

**ESSAYS ON FINANCIAL LIBERALISATION AND BANKING SUPERVISION
POLICIES IN DEVELOPED AND DEVELOPING ECONOMIES**

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ABSTRACT

This thesis discusses the liberalisation and banking regulation and supervision policies in the large data set of countries. Chapter 1 provides the detailed overview of the three distinct essays. Chapter 2 examines the impact of capital account liberalisation and financial development on economic growth by utilizing the data of 71 developed and developing countries. The empirical evidence of this chapter indicates that capital account liberalisation and financial sector development play an important role in future economic growth. More specifically, in middle and lower income countries, capital account liberalisation and financial development also have a positive and significant relationship with economic growth; the effects of capital account liberalisation in these countries are much higher than in high income countries.

Chapter 3 investigates the impact of financial liberalisation and banking regulation and supervision policies on net interest margins by using the Bank-scope database of more than 1300 individual banks in 76 countries. A dynamic two-step system GMM estimation technique provides the evidence, which indicates that financial reform, financial liberalisation and banking regulation and supervision lead to lower net interest margins. Specifically, interest rate controls and barriers to entry have become more important factors in reducing interest margins.

Chapter 4 also uses the Bank-scope database of the banking sector of 76 developed and developing countries to explore the relationship between financial reform, financial liberalisation and the quality of banking regulation and supervision on financial fragility, by applying a dynamic two-step system GMM panel estimator. The finding of this chapter is that the financial vulnerability of the banking sector could be affected not only by bank-specific and macro-specific variables, but also by financial liberalisation and banking regulation and supervision policies. The results show that financial reform and financial liberalisation significantly enhance the likelihood of financial fragility, while strong banking regulation and supervision reduce it.

To my respected Mother, Mashkooor Fatima,

My loving wife, Batool,

And my sweet daughter, Aasmah, who was born during my studies.

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CHAPTER 1:
INTRODUCTION

Introduction:

The thesis aims to investigate the impact of financial reforms; liberalisation and banking regulation and supervision policies at macro and micro-specific level. At macro level data, which is based on cross country regression structure, we explore the impact of capital account liberalization and financial development on growth. While at micro-specific, which is based on bank level data, we examine the impact of financial liberalisation and banking regulation and supervision policies on the financial sector.

The term capital account liberalisation is defined as the easing or removing of the restrictions on capital flows among countries. Generally, capital flows from capital abundant countries to capital scarce countries, where rates of returns are high. Over the past two decades or so, a large number of studies have investigated the link between capital account liberalisation and economic growth in developed and developing countries by using different indexes of liberalisation, such as the International Monetary Fund's (IMF) Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER); the Quinn index (1997); the Bekaert, Harvey and Lundblad index (BHL) (2005); the Chin and Ito index (2002), the OECD-Share; and the Montiel and Reinhart index (1999). However, they found mixed evidence of the effects of capital account liberalisation on economic growth, for example, Rodrik (1998) and Grilli and Milesi-Ferretti (1995) did not find any association between capital account liberalisation and economic growth. In contrast, Bekaert et al (2005) and Quinn and Toyoda (2008) found a positive link between capital account liberalisation and economic growth. Similarly, Klein and Olivei (2008) found a positive and significant impact of capital account liberalisation on economic growth in OECD countries through the deepening of the financial system; however, they found little evidence in non OECD countries.

These mixed findings of earlier studies, therefore, motivate us to utilise the updated measure of capital account liberalisation. So, Chapter 2 of this thesis is mainly concerned with the latest index of capital account liberalisation to measure the influence of capital account liberalisation on economic growth. The index of capital account liberalisation was recently developed by Abiad, Detragiache and Tressel (2008). The advantage of this database is that it provides an updated and wider range of financial liberalisation indexes. The strength of capital account liberalisation index is represented by a four point scale (0-3), ranging from fully repressed to fully liberalised, where 0, 1, 2 and 3 are shown as fully repressed, partially liberalised, largely liberalised and fully liberalised respectively. The objective of Chapter 2 is to investigate whether capital account liberalisation and financial development have any impact on the growth of high, middle and low income countries. The empirical findings of panel data estimation techniques, Instrumental Variable (IV) Two Stage Least Square (2SLS), Generalised Method of Movement (GMM) and IV-Fixed Effects, indicate that capital account liberalisation and financial sector development have a strong impact and play an important role in future economic growth in developed and developing countries. The results also suggest that inflow of capital is higher in middle and low income countries than in high income countries.

