# Banking Concentration and Financial Stability
# New Evidence from Developed and Developing Countries

**Mohamed Sami Ben Ali**
*College of Business and Economics, Qatar University, Qatar.*

**Timoumi Intissar**
*Senior Bank Advisor, BNA Bank, Tunisia.*

**Rami Zeitun**
*College of Business and Economics, Qatar University, Qatar.*

**Abstract:**

In this paper, we analyze the relationship between banking concentration and financial stability for a sample of 156 developed and developing countries during the period 1980-2011. Our study first examines the direct effect of banking concentration on financial stability. The results provide evidence that concentration does not directly affect the stability of the financial system. The study also investigates two indirect channels (profitability and interest margin) and finds that concentration has a positive and stabilizing impact on financial stability through the profitability channel and a negative and destabilizing impact through the interest rate channel.

When considering the level of development across countries, our results support the existence of a stabilizing effect of concentration on financial stability and the absence of a destabilizing interest channel for developing countries. Interestingly, our results also indicate that concentration has a direct and indirect effect on financial stability during crisis periods, but no direct effect on financial stability during normal periods.

## 1. INTRODUCTION

In recent decades, financial instability has become a major source of concern worldwide. The proliferation and recurrence of financial crises since the 1980s, which affected both developed and developing countries, as well as the socio-economic costs they generated are the main reasons for this concern. A significant component of this concern lies in the central role of banks at the heart of countries' growth dynamics.

International banking activity has undergone dramatic changes in terms of banks' structure, status and regulations in a competitive and changing environment. Financial deregulation endorsed the market entry of non-bank financial institutions. In addition, bank deregulation caused significant structural changes that impacted the fragility of financial systems.

The idea that emerges highlights the importance of banking concentration and the creation of stronger banks to have more stable financial systems. As a result, a broad movement of mergers and acquisitions has emerged around the world, and banks dramatically decreased in number but increased in size. Arguments that emerge in the literature have not, however, all documented a positive effect of concentration on financial stability. The empirical literature dealing with this relationship presents two possible connections in the sense that the concentration may promote stability (Beck et al., 2006; Evrensel, 2008), as it can also be a source of instability (Boyd et al., 2006; Uhde and Heimeshoff, 2009 and Shehzad et al., 2009).

Whether banking concentration is a source of stability or, on the contrary, an amplification factor of banking crises is a subject that requires particular attention because banks' financial situation heavily impacts the real economy (Dell'Ariccia et al., 2008, Kroszner et al., 2007). Most of the previous studies examined the direct effect of banking concentration on financial stability and financial crises. Except for a few studies (Bretschger et al., 2012, among others), the indirect effect of concentration on financial stability has not been extensively investigated. Moreover, no serious study has investigated if these channels act identically in crisis and in normal periods. The current study takes further steps and intends to fill this gap by examining the direct and indirect effect of banking concentration on financial stability for a large sample of 156 developed and developing countries during the period 1980-2011. Three distinct motivations, thus contributions, drive our study. First, this study intends to bring new insight to the current empirical literature in this field. Second, it considers a large panel of 156 developed and developing countries, which will deliver more robust empirical results and helps comparing our results with the existent results in the literature. Third, more importantly, the study examines the existence of the direct and indirect effects of banking concentration on the likelihood of a financial crisis during normal and crisis periods.

The remainder of the paper is organized as follows. Section 2 covers the relevant literature on the banking concentration and financial stability nexus. Section 3 discusses the methodology, data description and estimation procedures. Section 4 presents the empirical results. Section 5 concludes and presents some policy implications.

## 2. LITERATURE OVERVIEW

The literature on the banking sector structure and financial stability nexus is concentrated around two distinct strands with utterly opposite conclusions. The first strand supports the idea that banking concentration has a destabilizing effect (concentration-fragility hypothesis), and the second one provides support for a positive relationship between concentration and financial stability (concentration-stability hypothesis).

Several empirical studies report a positive relationship between banking concentration and the stability of the financial system through the bank profitability channel. Employing a sample of 134 countries during the period 1993-2004, Boyd et al. (2006) show that concentrated banks display higher profits. The same results were confirmed by Uhde and Heimeshoff (2009) for 25 countries in the European Union during the period 1997-

2005. Berger et al. (2009) highlight the risk channel as favoring the positive concentration-stability nexus. They show that the overall bankruptcy risks supported by a bank decreases with the increase of their market power. Indeed, banks would hold a larger capital share, which would increase their ability to absorb losses. Other theoretical contributions have considered the impact of market power on financial stability highlighting the greater profits of companies having dominant positions (Freixas and Rochet, 2008). Greater profits associated with market power can increase banks' capital and subsequently, their ability to absorb shocks in an unstable financial situation (Vives, 2010). Banks that are more concentrated are, therefore, less prone to liquidity or macroeconomic shocks. Matutes and Vives (2000) argue that market power emerging from a concentrated banking market encourages shareholders and managers not to engage in highly risky operations and to better choose their customers, which strengthens the financial system stability. Therefore, the probability of a bank run occurrence would be lower in a concentrated system (Smith, 1984). Similarly, Saez and Shi (2004) argue that in a concentrated system, the number of banks is limited, and no entity has an interest in the bankruptcy of others banks because the opportunity costs for bankruptcy is higher for the entire banking system (Northcott, 2004). Further arguments supporting the same idea show that a banking system with larger banks could facilitate access to information, mitigate adverse selection problems (Fernandez et al., 2010 and Márquez, 2002) and reduce moral hazard (Freixas and Rochet, 2008).

In addition to these channels between banking concentration and financial stability, the literature highlights other channels, such as the diversification channel. Diversification, the creation of multiple activities and internationalized banks can promote financial stability, as banks become less sensitive to national economic conditions. In addition, mergers and acquisitions, as a dynamic for concentration, could help achieve economies of scale that increase banking diversification (Williamson, 1986, 1987). Numerous studies highlight the important role of diversification in risk reduction, particularly loan portfolio diversification. Stever (2007), for example, argues that small banks are more risky because they have fewer opportunities for diversification, which may cause higher profit volatility. Beck et al. (2007) show that it is mainly through diversification that concentration improves financial stability.

The stability-market structure nexus could also be explained by arguments that emphasize the complexity of the banking system. Allen and Gale (2000) argue that in a concentrated banking system where only a few large institutions are present, it become easier to supervise them, which consequently reduces the moral hazard problems. A concentrated banking system has more market power to increase profits and reduce risk taking, hence decreasing the likelihood of a financial crisis by decreasing banking insolvency.

