduce risk due to change in market power and economic environment. Therefore, our results confirm findings of Beck et al. (2006a, 2006b) and Schaeck et al. (2007) that competition and concentration might show different characteristics of banking systems and mean that concentration is an insufficient measure of bank competitiveness.

We also report the robustness test in Model IV regarding the effect of financial deepening and market concentration on the bank stability. The finding depicts that stock market capitalization as percent of GDP, has no significant impact on the bank stability as shown in the Model I-III. However, there possibly exists market deepening variable (stock market capitalization to GDP) impact negatively on the bank stability. Moreover, with a financial system evolving from emerging country to developed one, the more market-driven financial system is, the more likely banks might take much higher risk activity. (Wen and Yu, 2012). Given the 2007-2009 global financial crisis and the ongoing Eurozone' solvency crisis, we suggest that financial deepening ratio play an important role assessing performance of financial intermediary when emerging market become developed one.

5 Remarking Conclusions

The literature wisdom shows that both theoretical and empirical studies provide contradictory predictions about the relationship between market concentration or competitiveness and financial stability in the banking system. In the past two decades, the structure of banking industry of many countries went through many changes and has shifted from traditional intermediation activities, such as traditional deposit and loans products, towards to activities that could generate much more non-interest income.

In this paper, we test the theories by using panel data analysis of bank stability on market concentration, financial deepening, bank income structure and international debt level for 18 emerging countries. Our study differs from previous approaches in a number respects. First, the impact of market concentration on financial stability of banking has been analyzed intensely with possible relationships between market structure, financial depth and international debt level analyzed. Second, by constructing Z_SCORE and three HHI indexes covering asset, loan, and deposit data for 18 emerging countries, we try to shed more light on the traditional debate over the relationship between concentration and bank

stability. Third, results of this paper present interesting observation whether banks in emerging country follow the progress when liberalizing, especially in a market-based financial system.

Our results show clearly there are differences in characteristics of banking systems and market structure inducing various levels of profitability in our sample, and that a significant amount of this variation can be explained by the factors in our analysis. We could not reject the view that concentration measurement is a proxy for financial stability in banking industry. Especially, we conjecture two reasons for observing the instability of the bank's performance in the market of emerging countries. First, performance of banks depends on existing market structure. Second, in country with the financial system which is much more prone to market-based, banks voluntarily might take much higher risk activity. Our results show that alternative financial system plays an important role in the bank risk behavior. The potentially important policy implication is that policies supporting financial deepening or promoting liquidity in the banking industry might not necessarily improve banking stability. One needs to take into consideration of banks competitiveness incorporates with degrees of financial depth and macroeconomic factors evolvement. Liberalized financial system analogously is not necessarily the ultimate solution.

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