Most of the developing countries are identical in their financial systems; for instance, most of them have high reserve requirements; domestic credit controls; direct controls on interest rates; and limited role of commercial banks. A number of developing countries have experienced costly financial sector reform programmes. Thus, these countries are still facing high bank interest margins which contribute to high reserve requirements, high intermediation costs or taxation and lack of banking

competition.¹ The main aim of Chapter 3 is to determine the impact of financial reform policies, bank specific and macro specific variables on net interest margins and also to try to address the question on whether developed and developing countries face high bank interest margins after the implementation of a financial reforms program? The conventional wisdom is that banks' interest margins have become important to examine, because they contain essential information regarding the performance and efficiency of the banking system. Therefore, to estimate the individual impact of financial liberalisation and banking regulation and supervision on net interest margins, we have explicitly introduced financial reform as the main variable of net interest margins, and split the reforms variable into a liberalisation index (which includes credit allocation controls; interest rate liberalisation; entry barriers; privatization; capital accounts liberalisation; security market liberalisation) and a banking regulation and supervision index. Hanson and Rocha (1986) explained that banks' interest spreads in developing countries were considerably and constantly higher than in developed economies. Barajas, Steiner and Salazar (1999) compared interest rate spreads between pre- and post-liberalisation periods; however, they suggested that interest rate spreads remained the same before and after financial liberalisation. Similarly, Chirwa and Mlachila (2004) found high net interest margins in Malawi after financial liberalisation. The intuition is that financial liberalisation creates efficiency gains and enhances competition among banks which converges bank interest margins at a global level. Brock and Suarez (2000) argued that high operating costs, high reserve requirements, high levels of non-performing loans and unstable macroeconomic conditions are the main factors of higher spreads in Latin American banks. Claeys and Vander (2008) also suggested that inefficient and less competitive banking environments may enhance interest margins.

¹ See Detragiache, Tressel and Gupta (2008); Tennant and Folawewo (2009).

The contribution of this study to the literature is that it includes some new bank specific determinants, as well as the use of financial liberalisation and banking regulation and supervision policies as a variable for large number of countries rather than comparing the results in pre- and post-liberalisation periods of single country. The micro level data of bank specific variables includes bank credit risk proxy of loan to assets ratio; bank capital proxy of equity to assets ratio; bank size proxy of total assets; bank age and foreign and government share in the banking sector of more than thirteen hundred individual banks in developed and developing countries. All these are drawn from the Bank-scope database maintained by Fitch/IBCA/Bureau Van Dijk. The data on financial liberalisation and banking regulation indexes are obtained from Abiad et al (2008). The empirical results of the dynamic two-step system GMM confirm that sound and strong financial reform policies play a significant role in narrowing banks interest margins. Specifically, the deregulation of interest rate controls and the removal of entry barriers from financial markets will lead to increased bank competition and efficiency, which lowers bank interest margins. Thus, low bank interest margins reduce the cost of financial intermediaries, and enhance investment opportunity and employment, resulting in the high growth of the economy.

“In macroeconomics, the term financial fragility is used loosely to refer to a financial system’s susceptibility to large-scale financial crises caused by small, routine shocks” (Lagunoff and Schreft, 2001:220). The recent widespread worldwide financial crisis, which initiated in the US, was preceded by a high level of non-performing loans (NPLs). In past years, the majority of studies used either bank-specific or macro-specific variables (or both) to investigate the determinants of NPLs. Guy and Lowe (2011) suggested that different macroeconomic stresses are the main cause of high NPLs in the Barbadian banking system. Shehzad et al (2010) suggested that ownership

concentration has an inverse relationship with banks' NPLs. Salas and Saurina (2002) also highlighted the significance of micro and macro specific determinants and suggested that any future changes in NPLs can be highly identified by bank-specific variables. Similarly, Ranjan and Dhal (2003) and some others also include macro determinants as explanatory variables of NPLs. Chapter 4 goes one step further in comparison to previous studies, along with both bank-specific and macro-specific determinants also considers financial liberalisation and banking supervision and regulation as an important determinant of financial fragility. We have employed impaired loans (the accounting term for NPLs) to gross loans used as a proxy of financial fragility. The ratio of impaired loans to gross loans is defined as the amount of loans which are impaired or doubtful. The main objective of this study is to explore the impact of financial reforms, bank specific and macro-specific variables on financial fragility in individual banks of seventy six developed and developing countries over the period 2001 to 2005.

In recent studies, Delis (2012) uses a financial reform variable to estimate its impact on banking competition and the market power of banks. Similarly, Hermes et al (2009) also examined the impact of financial liberalisation and banking regulation on bank efficiency by using the stochastic frontier analysis approach. Chapter 4 differs to these studies in that it examines the impact of financial reforms, financial liberalisation and different levels of banking regulation and supervision quality on financial fragility in a large micro panel data by using the most advanced estimation technique. The data of bank-specific variables (including total assets; equity to assets ratio; growth of gross loan; managerial quality proxy of cost to income ratio; foreign and government share in banking sector) are drawn from the Bank-scope database maintained by Fitch/IBCA/Bureau Van Dijk. The data of financial liberalisation and banking

regulation indexes are obtained from Abiad et al (2008). The empirical findings, based on the application of a dynamic two-step system GMM, suggest that financial reforms and financial liberalisation significantly enhance the likelihood of financial fragility, while banking regulation and supervision have an inverse relationship with financial fragility which implies that strong and sound regulation reduces the likelihood of NPLs.

The rest of the thesis is arranged as follows: Chapter 2 studies the nexus of capital account liberalisation, financial development and economic growth. Chapter 3 examines the effect of financial liberalisation and banking regulation policies on banks' interest margins. Chapter 4 investigates the impact of financial reforms and banking supervision and regulation on financial fragility. Finally, the concluding remarks of this thesis are discussed in Chapter 5.