The second strand in the literature dealing with the concentration-financial stability nexus supports the possibility of a negative relationship demonstrating that a concentrated market could have a destabilizing effect on financial stability by referring to the "*too big to fail*" thesis. The implicit or explicit assurance of being rescued in case of bankruptcy encourages risk-taking by banks, which will ultimately increase systemic risk (Mishkin, 1998). Berger et al. (2009) suggest the existence of a negative impact of higher concentration on banks' portfolios and confirm the destabilizing concentration thesis. Banks having power in the market would increase interest rates on loans, which would in turn eliminate the least risky part of the banks' customers. A bank default risk would surge, which would induce more bankruptcies. Thus, the more concentrated the banking system is, the more risky is the loan portfolio. A study by Boyd et al. (2006) utilizing data from 134 countries during the period 1993-2004 shows that the effect of riskier portfolios dominates despite the existence of high revenues related to the banking concentration and market power giving rise to a destabilizing impact on the financial system. This situation is even more risky given that the big banks generally seek to minimize the costs of monitoring, pushing them to concentrate their lending in a single industry to achieve economies of scale in information gathering. Loan portfolio diversification would, therefore, decrease and banks would become much more sensitive to shocks with a negative impact on financial system stability.

## 3. METHODOLOGY, DATA AND MODELS

This study empirically examines the relationship between bank concentration and financial stability. It is worth noting that the literature has not reached a consensus on the nature of this relationship. Most of the empirical studies seek to establish the existence of a direct effect of bank concentration on financial stability without

recognizing the importance of potential indirect effects. In this study, we first assess the existence of a direct effect. Then, we examine the existence of indirect effects.

We consider a broad definition of financial instability by considering its occurrence when a crisis erupts in a given country. Laeven and Valencia (2010) state that "*Crises are given by a simple binary variable that equals one if country i at time t experiences a financial crisis, and zero otherwise*." Empirically, Laeven and Valencia's (2012, 2010) approach considers that systemic crises are actual and not potential. Specifically, the occurrence of a systemic banking crisis (SYSC) is a binary variable governed by bank-specific, industry-specific and a list of macroeconomic control variables (X). Bank specific variables are represented by the net interest margin employed to assess the profitability of a bank's lending activities (NIM). We also utilize another profitability measure captured by the return on assets (ROA). The banking industry specific variable is captured by market concentration (CONC). Therefore, to examine the direct effect of banking concentration on financial stability, we estimate a linear model in the following form:

$$SYSC_{it} = \alpha_0 + \alpha_1 CONC_{it} + \alpha_2 ROA_{it} + \alpha_3 NIM_{it} + \varepsilon_{it} \quad (1)$$

Following Bretschger et al. (2012) the study utilizes per capita GDP (PGDP), GDP growth rate (GDPG) and inflation (INF) as macroeconomic variables. Macroeconomic variables are represented by the matrix (X). In addition, the binary deposit insurance variable (INS) is included as an important variable driving the concentration-stability nexus that indicates whether the country has or not a deposit insurance (Beck et al., 2013). Thus, our second model will be as follows:

$$SYSC_{it} = \beta_0 + \beta_1 CONC_{it} + \beta_2 ROA_{it} + \beta_3 NIM_{it} + \beta_4 INS_{it} + \beta_5 X + \varepsilon_{it} \quad (2)$$

After investigating the existence of a direct channel through which concentration may affect the likelihood of financial instability, we investigate the existence of potential indirect effects by testing two transmission channels. The first channel employs return on assets (ROA) and supports the argument that a concentrated banking system has greater market power and thus, has significant revenues that could increase banks capacity to absorb negative shocks. The effect of the first channel on the financial system is, therefore, stabilizing. The second channel employs the net interest margin. The argument is that large concentrated banks display higher interest rates, which are likely to eliminate the least risky of the customers who prefer not to borrow at higher rates. The bank loan portfolio quality is likely to deteriorate, thereby increasing the occurrence of crises. The impact of the second channel on the financial system is, therefore, destabilizing.

As in Bourke (1989), Molyneux and Thornton (1992), Athanasoglou et al. (2008), and Bretschger et al. (2012), among others, we define the two models representing our two transmission channels:

$$ROA_{it} = \lambda_0 + \lambda_1 ROA_{it-1} + \lambda_2 CONC_{it} + \lambda_3 Y + \varepsilon_{it} \quad (3)$$

$$NIM_{it} = \delta_0 + \delta_1 NIM_{it-1} + \delta_2 CONC_{it} + \delta_3 Y + \varepsilon_{it} \quad (4)$$

where Y is a set of macroeconomic and bank-specific variables. Per capita GDP, GDP growth rate and the inflation rate are the macroeconomic variables. The cost to income ratio (CIR) is included to control for bank specific characteristics (Bretschger et al., 2012).

The assumption that concentration has a stabilizing effect suggests a negative relationship between banking concentration and financial instability. Therefore, we expect a positive relationship between ROA and concentration and a negative relationship between asset returns and financial instability. As for the destabilizing channel, we expect a positive relationship between concentration and the net interest margin, on one side, and a positive relationship with the probability of a crisis occurrence, on the other side.

To highlight the effect of these channels on financial stability, we use the estimated values of ROA and NIM with other control variables and estimate the following model:

$$SYSC_{it} = \mu_0 + \mu\widehat{ROA} + \mu_2\widehat{NIM}\,\widehat{NIM} + \mu_3 X + \varepsilon it \quad (5)$$

Because our dependent variable is binary, we employ the probit model. To check the robustness of our results, we estimate a logit model

As presented in Appendix A, the study considers a sample of 156 developed and developing countries during a period of 32 years (1980-2011). This relatively large amount of data will improve the accuracy of our estimations. In addition, the period of the study allows us to consider two major systemic crises that have particularly affected banking institutions around the world: the Asian crisis (1997) and the subprime crisis (2008). In addition, it considers relatively stable periods such as the one from 2003 to 2006. All variables are summarized in Table 1.

Equations (3) and (4) are estimated utilizing the Generalized Method of Moments (GMM) system. In this regard, using a dynamic estimation model, such as GMM, is the appropriate econometric technique (Athanasoglou at al., 2008). Using GMM method could take into account measurement errors but mainly potential correlations between the independent variables (Baltagi, 2001). We run a Sargan test to examine the validity of instruments. To test for the second autocorrelation of the residuals, the Arellano-Bond test is employed (Arellano and Bond, 1991). In addition, a stationary test is performed for all variables in our sample to ensure the validity of our results because we have a large period in a panel framework that may be affected by non-stationary data (Maddala and Wu, 1999).

**Table 1. Definitions of Variables and Sources**

| Variable | Proxy | Definition | Source |
|---|---|---|---|
| **SYSC** | Systemic crisis | Dummy variable (0,1) | Laeven an Valencia (2012) |
| **ROA** | Return On Assets | Net income/total assets | Beck et al. (2013) |
| **NIM** | Net Interest Margin | Net interest income / total earnings assets | Beck et al. (2013) |
| **CONC** | Concentration | Assets held by the three largest banks in each country | Beck et al. (2013) |
| **INS** | Deposit Insurance | A dummy variable that takes a value of one if the country has deposit insurance, and zero otherwise | (Barth et al., 2012) |
| **CIR** | Cost Income Ratio | Total costs /total income of all commercial banks | Beck et a.l (2013) |
| **INF** | GDP deflator (annul %) | The ratio of nominal GDP / real GDP | World Development Indicators |
| **PGDP** | Per capita GDP | The country's GDP / population | World Development Indicators |
| **GDPG** | Per capita GDP growth | Annual % growth rate of per capita GDP. | World Development Indicators |

## 4. Results and Discussion

The table in Appendix B provides the descriptive statistics for the full sample and subsamples (developing and developed countries). The average concentration ratio for developed countries is slightly higher compared with developing countries (0.77 and 0.71, respectively). The correlation matrix presented in Table 2 shows that the return on assets and the net interest margin are positively correlated with concentration, which is consistent with theoretical predictions stating that higher banking concentration is consistent with higher profits stemming from high interest rates. Profitability is negatively correlated with financial instability. The NIM is positively correlated with the probability of crisis. The results also report a negative relationship between concentration and the financial system instability.

**Table 2. Pairwise Correlation Matrix**

| Variables | SYSC | CONC | NIM | ROA | INS | INF | PGDP | GDPG |
|---|---|---|---|---|---|---|---|---|
| **SYSC** | 1.0000 | | | | | | | |
| **CONC** | -0.0801 | 1.0000 | | | | | | |
| **NIM** | 0.1518 | 0.0515 | 1.0000 | | | | | |
| **ROA** | -0.2618 | 0.0520 | 0.2314 | 1.0000 | | | | |
| **INS** | -0.2123 | -0.2397 | -0.1181 | -0.1271 | 1.0000 | | | |
| **INF** | -0.0251 | 0.0442 | 0.3678 | 0.0452 | -0.0371 | 1.0000 | | |
| **PGDP** | 0.1896 | 0.0545 | -0.5120 | -0.1365 | 0.1503 | -0.1423 | 1.0000 | |
| **GDPG** | 0.1760 | -0.0455 | 0.0423 | 0.1245 | 0.0430 | -0.0021 | -0.1495 | 1.0000 |
| **CIR** | 0.1512 | -0.1075 | 0.1313 | -0.0968 | 0.1769 | 0.0427 | -0.1071 | -0.0495 |

Table 3 reports the estimations outcomes for models (1) and (2) for the full sample. The results indicate a negative but insignificant relationship between banking concentration and financial instability in all models. This result suggests that a change in the overall concentration would not have a significant impact on financial instability, all other things being equal. This result suggests the absence of any direct effect of concentration on financial stability. The concentration-stability nexus is therefore indirect. We will investigate any potential channels through which concentration may affect stability. This could also be the result of the heterogeneity of our sample. This will be further investigated in the remaining of the paper. This finding is in line with earlier studies such as Ruiz-Porras (2007) and Bretschger et al. (2012), among others. It is worth noting in this regard that the results stemming from empirical studies addressing the effects of banking concentration on financial stability report different findings depending if a z-score or a dummy variable is utilized. Studies employing a dummy variable report a positive relationship between concentration and instability (Laeven and Valentia, 2008, among others), whereas studies employing the z-score find a negative relationship between concentration and instability (Boyd et al., 2006; Shehzad et al., 2009, among others).

The profitability as measured by ROA negatively and significantly influences the probability of a systemic financial crisis. The negative sign of the coefficient in all models supports the argument that the occurrence of a crisis decreases with the level of profitability. This result give evidence that most likely that the first transmission channel of concentration on financial stability is through the profitability channel. This implies that the higher the return on assets, the lower the risk of financial instability. A bank's ability to generate sufficient and sustainable profitability increases its continuity in the market. In this regard, Berger et al. (2009) found that the overall bankruptcy supported by a bank decreases with the increase in market power. Their findings provide evidence that banks having a larger share of capital increase their capacity to absorb losses. Banks of large size tend to have higher economies of scope by having access to markets, and small banks cannot afford them (Heggestad, 1977).

Our results regarding the NIM provide evidence for the positive and significant effect of the net interest margin on financial instability. This positive and significant relationship is due to the destabilizing effect of excessive risk-taking by banks. Higher interest rates attract risky borrowers, which will increase the likelihood of bank failures and equally reduce financial system stability. Similarly, the net interest margin is most probably affecting financial stability indirectly and could therefore be an indirect transmission channel of concentration on financial stability.

The regression coefficient obtained for the deposit insurance variable (INS) is significantly positive. This result is in line with Mitchener and Wheelock (2013), who show that deposit insurance increases the occurrence of a crisis. In the same line of thought, Maggie et al. (2014) find that higher deposit insurance leads to higher bankruptcy. This result is particularly in line with the *moral hazard* assumption, which indicates that the existence of guarantees on deposits encourages shareholders to acquire maximum debt assets with maximum risk, which increases the risk of instability. For macroeconomic variables, inflation is positively but not significantly affected the probability of crisis occurrence.

**Table 3. Systemic Crisis – Direct Channel for The Full Sample**

| Regressions | Model (1) | | Model (2) | | | |
|---|---|---|---|---|---|---|
| | Logit | Probit | Logit | Probit | Logit | Probit |
| **CONC** | -0.0024 | -0.0037 | -0.0057 | -0.0009 | -0.0046 | -0.0084 |
| **ROA** | -0.0114*** | -0.1468*** | -0.1002*** | -1.2505*** | -0.4466*** | -0.1172*** |
| **NIM** | 0.0676** | 0.0214** | 0.0004* | 0.0165* | 0.0022* | 0.0082* |
| **INS** | | | 1.0639*** | 3.6400*** | 1.0024*** | 2.8653*** |
| **GDPG** | | | | | -0.0532*** | -0.0044* |
| **PGDP** | | | | | 0.0023** | 0.0012 |
| **INF** | | | | | 0.0003 | 0.0006 |
| **Constant** | -2.2471*** | -3.9892*** | -1.3016*** | -3.5790*** | -2.2705*** | -4.1729*** |
| Log likelihood | -370.224 | -355.998 | -317.976 | -368.660 | -337.010 | -349.820 |
| Wald chi2 (3; 4; 6) | 44.75 | 26.20 | 31.68 | 62.45 | 51.22 | 44.55 |
| Prob>chi2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| rho | 0.5474 | 0.5212 | 0.5662 | 0.4942 | 0.3667 | 0.4812 |
| chibar2(01) | 81.40 | 90.21 | 56.00 | 62.58 | 65.30 | 51.93 |
| Prob>= chibar2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Nb. Countries | 156 | 156 | 156 | 156 | 156 | 156 |
| Observations | 1660 | 1660 | 1660 | 1660 | 1608 | 1608 |

The Wald test is used to test the contribution of each predictor in the model and therefore its significance, with the degree of freedom in the parenthesis. The Wald test statistics presented in this Table show that our results have high significance. Rho denotes to the proportion of the remaining variance from the variance across countries in our sample. For example, in this table, approximately 55 % of the variance in financial stability occurrence is across countries. Chibar is the likelihood ratio test of rho.
***, **, and * indicate significance levels at 1, 5, and 10 percent, respectively.