CHAPTER 2:

***THE NEXUS OF CAPITAL ACCOUNT LIBERALISATION, FINANCIAL
DEVELOPMENT AND ECONOMIC GROWTH***

2.1. Introduction:

It is generally recognized that, along with human capital and technological enhancement, the financial intermediaries, financial liberalisation policies and institutional quality have also been the leading factors of economic growth over the past decades, and the empirical evidence confirms the importance of these determinants for economic growth (Demetriades and Law, 2004).²

A large body of empirical and theoretical work has been conducted to find the relationship between financial development and economic growth. King and Levine (1993) used data of 80 countries over the period from 1960 to 1989 and found the consistent results with Schumpeter's view that economic growth benefits from a well financial system. A well-developed financial system plays a pivotal role in economic growth. Similarly, Rousseau and Sylla (2003, 1999) explained that early growth in the U.S. and in other countries was finance-led.³ In McKinnon (1973) and Patrick (1966), the financial sector is important because it performs an essential role and provides benefits in the development process through the efficient utilisation of resources. To measure financial development, researchers used different proxies in their literature and find a positive and significant impact on growth. McKinnon and Shaw's (1973) research work analysed how the impact of financial development on economic growth works through productivity instead of saving mobilization. King and Levine (1993) explained

² Findings of previous literature suggest that financial sector, capital account liberalisation and institutions enhanced growth, for instance, Klein and Olivei (2008), Chin and Ito (2006), Bonfiglioli and Mendicino (2004), Rajan and Zingales (2003), and King and Levine (1993). Similarly, the most recent theoretical and empirical work by Bekaert et al (2011) also explains the significance of financial sector openness in promoting growth.

³ While Demetriades and Hussein (1996) demonstrate in their study of 16 less-developed countries that causality normally moves from growth to finance and not vice versa.

that the relationship between financial sector indicators and growth is statistically significant and positive. They also measured the significance of the banking sector through financial indicators. Financial intermediaries can take part in the development of an economy through the banking system because they choose those firms that use public saving and thus enhance productivity; technological change and economic development.⁴

Demetriades and Law (2004) studied the impact of financial development and institutional quality on growth in 72 developed and developing countries over the period from 1978 to 2000. They suggest that poor countries can attain a greater impact of finance on growth through the nexus of a sound financial system and better institutional quality. Their finding also reveals that financial development is most effective in delivering extra growth in middle income countries. Similarly, Knack and Keefer (1995) explained that the impact of institutions on economic growth is positive and tracks the economy towards high growth if institutions are strong, because strong institutions make the financial sector more reliable.

Countries across the world have experienced the beneficial effects of financial sector development and high diversification opportunities due to the opening up of capital markets. This can be inferred from economic theory, which suggests that the efficient allocation of resources as well as opportunities for risk diversification and promotion of financial development can be achieved through unregulated flows of international capital. This is evident from the step taken by governments of industrial countries, who started widespread capital account liberalisation, as noted over the past decades (see Edison, Klein, Ricci and Slok 2004). Similarly, several empirical studies

⁴ (See Schumpeter, 1911)

have been undertaken to study the economic effect of capital account liberalisation on economic growth. However, they found some mixed evidence of capital account liberalisation on economic performance.

Many studies show that liberalisation has a positive and significant impact on growth in developed economies, while having an adverse effect on under-developed economies. Eichengreen (2001), in his survey study of capital account liberalisation, concluded that the existing literature has not provided the conclusive evidence that liberalisation has any impact on growth. However, Edison, Klein, Ricci, and Slok (2004) surveyed ten studies on liberalisation and in three of these found a positive relationship between capital account liberalisation and economic growth, also suggesting that the impact of capital account liberalisation disappears when institutional variable such as government reputation is included in to the model. Rodrik (1998), in his extensively viewed article, explained that capital account liberalisation has no impact on growth in a large sample data of developed and developing countries over the period 1975 to 1989. Similarly, Grilli and Milesi-Ferretti (1995) also examined the relationship between capital account liberalisation and economic growth in advanced industrial countries and found no association. While, Bekaert, Harvey and Lundbad (2005) explained that capital account liberalisation has a positive impact on economic growth and accelerates future growth.⁵

In the past years or so, a number of works have considered the topic of financial development, capital account liberalisation and economic growth. Almost all research shows that there is a positive and significant impact of financial development and

⁵ Demirguc-Kunt and Detragiache (1998) stated that financial liberalisation has a negative effect on the banking sector and leads to banking crises, as explained in their study of 53 countries over the period 1980-1995.

capital account liberalisation on economic growth by using different measures of financial development and capital account liberalisation. For instance, Quinn and Toyoda (2008) found a positive and significant relationship between capital account liberalisation and growth in the long run.

In the same vein, the main objective of this chapter is to examine the impact of capital account openness and financial development on economic growth in seventy one developed and developing countries. This chapter also attempts to assess whether capital account liberalisation and financial development have any impact on economic growth in high, middle and lower income countries. Additionally, this chapter also explores whether the interaction between financial development and institutional quality has any impact on growth. This study is closely related to Klein and Olivei (2008:862); they examined the “causal link between capital account liberalisation and financial depth and through this channel to overall economic growth in developed and developing countries over the period from 1976 to 1995”. They used most common index of capital account liberalisation from International Monetary Fund’s publication Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) with binary values 0 (always restricted) and 1 (never restricted).⁶ This study is distinguished to them in that way; we include both variable capital account and financial development, and examine their impact on economic growth by using comprehensive and updated data set. More importantly, the use of the latest index of the capital account liberalisation motivated us to contribute to the existing literature. The advantage of this database is that it provides several measurements of financial reform and offers a wider range of indicators for measuring financial liberalisation (including credit allocation controls, interest rate

⁶ Quinn and Toyoda (1998) and Bekaert et al (2005), argued that use of IMF indicator is too coarse and cannot measure the intensity of capital controls.

liberalisation, entry barriers, privatization, capital account liberalisation and security market liberalisation). Secondly, by the use of Fixed Effects and Instrumental Variable (IV) estimation techniques on 71 developed and developing countries over the period 1985 to 2004. The selection criteria of countries in this chapter is based on the “ New Database of Financial Reforms” developed by Abiad, Detragiache and Tressel (2008); this database contains 91 countries over the period 1973 to 2005 but the unavailability of financial development (ratio of private credit to GDP and ratio of liquid liabilities to GDP) data for a few countries constraints us to 71 countries.

The empirical findings of this chapter suggest that capital account liberalisation and financial sector development have a strong impact on economic growth. More specifically, capital account liberalisation and financial development have a positive and significant relationship on growth in middle and lower income countries, which suggest that inflow of capital is higher in middle and low income countries, compared to high income countries. However, Klein and Olivei (2008) found positive and statistically significant impact of capital account liberalisation on economic growth through the deepening of a country’s financial system in OECD countries, but find little evidence of capital account liberalisation to promote financial deepening in non OECD countries. Thus, the results of this chapter confirm that capital account liberalisation spur economic growth in both developed and developing countries.⁷

The remainder of this chapter is organised as follows. The next section explains the data source and description of the variables that are used in the model. Section 3 explains the empirical method and model specification that has been used to estimate

⁷ Edison, Klein, Ricci and Slok’s (2004) findings also confirm for middle income countries that capital account liberalisation and stock market liberalisation has a significant effect on growth.

growth. Section 4 represents the findings of the empirical analysis. Finally, the last section explains the summary and conclusion of the chapter.

2.2. The Data Source:

The data of GDP growth, real per capita income, secondary school enrolment, trade openness, financial development indicators, institutional quality variables and capital account index of seventy one countries over the period 1985 to 2004 are collected from different sources. These are the World Development Indicator (*WDI*), International Financial Statistics (*IMF*), the Penn World Table version-6.3, the International Country Risk Guide (*ICRG*) and the “New Database of Financial Reforms” proposed by Abiad, Detragiache and Tressel (2008), respectively. Furthermore, the data of seventy one countries are also grouped into three categories: high income, middle income and lower income countries.⁸

The data of the real GDP per capita growth and initial value of real GDP per capita (at 2005 constant prices), are drawn from the Penn World Table Version-6.3. The data on secondary school enrolment and the ratio of trade openness to GDP have been collected from the World Development Indicator (*WDI*).

⁸ Appendix-A2.2 includes list of countries. The World Bank classifies these economies as low income economies if income is USD 1,005 or less; middle income economies if it is between USD 1,005 and 12,275; and high income economies if income is more than USD 12,275.

2.2.1. Capital Account Liberalisation (CAL)

Many studies used different indexes of capital account liberalisation to determine its impact on growth.⁹ In this chapter the data for capital account liberalisation index are drawn from “A New Database of Financial Reforms” by Abiad et al (2008). This financial reform database covers 91 countries over the period 1973-2005.¹⁰ The capital account liberalisation is one of the six indices of financial liberalisation, and the strength of the capital account liberalisation index is based on a four-point scale, from fully repressed to fully liberalised (0-3), where 0, 1, 2 and 3 are shown as fully repressed, partially liberalised, largely liberalised and fully liberalised respectively.

2.2.2. Financial Development Indicators (FD)

Several indicators of financial development have been used in previous studies. In this chapter, we consider two indicators to measure financial sector development, namely private credit and liquid liabilities; these indicators have been frequently used in previous studies for measuring financial sector size and financial depth.¹¹ The first indicator is the ratio of private credit from banks and other financial intermediaries to GDP, which is probably the most significant and widely-used indicator of financial development. Empirical studies also prefer private credit as an indicator of financial development to capturing the credit issued to the private sector alone (see Levine et al,

⁹ The majority of studies use a different measure's of capital account liberalisation; for example, IMF's annual report on exchange arrangements and exchange restrictions (AREAER), Quinn (1997) index, Bekaert, Harvey and Lundblad (BHL) (2005), Chin and Ito (2002), OECD-Share, and Montiel and Reinhart (1999).

¹⁰ (See Abiad, Tressel and Detragiache, 2010)

¹¹ Baltagi and Demetriades (2009), Klein and Olivei (2008) and King and Levine (1993)

2000). The second ratio, liquid liabilities to GDP, indicates the overall size of financial intermediaries. It consists of the sum of currency outside the banking system and the demand and interest-bearing liabilities of banks and non-banking financial intermediaries. The data on private credit and liquid liabilities over the period 1985 to 2004 are obtained from International Financial Statistics (*IFS*) - IMF.