Inflation in the sample countries could not be considered as a main factor explaining financial stability in the sample countries. In general the impact of inflation on profitability and therefore on financial instability/instability depend on the degree to which bank income and expenses increased relative to operating costs and this depend on the degree to which banks managers are able to anticipate inflation and therefore to increase lending interest rates (Athanasoglou et al., 2008). In our estimation, the impact of the GDP per capita growth rate on financial instability is however negative and highly significant in all regressions. This result suggests that higher economic growth lowers the probability of financial instability (Beck et al., 2006; Allen et al., 2012). Higher economic growth means more banking and lending activities for banks and therefore more profit and this will in turn lower bank default and bankruptcy.

Estimation results of Equations (3) and (4) utilizing the System GMM are displayed in Table 4. The results exhibit a positive and significant relationship between concentration and ROA, on the one hand, and with the NIM, on the other hand. This finding is consistent with previous studies including Bourke (1989), Molyneux and Thornton (1992), Athanasoglou et al. (2008), and Bretschger et al. (2012), among others. This result suggests that a higher level of bank concentration leads to monopoly profits as argued by Molyneux and Thornton (1992). This result is also confirmed by Boyd et al. (2006) and Srairi (2010), who show that banking concentration and profitability are positively correlated because banks having higher market power display higher profits.

Estimations outcomes suggest that bank concentration is positively and significantly affecting net interest margin. This finding is supported by the idea stating that concentration increases loan-interest rates and higher lending rates, which tend to eliminate the least risky bank customers who prefer not to borrow at these rates

(Beck et al., 2007). As a result, the portfolio loan's quality would deteriorate, which would increase the probability of bankruptcy (Bretschger et al., 2012).

**Table 4. ROA and NIM Channels Using GMM System**

| Regressions | GMM System | |
|---|---|---|
| | **ROA** | **NIM** |
| **ROA (t-1)** | 0.0625 *** | |
| **NIM (t-1)** | | 0.4520*** |
| ***CONC*** | 0.0166*** | 0.3002*** |
| ***GDPG*** | 0.0321*** | 0.0379** |
| ***PGDP*** | 0.0368* | -0.0143 |
| **INF** | 0.0565*** | 0.0196*** |
| ***CIR*** | -0.0001 *** | -0.0002*** |
| ***Constant*** | 1.53 | 3.13*** |
| AR(1) | -1.2917 | -5.0883 |
| | (0.3062) | (0.1068) |
| AR(2) | 0.3721 | -0.7003 |
| | (0.7098) | (0.4367) |
| Sargan | 56.9175 | 83.7258 |
| | (0.6001) | (0.2109) |
| Nb. countries | 156 | 156 |
| Observations | 1206 | 1206 |

***, **, and * indicate significance levels at 1, 5, and 10 percent, respectively.

The results also show that the GDP per capita growth rate is positive and significant in both models (ROA and NIM). This result suggests that economic activity positively impacts bank performance because higher economic growth leads to higher consumption and investment and therefore, to higher credit, which consequently increases bank performance (Goddard et al., 2004; Schwaiger and Liebig, 2008). Consistent with Srairi (2010), profitability is found to be positively and significantly affected by inflation. The effect of inflation on profitability would depend on the degree to which bank income and expenses increased relative to inflation (Revell, 1979; Athanasoglou et al., 2008).

To present the indirect effect of bank concentration on financial stability, we estimated Equation (5). The results presented in Table 5 reports that high return on assets is associated with lower financial instability. However, higher net interest margins increase the likelihood of a crisis. Our results also show that the coefficient of GDP growth rate is negative and significant using ROA model. This result suggests that an increase in economic activity positively impacts bank performance and thereby, decreases the probability of crisis occurrence. This result suggests that higher economic growth is consistent with an increase in consumption and investment, which would lead to higher credit demand, and at the same time, an increase in bank performance (Goddard et al., 2004; Schwaiger and Liebig, 2008).

**Table 5. Systemic Crisis – Indirect Effects**

| | **Logit** | **Probit** |
|---|---|---|
| **ROA** | -0.0997*** | -0.1065*** |
| **NIM** | 0.0034*** | 0.0021*** |
| **INS** | 3.1459** | 2.1589*** |
| **GDPG** | -0.1160 | -0.1247*** |
| **PGDP** | 0.0145 | 0.0024 |
| **INF** | 0.0035*** | 0.0028 |
| **Constant** | -6.5137*** | -4.6813*** |
| Log likelihood | -332.6654 | -330.9521 |
| Wald chi2 (5) | 70.12 | 80.73 |
| Prob>chi2 | 0.0000 | 0.0000 |
| rho | 0.5067 | 0.5009 |
| chibar2(01) | 56.34 | 59.01 |
| Prob>= chibar2 | 0.000 | 0.000 |
| Nb. Countries | 156 | 156 |
| Observations | 1606 | 1606 |

***, **, and * indicate significance levels at 1, 5, and 10 percent, respectively.

The level of economic development might affect the predisposition of a country to financial instability. To check the validity of our initial results and test it across countries, we run a set of regressions by subsamples depending of their level of development (developed and developing countries). Table 6 provides the results of the direct and indirect effects of concentration on financial stability for models (1) and (2) for both subsamples. The results show that the coefficients of the return on assets and net interest margin have the anticipated effect on financial instability in both developed and developing countries. However, we are still obtaining no evidence of a direct effect of banking concentration on financial instability in both developed and developing countries. We suspect as for the whole sample the existence of potential indirect channels through which financial stability/instability is impacted. To examine the existence of any indirect transmission channels across the two subsamples employing the GMM system (see Table 7). The results present robust support to suggest the existence of a positive and significant effect of concentration on profitability (ROA) in both developed and

developing countries. However, contrary to developed countries, we report no significant relationship between banking concentration and the interest margin (NIM) in developing countries.