2.2.3. Institutional Quality Index (IQ)

To estimate the institutional quality indicator, the data has been obtained from the International Country Risk Guide (ICRG), a monthly publication of Political Risk Services (PRS). Knack and Keefer (1995) developed a government reputation or institutional quality index and used this variable in their paper. To follow Knack and Keefer (1995), the data of five PRS indicators namely: i) Corruption ii) Rule of Law; iii) Bureaucratic Quality iv) Government Repudiation of Contracts and v) Risk of Expropriations are considered to measure the quality of institutions. The range of first three ICRG variables is 0-6, while the range of last two variables is 0-10; for same range, we multiplied the first three variables by 5/3 and summed up all five indicators of ICRG into one variable. After summing these indexes, the range of this institutional quality variable is 0 to 50; a higher values of range show better conditions and vice versa (see Baltagi, Demetriades and Law, 2009).

The financial systems across the countries differ to each other and can be mainly explained by their legal origin.¹² Thus, in this chapter we treated legal origin as an instrumental variable to control for simultaneity bias. The data of legal origins are

¹² Financial markets are stronger and deeper in the English legal system while the French legal system slows down financial sector performance (see La Porta et al 1998).

drawn from La Porta et al (1998) and the Central Intelligence Agency (CIA) World Fact Book.

2.3. The Empirical Method:

A number of studies have used cross-section data to analyse the determinants of economic growth. To capture the steady state relationship between the variables, this study takes five-year averages. The baseline model evaluates the effects of capital account liberalisation and financial development on economic growth by using Fixed Effects estimation technique.^{13,14} Generally, Fixed Effects model command (xtreg with fe option) without instrument is used to control a country's unobservable specific effects. In this chapter, we used Fixed Effects estimation technique with instrumental command (xtivreg with fe option) to address the potential of endogeneity because an explanatory variable could be correlated with a time varying variable. We also estimate the regression by using instrumental variable (IV) Two-Stage Least Square (2SLS) and Generalised Method of Movement (GMM) estimation techniques for consistency check of the results. IV-2SLS and IV-GMM are the standard estimation techniques for the over-identified model,¹⁵ while a Fixed Effects estimation technique is used to control unobservable country fixed effects and omitted variable bias. To control the possibility of endogeneity, financial development indicators and capital account liberalisation are

¹³ Quinn and Toyoda (2008) also used fixed effects model.

¹⁴ If Hausman-test rejects the null see Appendix-A2.1, so, the use of random effects model is not appropriate (Wooldridge, 2002).

¹⁵ In over-identified model the number of instrument are more than number of endogenous regressors, while, in just-identified model number of instrument and number of endogenous variable are the same (see Cameron and Trivedi (2009)).

instrumented by the legal origin of countries,¹⁶ the average trade openness of neighbouring countries, the average liberalisation of neighbouring countries and the average financial development indicators of neighbouring countries (see Baltagi and Demetriades, 2009).¹⁷ A post estimation test to confirm the presence of an endogeneity in a model, and the rejection of null hypothesis (Ho: variables are exogenous) in all tables suggests that variables are endogenous except in table 2.4b and 2.5a of column (2) and (4) where variables are weakly endogenous. The Hansen’s J over-identification test accepts these variables as instruments. The results obtained by the IV-2SLS with robust standard errors (to correct for heteroskedasticity) are described in columns (1) and (2); the results of the GMM estimation with robust standard errors are explained in columns (3) and (4), and Fixed Effects estimation results are described in column (5). In this chapter, we consider the Levine et al (2000) benchmark specification for a generalized relationship among capital account liberalisation, financial development and economic growth in 71 developed and developing countries. Thus, the empirical model is the following:

$$\mathbf{GROWTH}_{i,t} = \alpha_0 + \beta_1 \mathbf{CAL}_{i,t} + \beta_2 \mathbf{FD}_{i,t} + \beta_3 \mathbf{IQ}_{i,t} + \beta_4 \mathbf{X}_{i,t} + \mu_i + \eta_t + \xi_{i,t} \text{ ----- (2.1)}$$

Where dependent variable, ‘**GROWTH**_{*i,t*}’ over five year periods, which is defined as the growth of real GDP per capita of country ‘*i*’ at time ‘*t*’; ‘**CAL**_{*i,t*}’ is a measure of capital account liberalisation; ‘**FD**_{*i,t*}’ is a proxy of financial development,

¹⁶ Legal origin variables are considered to be the most suitable instruments, because on one side it is exogenous to economic growth and on the other side it is correlated with financial development (see Beck, Levine and Loayza, 2000).

¹⁷ The “geographic” instrument constructed by Frankel and Romer (1999).

namely ratio of private credit to GDP and ratio of liquid liabilities to GDP¹⁸; and ' $IQ_{i,t}$ ' is denoted the institutional quality (includes corruption, rule of law, bureaucratic quality, government repudiation of contracts and risk of expropriation), which is employed to control for the level of institutional development.

The vector ' $X_{i,t}$ ' is a matrix of macroeconomic determinants, to follow previous studies,¹⁹ and consider initial real GDP per capita and educational attainment as basic control variables. A logarithm of initial value of real GDP per capita is used to capture the convergence effect; average years of trade openness, measured as the sum of exports and imports as a share of GDP; and average years of secondary school enrolment, which is treated as an indicator of the human capital stock in the country. Where ' μ_i ' and ' η_t ' is country and time fixed effects, respectively, and ' $\xi_{i,t}$ ' is a standard error term of the specification. The periods t corresponds to initial and average values of five non-overlapping years (1985, 1990, 1995 and 2000) (see Levine et al, 2000). This has two important advantages. Firstly, it serves to ease the correlation effect, which is raised due to business cycle fluctuations. Secondly, endogeneity problems can be reduced through averages.²⁰ In model (II), we include cross term of financial development indicators and institutional quality variable.

$$GROWTH_{i,t} = \alpha_0 + \beta_1 CAL_{i,t} + \beta_2 FD_{i,t} + \beta_3 (FD * IQ)_{i,t} + \beta_4 X_{i,t} + \mu_i + \eta_t + \xi_{i,t} \text{ -----(2.2)}$$

Where, ' $(FD * IQ)_{i,t}$ ' are represented by the interaction term between liquid liabilities to institutional quality and private credit to institutional quality.

¹⁸ Here, we used initial values of financial development indicators of each five year span to reduce the simultaneity bias that could arise from the impact of economic growth on development of the financial sector.

¹⁹ Such as Demetriades and Rousseau (2011), Klein and Olivei (2008) and Rodrik (1998).

²⁰ See Chinn and Ito (2006).

2.4. Empirical Results:

Table 2.1a presents the descriptive statistics of GDP growth and all its determinants that are used in the empirical analysis. This table also explains the unit of measurement, mean, standard deviation, minimum and maximum values of all key determinants that are used in the full sample of 71 countries. The mean value of the five- year growth variable is around 0.07%, and moves from -0.25% to 0.42%. The mean value of log of per capita income is approximately 8.8%, and ranges from 6.3% to 10.6%. The financial development indicator is denoted by the ratio of liquid liabilities to GDP and the ratio of private credit to GDP, with the mean values of 51.4% and 52.1% respectively. The minimum values of these indicators are 4.50% and 1.52% and the maximum values are 242.2% and 195.2%, respectively. The mean value of the capital account index is around 1.95, while the minimum and maximum index value moves between 0 and 3. The average value of institutional quality in developed and developing countries is around 27.21, with a range of 0 to 45. The mean value of trade openness to GDP is around 63.29%; the low and high percentages of trade openness are 13.42% to 311.4%. Lastly, the mean value of secondary school enrolment is 64.16%, with a high standard deviation as shown by its wide range. The high mean value of per capita income, the ratio of private credit to GDP, the ratio of liquid liabilities to GDP, capital account liberalisation, institutional quality, trade openness and secondary school enrolment that are found in high income countries, rather than in middle and lower income countries, suggests that high income countries have a better financial system and sound institutional quality. These are differences that encourage the analysis of how financial development and capital account liberalisation spur economic growth at different stages of development (See A2.2).

Table - 2.1a, Descriptive Statistics

Full Sample, 1985-2004

Variables	Obs.	Mean	St. Dev.	Mini.	Max.
Growth (%)	284	0.07	0.09	-0.25	0.42
Log of real GDP per capita (%)	284	8.82	1.11	6.36	10.6
Ratio of liquid liabilities to GDP (%)	264	51.4	34.4	4.50	242.2
Ratio of private credit to GDP (%)	281	52.1	41.1	1.51	195.2
Capital account liberalisation	284	1.95	1.01	0	3
Institutional quality	279	27.2	8.77	0	45
Ratio of trade openness to GDP (%)	279	63.2	41.3	13.4	311.4
Secondary school enrolment (%)	265	64.1	33.6	3.31	161.6

Note:

Where, dependent variable is growth over five years. Log of real GDP per capita represents the logarithm of initial value which is reset at 5-years intervals (1985, 1990, 1995 and 2000). Similarly, capital account liberalisation, trade openness and secondary school enrolment represent the 5 years average values between t and $t+5$.

Table – 2.1b, Correlation Matrix

Full Sample, 1985-2004

Variables	1	2	3	4	5	6	7	8
Growth	1.000							
Log of real GDP per capita	0.065 (0.274)	1.000						
Capital account liberalisation	0.097 (0.101)	0.668* (0.000)	1.000					
Secondary school enrolment	0.067 (0.272)	0.491* (0.000)	0.366* (0.000)	1.000				
Ratio of trade openness to GDP	0.099 (0.099)	0.139* (0.020)	0.202* (0.001)	0.221* (0.001)	1.000			
Institutional quality	0.193* (0.001)	0.401* (0.000)	0.329* (0.000)	0.285* (0.000)	0.060 (0.321)	1.000		
Ratio of private credit to GDP	0.114 (0.054)	0.695* (0.000)	0.503* (0.000)	0.320* (0.000)	0.188* (0.002)	0.304* (0.000)	1.000	
Ratio of liquid liabilities to GDP	0.059 (0.337)	0.573* (0.000)	0.422* (0.000)	0.237* (0.000)	0.264* (0.000)	0.202* (0.001)	0.823* (0.000)	1.000

Note :() indicates the 5 % significance level.*

Table 2.1b shows the pair-wise correlation matrix, provides the relationship between the key variables and how instruments were chosen. It is important to note that the correlation matrix also reveals that private credit and liquid liabilities indicators are highly correlated to each other, at 0.82, as would be expected. The correlation coefficient of growth with liquid liabilities, private credit and capital account liberalisation is 0.05, 0.11 and 0.09, respectively. Similarly, the correlation between growth and institutional quality is approximately 0.19. The correlation between growth and the log of per capita income is about 0.06. The correlation of capital account liberalisation with the ratio of private credit to GDP and the ratio of liquid liabilities is positive and significant at the 5% level. The correlation coefficient between the log of per capita income to private credit and liquid liabilities is also high, 0.69 and 0.57 respectively.