**Table 7. ROA and NIM Channels – GMM Estimates**

| | **Developing countries** | | **Developed countries** | |
|---|---|---|---|---|
| **Regressions** | **ROA** | **NIM** | **ROA** | **NIM** |
| **ROA (t-1)** | 0.2050 *** | | 0.310 2*** | |
| **NIM (t-1)** | | 0.1103*** | | 0.1075** |
| ***CONC*** | 0.1893*** | 0.1164 | 0. 9138*** | 0.1973*** |
| ***GDPG*** | 0.1810 | 0.9567*** | 0.3150*** | 0.4321** |
| ***PGDP*** | -0.0102*** | -0.0104 | -0.0009*** | -0.0102 |
| **INF** | 0.0115*** | -0.0821 | 0.0601 | -0.0120 |
| ***CIR*** | -0.0184 ** | -0.1870*** | -0.2083 *** | -.0001*** |
| ***Constant*** | 9.0112*** | 13.0061** | 7.1505*** | 5.3562*** |
| AR(1) | -2.5012 | -1.1032 | -3.1026 | -2.5952 |
| | (0.1650) | (0.1251) | (0.9830) | (0.1427) |
| AR(2) | 2.4811 | -0.9573 | -0.5861 | -1.0135 |
| | (0.3750) | (0.1832) | (0.6081) | (0.3749) |
| Sargan | 68.1164 | 85.2083 | 60.6701 | 51.7018 |
| | (0.2510) | (0.1183) | (0.1483) | (0.4208) |
| Nb. countries | 115 | 115 | 41 | 41 |
| Observations | 980 | 980 | 466 | 466 |

***, **, and * indicate significance levels at 1, 5, and 10 percent, respectively.

This result suggests that the net interest margin is driven by other factors in developing countries. Financial systems in developing countries are generally less developed. Because of high transaction costs and the absence of economies of scale, lending rates may be too high. Therefore, high net interest margins may occur due to existing deficiencies rather than high market concentration (Bretschger et al., 2012). Interestingly, the estimated coefficient of concentration in developed countries (0.914) is higher compared with developing countries (0.189), reflecting the economic importance of concentration on banks' profitability ROA in developed countries. Furthermore, GDPG is found to have a positive and significant impact on banks performance in developed countries, whereas GDPG has a positive but insignificant impact in developing countries.

**Table 8. ROA and NIM Channels – GMM Estimates**

| | 1980→1995 | | 1996→2006 | | 2007→2011 | |
|---|---|---|---|---|---|---|
| **Regressions** | **ROA** | **NIM** | **ROA** | **NIM** | **ROA** | **NIM** |
| **ROA (t-1)** | 0.3010 *** | | 0.4125*** | | 0.2458*** | |
| **NIM (t-1)** | | 0.1006*** | | 0.2108** | | 0.1146** |
| ***CONC*** | 0.1243** | 0.5429 | 1. 1023*** | 1.0061*** | 0.8240*** | 0.2462*** |
| ***GDPG*** | 0.4721** | 0.8462* | 0.3351*** | 0.3250** | 0.2580*** | 0.3427** |
| ***PGDP*** | -0.0082*** | -0.0117 | -0.0011*** | -0.5431 | -0.0011*** | -0.0102 |
| **INF** | 0.0241*** | -0.0905 | 0.5106 | 0.5132 | 0.0871 | -0.0116 |
| ***CIR*** | -0.0112 ** | -0.2013*** | -0.0824*** | -0.4201*** | -0.2591*** | -0.0014*** |
| ***Constant*** | 8.4120*** | 10.1132** | 9.1823*** | 8.0215*** | 8.5512*** | 6.6072*** |
| AR(1) | -1.8020 | -1.1589 | -2.2651 | -1.9041 | -4.0013 | -3.1957 |
| | (0.6580) | (0.2590) | (0.5022) | (0.5481) | (0.5621) | (0.5623) |
| AR(2) | 2.3497 | -0.8510 | -0.1687 | -2.5420 | -0.1572 | -1.2160 |
| | (0.6213) | (0.2146) | (0.5127) | (0.7420) | (0.6124) | (0.7128) |
| Sargan | 82.0124 | 80.2143 | 65.5427 | 58.1249 | 63.8162 | 65.5471 |
| | (0.1302) | (0.1276) | (0.1350) | (0.5701) | (0.1820) | (0.2716) |
| Nb. countries | 156 | 156 | 156 | 156 | 156 | 156 |
| Observations | 1120 | 1120 | 842 | 842 | 656 | 656 |

***, **, and * indicate significance levels at 1, 5, and 10 percent, respectively.

To sum up, our results provide support to the suggestion that concentration has a stabilizing impact on financial stability for developing countries. However, the concentration-fragility hypothesis does not hold for these countries. Moreover, concentration is found to positively impact profitability and net interest margin as well. Our results also support both hypotheses regarding concentration: the stabilizing and destabilizing effect of concentration on financial stability. The presence of a corrupted environment, the lack of sound and committed institutions to monitor the banking system in developing countries is a key point in explaining these differences.

To further develop our estimations and analyze the robustness of our results, we split our period of study into three sub-periods. This decomposition is based on the occurrence or the absence of international crises during these sub-periods that could impact banking stability. The first period is from 1980 to 1985, where no major

international crises have been recorded. The second sub-period is from 1996 to 2006. Two main crises have been recorded during the second period: the Asian financial crisis in 1996-1997 and the Russian financial crisis (1998) that had an impact and spread worldwide. The third sub-period is from 2007 to 2011, during which the subprime financial crisis erupted in the United States in 2008 and then, had major repercussions worldwide.

The estimation results are presented in Tables 8 and 9. The concentration coefficient for the first sub-period 1980-1985 is not significant, demonstrating the absence of any direct effect of bank concentration on financial stability. However, we report a stabilizing indirect effect since concentration is showing a positive and significant effect on ROA and therefore, on bank stability in the sense that more profitability induces less financial instability.

As for the second sub-period, our results show that the coefficient of concentration is negative and significant which suggests the existence of a direct and indirect effect of concentration on financial instability. Concentration has a positive effect on profitability, and it is negatively correlated to crisis occurrence. Therefore, there is an indirect effect of concentration on stability as shown in Table 9. Furthermore, for the sub-period 2007-2011, the results show also a negative and significant effect of concentration on financial instability. This implies that more concentration decreases financial instability.

## 5. CONCLUSION AND POLICY IMPLICATIONS

Two main strands of the literature exist regarding the relationship between banking concentration and financial stability. The first strand highlights the effect of the return on assets as a stabilizing channel. The second strand highlights the effect of net interest margin as a destabilizing one.

Our study focused on the relationship between banking concentration and financial stability by exploring both the direct and indirect channels. The results showd that concentration does not directly affect the stability of the financial system. As regards the indirect channels, our results show that concentration has a positive and stabilizing impact on financial stability through the profitability channel. This supports the evidence that additional revenues related to banking concentration could increase banks' capital and subsequently, their ability to absorb negative shocks during financial crises. Our results also support the existence of a negative and destabilizing impact through the interest rate channel. This argument suggests that banks that are more concentrated charge higher interest rates, which would eliminate the least risky part of the customers who prefer not to borrow at those rates.

When considering the level of development across countries, our results support the existence of a stabilizing effect of concentration on financial stability for developing countries. This shows that banking systems in developing countries are highly concentrated, which improve their ability to absorb shocks. Our results report the absence of the destabilizing interest channel for these countries. This argument suggests that banks in these countries are not applying a risky interest rate policy, which helps them keep a good quality of customers in their portfolios.

Further estimations of our models indicate that concentration has a direct and indirect effect on financial stability during crisis periods. Nevertheless, concentration has an insignificant direct effect on financial stability during normal periods. These findings have major policy implications in both developed and developing countries as they suggest that concentration helps in improving the banking systems' stability. Macroeconomic policies are advised to increase banks concentration in normal periods because this will highly improve their robustness, resiliency and capacity to absorb negative shocks when a crisis erupts.

**Table 6. Systemic Crisis – Direct and Indirect Effects**

| | Direct Effect | | | | | | | | Indirect Effects | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Developing Countries | | | | Developed Countries | | | | Developing Countries | | Developed Countries | |
| | Model (1) | | Model (2) | | Model (1) | | Model (2) | | | | | |
| Regressions | Logit | Probit | Logit | Probit | Logit | Probit | Logit | Probit | Logit | Probit | Probit | Logit |
| **CONC** | 0.0082 | 0.0091 | 0.0110 | -0.1102 | -0.0135 | -0.1501 | -0.2017 | -0.0124 | | | | |
| **ROA** | -0. 5006*** | -0.1165*** | -0.3412*** | -0.1286*** | -0. 1158*** | -0.0812*** | -0.1126*** | -0.0681*** | -0.6240*** | -0.1761*** | -0.2586*** | -0.1803*** |
| **NIM** | 0.3709** | 0.1327** | 0.3123*** | 0.1378*** | 0.0210** | 0.0013* | 0.0154** | 0.0101** | 0.0146 | 0.0182 | 0.0125** | 0.0113* |
| **INS** | | | 1. 0027 | 0.0450*** | | | 1.1191*** | 1.9354*** | 0.1386*** | 0.0561*** | 1.6892*** | 1.4761*** |
| **GDPG** | | | -0.1162*** | -0.1207*** | | | -0.3546*** | -0.1913*** | -0.1021*** | -0.1134*** | -1.7387** | -0.4720*** |
| **PGDP** | | | 0.022** | 0.0045 | | | 0.0056** | 0.0078 | 0.0115** | 0.0091 | 0.00543** | 0.00621 |
| **INF** | | | 0.0302*** | 0.0136 | | | -0.0123 | 0.1028 | -0.0423 | 0.0127 | -0.0258 | -0.0121 |
| **Constant** | -2.3195*** | -3.0412*** | -3.9181 | -2.9680*** | -3.6819 | -1.8864 | -4.0021** | -3.5410** | -3.1117*** | -3.6132*** | -2.4014*** | -2.6816 |
| Log likelihood | -121.365 | -136.501 | -130.512 | -138.780 | -141.261 | -157.212 | -150.189 | -146.086 | -138.927 | -140.061 | -157.470 | -163.884 |
| Wald chi2 (3; 4; 6) | 30.41 | 33.42 | 41.83 | 55.20 | 50.66 | 47.59 | 49.35 | 58.76 | 44.27 | 65.55 | 50.93 | 50.30 |
| Prob>chi2 | 0.000 | 0.000 | 0.000 | 0.0000 | 0.000 | 0.000 | 0.0000 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 |
| rho | 0.701 | 0.691 | 0.638 | 0.715 | 0.679 | 0.496 | 0.714 | 0.634 | 0.719 | 0.726 | 0.511 | 0.501 |
| chibar2(01) | 53.41 | 56.80 | 45.02 | 55.19 | 28.57 | 26.10 | 31.78 | 32.54 | 65.39 | 60.82 | 16.44 | 19.25 |
| Prob>= chibar2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 |
| Nb. countries | 115 | 115 | 115 | 115 | 41 | 41 | 41 | 41 | 115 | 115 | 41 | 41 |
| Observations | 908 | 908 | 869 | 869 | 452 | 452 | 452 | 452 | 869 | 869 | 452 | 452 |

***, **, and * indicate significance levels at 1, 5, and 10 percent, respectively. ROA and NIM are the GMM estimated values for the indirect effects..

**Table 9. Systemic Crisis – Direct and Indirect Effects**

| | Direct Effect | | | | | | Indirect Effect | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1980→1995 | | 1996→2006 | | 2007→2011 | | 1980→1995 | | 1996→2006 | | 2007→2011 | |
| **Regressions** | **Logit** | **Probit** | **Logit** | **Probit** | **Logit** | **Probit** | **Logit** | **Probit** | **Logit** | **Probit** | **Logit** | **Probit** |
| **CONC** | 0.0110 | -0.0062 | -0.0074** | -0.0037** | -0.1316* | -0.1054** | | | | | | |
| **ROA** | -0.2393*** | -0.1191*** | -0.0423*** | -0.1064*** | -0.0712*** | -0.0422*** | -0.0061*** | -0.0975*** | -0.1167** | -0.0981*** | -0.1564** | -0.0270** |
| **NIM** | 0.1335*** | 0.0856*** | 0.0308** | 0.0207** | 0.0239** | 0.0139** | 0.2836** | 0.5212* | 0.2663* | 0.3099* | 0.0177** | 0.0055** |
| **INS** | 0. 9421 | 0.0943*** | 2.4238* | 1.2447*** | 1.6787*** | 1.6571*** | 1.0027 | 0.0543*** | 2.1700** | 1.0417* | 1.2655*** | 1.0469*** |
| **GDPG** | -0.1942*** | -0.0112*** | -0.0099** | -0.0267*** | -0.0822*** | -0.0460*** | -0.1162*** | -0.1438** | -0.5846*** | -0.1913*** | -0.3819*** | -0.6849*** |
| **PGDP** | 0.0233** | 0.00433 | 0.0098** | 0.0023 | 0.0045** | 0.0089 | 0.0093** | 0.0083 | 0.0029** | 0.00654 | 0.0062** | 0.0045 |
| **INF** | 0.0202*** | 0.0559 | -0.0151 | 0.0057 | -0.0364 | 0.1689 | 0.0234*** | 0.0137** | -0.0241* | 0.1578** | -0.0135 | 0.1028 |
| **Constant** | -0.8976 | -0.5381*** | -6.9972 | -3.5621 | -43.7441 | -21.1250* | -0.9129 | -1.6044* | -8.6281 | -4.4226* | -26.2902 | -13.0997 |
| Log likelihood | -548.010 | -545.927 | -124.685 | -123.714 | -117.761 | -117.994 | -533.366 | -531.221 | -117.802 | -116.987 | -125.328 | -124.700 |
| Wald chi2 (5,6) | 26.34 | 27.55 | 15.13 | 15.16 | 27.60 | 28.17 | 28.01 | 29.26 | 21.18 | 23.66 | 23.03 | 26.38 |
| Prob>chi2 | 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.2688 | 0.2258 | 0.000 | 0.0000 | 0.0007 | 0.0006 | 0.0008 | 0.0002 |
| rho | 0.429 | 0.407 | 0.691 | 0.664 | 0..858 | 0.859 | 0.3913 | 0.3731 | 0.684 | 0.693 | 0.786 | 0.770 |
| chibar2(01) | 99.57 | 102.04 | 40.74 | 41.94 | 117.34 | 118.42 | 84.62 | 88.20 | 34.78 | 33.52 | 93.99 | 88.11 |
| Prob>= chibar2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Nb. countries | 156 | 156 | 156 | 156 | 156 | 156 | 156 | 156 | 156 | 156 | 156 | 156 |
| Observations | 1564 | 1564 | 1004 | 1004 | 624 | 624 | 1687 | 1687 | 1117 | 1117 | 734 | 734 |