To examine the in-depth effect of capital account liberalisation and financial development on economic growth in 71 developed and developing countries over the period 1985-2004, full sample data was split into 25 high income countries, 35 middle income countries and 11 low income countries, and treated capital account liberalisation and financial development indicators as the main explanatory variable for economic development. The main results of the entire sample data are explained in table 2.2 and high income countries' results are described in table 2.3; similarly, the results of middle income and low income countries are reported in tables 2.4 and 2.5, respectively.

The results in columns (1), (3) and (5) of tables 2.2 to 2.5 present the regression results of the model which is specified in equation (1), while columns (2) and (4) report the results of interaction term between financial development indicators and the institutional quality variable, which is specified in equation (2). The results in column

(1) and column (2) of all tables 2.2 - 2.5 have been obtained by using the IV-2SLS estimation technique with robust standard errors. In the same way, results in column (3) and column (4) of all tables have been attained by utilizing the IV-GMM estimation technique with robust standard errors. Results reported in column (5) of all tables have been obtained by the Fixed Effects estimation technique

The ratio of liquid liabilities to GDP is used as a proxy of financial development in table 2.2a. Similarly, in table 2.2b, ratio of private credit to GDP is used as a proxy of financial development. It is noteworthy that in tables 2.2a and 2.2b, the sign of the estimated coefficients of capital account liberalisation, measures of financial development and institutional quality are statistically significant and economically meaningful at the 1% and 5% level. It is also important to note that the p-value of Hansen's J over-identification suggests that models are completely identified in column (1) to column (4). Wald chi-square p-value explains the overall significance of the model. The root mean square estimators (RMSE) values also demonstrate that the estimated value predicts the observation of the parameter with high accuracy in column (1) to column (4). In table 2.2a and 2.2b, equation 1 reveals the results for the model with liquid liabilities and private credit respectively. We can see that when the equation controls the variable of neighbours' financial indicators, neighbours' trade, and legal origins in the IV 2SLS and IV GMM, capital account liberalisation, measures of financial development, institutional quality and the interaction term between financial development and institutional quality contribute to enhancing economic growth. Similarly, when we control the value of the lagged dependent variable and neighbours' financial development indicators in Fixed Effects, these variables also have a positive and significant impact on growth.

In table 2.2a, the results in columns (1) to (5) explain that the ratio of liquid liabilities to GDP, capital account liberalisation and the institutional quality variable have a positive and statistically significant impact on economic growth. The results in the first two columns are obtained by the IV 2SLS technique with robust option, where liquid liabilities are instrumented by a neighbour's liquid liabilities and legal origin. The Hansen J over-identification test accepts these variables as instruments. In column (1), the sign of liquid liabilities and capital account liberalisation are positive and highly significant at the 1% level, while institutional quality is significant at the 5% level. When the interaction term is included in column (2), as shown in model 2, liquid liabilities and capital account liberalisation remain positive and highly significant at the 1% conventional level. The interaction term of liquid liabilities and institutional quality also has a positive and significant impact on economic growth at the 1% level, which suggests that financial development promotes economic growth in a sound and better institutional environment. The significance level of the interaction term in column (2) is higher than the institutional quality variable of column (1). The coefficient of liquid liabilities increases from 14% to 16% in column (2), but the standard error remains the same. In the same way, the results which are obtained by the IV-GMM estimation technique have been reported in columns (3) and (4); here, we used the similar set of instrumental variables which is also accepted by the Hansen J statistic over-identification test. All key variables of regression in column (3) are positive and significant at the 1% level; the levels of significance of all main variables are still consistent in column (4) as well, when the interaction term between liquid liabilities and institutional quality is included in the equation. Moreover, column (5) of table 2.2a captures the impact of the unobservable term through Fixed Effects estimation

Table – 2.2a, Liquid Liabilities, Capital Account Liberalisation and Growth
Full Sample, 1985-2004