***, **, and * indicate significance levels at 1, 5, and 10 percent, respectively. ROA and NIM are the GMM estimated values for the indirect effects.

**REFERENCES**


Allen, F., and Gale, D. (2000). Financial Contagion. *The Journal of Political Economy*, 108 (1): 1-33.

Allen, F., Carletti, E., Cull, R., Qian, J., Senbet, L., and Valenzuela, P. (2012). Resolving the African financial development gap: cross-country comparisons and a within-country study of Kenya. *NBER Working Paper*, No. 18013.

Arellano, M., and Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58 (2): 277 – 297.

Athanasoglou, P. P., Brissimis, S. N., Delis, M.D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money*, 18 (2): 121–136.

Baltagi, B.H. (2001). Econometric Analysis of Panel Data, 2nd ed. John Wiley & Sons, Chichester.

Barth, M.E., Landsman, W.R., Lang, M., and Williams, C. (2012). Are IFRS-based and US GAAP-based accounting amounts comparable?. *Journal of Accounting and Economics*, 54 (1): 68–93.

Beck, T., De Jonghe, O., and Schepens, G. (2011). Bank competition and stability: cross country heterogeneity. *European Banking Discussion Paper, 19*.

Beck, T., Demirguc-Kunt, A., and Levine, R. (2013). Financial development and structure dataset (updated Nov. 2013). *World Bank Policy Research Working Paper*, WPS 2146.

Beck, T., Demirguec-Kunt, A., and Levine, R. (2006). Bank concentration, competition, and crises: first results. *Journal of Banking and Finance*, 30 (5): 1581–1603.

Beck, T., Dermiguc-Kunt, A., and Levine, R. (2007). Bank Concentration and Fragility: Impact and Mechanics. Working paper No. 11500, available at: http://www.nber.org

Berger, A.N., Klapper, L.F., and Turk-Ariss, R. (2009). Bank Competition and Financial Stability. *Journal of Financial Services Research*, 35 (2): 99-118.

Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking and Finance*, 13 (1): 65–79.

Boyd, J.H., De Nicolo, G., and Jalal, A.M. (2006). Bank risk-taking and competition revisited: new theory and new evidence. IMF Working Paper, 06/29.

Bretschger, L., Kappel,V., and Werner, T. (2012). Market concentration and the likelihood of financial crises. *Journal of Banking and Finance*, 36 (12): 3336–3345.

Dell'Ariccia G., Detragiache E., and Rajan R. (2008). The real effect of banking crises. *Journal of Financial Intermediation*, 17 (1): 89-112.

Evrensel, A. (2008). Banking crisis and financial structure: a survival-time analysis. *International Review of Economics and Finance*, 17 (4): 589–602.

Fernandez, A.I., González, F., and Suarez, N. (2010). How Institutions and Regulation Shape the Influence of Bank Concentration on Economic Growth: International Evidence. *International Review of Law and Economics*, 30(1): 28-36.

Freixas, X. and Rochet, J-C.H. (2008). Microeconomics of Banking. Second *Edition. MIT Press*.

Goddard, J. A., Molyneux, P., and Wilson, J. O. (2004). The profitability of European banks: a cross-sectional and dynamic panel analysis. *Manchester School*, 72 (3): 363–381.

Heggestad, A.A. (1977). Market structure, risk and profitability in commercial banking. *Journal of Finance*, 32(4): 1207–1216.

Kroszner, R., Laeven, L., and Klingebiel, D. (2007). Banking crises, financial dependence, and growth. *Journal of Financial Economics*, 84 (1): 187-228.

Laeven, L., and Valencia, F. (2008). Systemic banking crises: a new database. *IMF Working Papers 08/224, International Monetary Fund*.

Laeven, L., and Valencia, F. (2010). Resolution of banking crises: the good, the bad, and the ugly. *IMF Working Papers 10/146, International Monetary Fund.*

Laeven, L., and Valencia, F. (2012). Systemic Banking Crises Database: An Update. *IMF Working Papers 12/163, International Monetary Fund.*

Maddala, G.S., and Wu, S. (1999).Cross-country Growth Regressions: Problems of Heterogeneity, Stability and Interpretation, *Applied Economics,* 32 (5): 635-642.

Maggie, F.X., Rebecca, L.Y., and Molyneux,P. (2014). Bank competition and financial stability in Asia Pacific. *Journal of Banking and Finance*, 38 (1): 64-77.

Márquez, R. (2002). Competition, Adverse selection, and information dispersion in the banking industry. *Review of Financial Studies*, 15 (3): 901-926.

Matutes, C., and Vives, X. (2000). Imperfect competition, risk taking and regulation in banking. *European Economic Review*, 44 (1): 1-34

Mishkin, F. (1998). Financial consolidation dangers and opportunities. *NBER, Working Paper* No. *6655.*

Mitchener, K.J., and Wheelock, D.C. (2013). Does the structure of banking markets affect economic growth? Evidence from U.S. state banking markets. *Explorations in Economic History*, 50 (2):161–178.

Molyneux, P., and Thornton, J. (1992). Determinants of European bank profitability: a note. *Journal of Banking and Finance*, 16 (6): 1156–1178.

Northcott, C.A. (2004). Competition in banking: A review of the literature. Bank of Canada Working Paper No.2004-24, available at:www.bankofcanada.ca.

Revell, J. (1979). Inflation and financial institutions*. Financial Times ., London*.

Ruiz-Porras, A. (2007). Banking competition and financial fragility: evidence from panel-data. *MPRA Paper No. 5673*. University Library of Munich, Germany.

Saez, L., and Shi, X. (2004). Liquidity pools, risk sharing and financial contagion. *Journal of Financial Services research,* 25 (1): 5-23.

Schwaiger, M.S., and Liebig, D. (2008). Determinants of bank interest margins in Central and Eastern Europe. *Financial Stability Report*, 14: 68–87.

Shehzad, C.T., Scholtens, B., and De Haan, J. (2009). Financial crises and Bank earnings volatility the role of bank size and market concentration. *Working Paper* No. *1470727*, available at: www.ssrn.com.

Smith, B.D. (1984). Private information, deposit interest rates and the stability of the banking system. *Journal of Monetary Economics*, 14 (3): 293-317.

Srairi, S. (2010). Cost and profit efficiency of conventional and Islamic banks in GCC countries. *Journal of Productivity Analysis*, 34(1): 45-62.

Stever, R. (2007). Bank size, credit and the sources of bank market risk. *BIS Working Paper no. 238, Basel.*

Uhde, A., and Heimeshoff, U. (2009). Consolidation in banking and financial stability in Europe further evidence. *Journal of Banking and Finance,* 33 (7): 1299-1311.

Vives, X. (2010). Competition and stability in banking. *CEPR, Policy Insight, No 50*.

Williamson, S.D. (1986). Costly Monitoring, Financial Intermediation, and Equilibrium Credit Rationing. *Journal of Monetary Economics*, 18 (2): 159–179.

Williamson, S.D. (1987). Costly monitoring loan contracts and equilibrium credit rationing. *The Quarterly Journal of Economics*, 102 (1): 135-146.

## Appendix A. Sample and Sub-Samples List of Countries (156 Countries)

| DEVELOPED COUNTRIES | DEVELOPING COUNTRIES | | |
|---|---|---|---|
| Australia | Albania | Ghana | Papua New Guinea |
| Austria | Algeria | Grenada | Paraguay |
| Barbados | Angola | Guatemala | Peru |
| Belgium | Argentina | Guinea | Philippines |
| Brunei | Armenia | Guinea-Bissau | Romania |
| Canada | Azerbaijan | Guyana | Russian Federation |
| China, P.R.: Hong Kong | Bangladesh | Haiti | Rwanda |
| Croatia | Belarus | Honduras | São Tomé and Principe |
| Czech Republic | Belize | India | Senegal |
| Denmark | Benin | Indonesia | Serbia |
| Equatorial Guinea | Bhutan | Jamaica | Sierra Leone |
| Estonia | Bolivia | Jordan | South Africa |
| Finland | Bosnia and Herzegovina | Kazakhstan | Sri Lanka |
| France | Botswana | Kenya | Sudan |
| Germany | Brazil | Kyrgyz Republic | Suriname |
| Greece | Bulgaria | Lao People's Dem. Rep. | Swaziland |
| Hungary | Burkina Faso | Latvia | Syrian Arab Republic |
| Iceland | Burundi | Lebanon | Tajikistan |
| Iran, I.R. of | Cambodia | Lesotho | Tanzania |
| Ireland | Cameroon | Libya | Thailand |
| Israel | Cape Verde | Lithuania | Togo |
| Italy | Central African Rep. | Macedonia. FYR | Tunisia |
| Japan | Chad | Madagascar | Turkey |
| Korea. Rep. | Chile | Malawi | Turkmenistan |
| Kuwait | China | Malaysia | Uganda |
| Luxembourg | Colombia | Mali | Ukraine |
| Netherlands | Comoros 1994 | Mauritania | Uruguay |
| New Caledonia | Congo, Rep. of | Mauritius | Uzbekistan |
| New Zealand | Congo. Dem. Rep. | Mexico | Venezuela. RB |
| Norway | Costa Rica | Moldova | Vietnam |
| Poland | Cote d'Ivoire | Mongolia | Yemen. Rep. |
| Portugal | Djibouti | Morocco | Zambia |
| Singapore | Dominica | Mozambique | Zimbabwe |
| Slovak Republic | Dominican Republic | Myanmar | |
| Slovenia | Ecuador | Namibia | |
| Spain | Egypt. Arab Rep. | Nepal | |
| Sweden | El Salvador | Nicaragua | |
| Switzerland | Ethiopia | Niger | |
| Trinidad and Tobago | Gabon | Nigeria | |
| United Kingdom | Gambia. The | Pakistan | |
| United States | Georgia | Panama | |

## Appendix B. Descriptive Statistics

| **Full Sample** | | | | | |
|---|---|---|---|---|---|
| **Variable** | **Observation** | **Mean** | **Std. dev.** | **Min** | **Max** |
| **SYSC** | 4993 | 0.086 | 0.28 | 0 | 1 |
| **ROA** | 1982 | 1.348 | 3.41 | -109.49 | 21.119 |
| **NIM** | 1977 | 4.904 | 3.347 | 0.006 | 39.237 |
| **CONC** | 2025 | 0.723 | 19.846 | 0.213 | 1 |
| **PGDP** | 4545 | 10588 | 16577 | 111 | 158803 |
| **GDPG** | 4596 | 3.399 | 5.681 | -50.248 | 88.957 |
| **INF** | 4574 | 53 | 594 | -27 | 26762 |
| **INS** | 4993 | 0.589 | 0.491 | 0 | 1 |
| **CIR** | 2135 | 56.873 | 16.084 | 1.53 | 226.316 |
| **Developing Countries** | | | | | |
| **Variable** | **Observation** | **Mean** | **Std. dev.** | **Min** | **Max** |
| **SYSC** | 3681 | 0.092 | 0.29 | 0 | 1 |
| **ROA** | 1458 | 1.573 | 2.554 | -51.412 | 21.119 |
| **NIM** | 1455 | 5.844 | 3.367 | 0.006 | 39.237 |
| **CONC** | 1487 | 0.708 | 0.203 | 0.213 | 1 |
| **PGDP** | 3327 | 4194 | 8707 | 111 | 81947 |
| **GDPG** | 3373 | 3.437 | 6.129 | -50.248 | 88.957 |
| **INF** | 3351 | 70.429 | 693.148 | -27.631 | 26762 |
| **INS** | 3681 | 0.565 | 0.495 | 0 | 1 |
| **CIR** | 1573 | 58.13 | 15.589 | 6.651 | 226.316 |
| **Developed Countries** | | | | | |
| **Variable** | **Observation** | **Mean** | **Std. dev.** | **Min** | **Max** |
| **SYSC** | 1312 | 0.067 | 0.251 | 0 | 1 |
| **ROA** | 524 | 0.722 | 5.033 | -109.49 | 7.598 |
| **NIM** | 522 | 2.284 | 1.234 | 0.124 | 8.922 |
| **CONC** | 538 | 0.765 | 0.175 | 0.269 | 1 |
| **PGDP** | 1218 | 28053 | 20044 | 4270 | 158803 |
| **GDPG** | 1223 | 3.295 | 4.205 | -20.615 | 33.99 |
| **INF** | 1223 | 6.231 | 17.004 | -25.699 | 390.679 |
| **INS** | 1312 | 0.658 | 0.474 | 0 | 1 |
| **CIR** | 562 | 53.356 | 16.918 | 1.53 | 126.016 |