Dependent variable GDP growth	IV-2SLS(robust)		IV-GMM(robust)		Fixed Effects
	1	2	3	4	5
Log of real GDP per capita	-0.078*** (0.023)	-0.069*** (0.021)	-0.075*** (0.022)	-0.067*** (0.021)	-0.510*** (0.075)
Ratio of liquid liabilities to GDP	0.140*** (0.052)	0.165*** (0.052)	0.132*** (0.050)	0.162*** (0.051)	0.399** (0.208)
Capital account liberalisation	0.036*** (0.012)	0.030*** (0.012)	0.035*** (0.012)	0.030*** (0.012)	0.060*** (0.013)
Ratio of trade openness to GDP	-.0002 (.0003)	-.0002 (.0003)	-.0002 (.0003)	-.0002 (.0003)	.0011 (.0008)
Secondary school enrolment	.0003 (.0002)	.0002 (.0002)	.0002 (.0002)	.0002 (.0002)	.0007 (.0007)
Institutional quality	.0019** (.0008)	-	.0021*** (.0008)	-	.0019** (.0008)
Interaction of liquid liabilities and ins. Quality	-	0.006*** (0.001)	-	0.006*** (0.001)	-
Constant	0.733*** (0.242)	0.743*** (0.220)	0.695*** (0.233)	0.727*** (0.217)	4.097*** (0.608)
No. of Obs.	216	201	216	201	191
Wald chi-sq. (p-value)	27.54 (0.001)	23.12 (0.005)	28.77 (0.000)	23.06 (0.006)	234.05
Root MSE	0.105	0.105	0.103	0.104	-
Hansen j over id test (p-value)	0.470	0.532	0.470	0.532	-
Endogeneity test (p-value)	0.004	0.002	0.006	0.003	-
Time Dummies	Yes	Yes	Yes	Yes	No

Note: Dependent variable is growth rate over five year period. Here liquid liabilities are used as a financial development indicator. In IV-2SLS and IV-GMM, we instrumented the ratio of liquid liabilities to GDP by neighbouring countries' liquid liabilities to GDP and legal origin; while in Fixed Effects, the ratio of liquid liabilities to GDP is instrumented by lagged value of dependent variable. Endogeneity test reject the null (H_0 : Variables are exogenous). Heteroskedasticity robust standard errors are in parentheses.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

techniques and uses the lagged dependent variable as instrument to check for possible endogeneity of liquid liabilities. In the Fixed Effects estimation, capital account liberalisation is significant at the 1% level while liquid liabilities and institutional quality are significant at the 5% level. The coefficient of liquid liabilities and capital account liberalisation in the Fixed Effects estimation is more than double than that of the IV-2SLS and IV-GMM, but the coefficient of institutional quality is slightly reduced.

Similarly, in table 2.2b the first two columns report the result of the IV-2SLS robust estimation, columns (3) and (4) demonstrate the IV-GMM robust estimation and the last column shows the Fixed Effects estimation. Here the value of neighbours' ratio of private credit to GDP and legal origin are used as the instrumental variables of financial development indicators. Private credit is significant at the 5% level in column (1) and at the 1% level in column (2). When we introduce the interaction term between private credit and institutional quality, the significant level of private credit is higher in column (2), whereas the significant level of capital account liberalisation remains the same in both columns (1) and (2). In columns (3) and (4), the key variables capital account and private credit are significant at the 5% level. Additionally, institutional quality in column (3) and the interaction term between private credit and institutional quality in column (4) are significant at the 1% level. Moreover, in column (5) the significance level of private credit reduces and reaches at the 10% level; however, the coefficient of private credit in the Fixed Effects estimation is much greater than the coefficient of private credit in the 2SLS and GMM estimation. Similarly, the impact of capital account and institutional quality on growth is significant at the 1% level.

Table – 2.2b, Private Credit, Capital Account Liberalisation and Growth**Full Sample, 1985-2004**

Dependent variable GDP growth	IV-2SLS(robust)		IV-GMM(robust)		Fixed Effects
	1	2	3	4	5
Log of real GDP per capita	-0.068*** (0.025)	-0.053*** (0.021)	-0.063*** (0.024)	-0.049*** (0.020)	-0.606*** (0.165)
Ratio of private credit to GDP	0.072** (0.035)	0.075*** (0.032)	0.065** (0.034)	0.069** (0.031)	0.495* (0.306)
Capital account liberalisation	0.025** (0.011)	0.024** (0.011)	0.0234** (0.0108)	0.020** (0.010)	0.036*** (0.012)
Ratio of trade openness to GDP	-.000007 (.0002)	.00001 (.0002)	-.00002 (.0002)	-.00002 (.0002)	.0013*** (.0006)
Secondary school enrolment	.0002 (.0002)	.0001 (.0002)	.0002 (.0002)	.0001 (.0002)	.0005 (.0008)
Institutional quality	.0023*** (.0007)	-	.0023*** (.0007)	-	.0031*** (.0012)
Interaction of Private credit and ins. Quality	-	.0033*** (.0007)	-	.0032*** (.0007)	-
Constant	0.612*** (0.250)	0.546*** (0.213)	0.569** (0.245)	0.518*** (0.208)	4.88*** (1.29)
No. of Obs.	230	224	230	224	231
Wald chi-sq. (p-value)	24.24 (0.003)	33.68 (0.000)	24.45 (0.003)	29.85 (0.000)	182.66
Root MSE	0.098	0.090	0.097	0.090	-
Hansen j over id test (p-value)	0.429	0.143	0.429	0.143	-
Endogeneity test (p-value)	0.066	0.108	0.108	0.190	-
Time Dummies	Yes	Yes	Yes	Yes	No

Note: Dependent variable is growth rate over five year period. Here private credit is used as a financial development indicator. In IV-2SLS and IV-GMM, we instrumented the ratio of private credit to GDP by neighbouring countries' private credit to GDP and legal origin; while in Fixed Effect, the ratio of private credit to GDP is instrumented by neighbouring countries' private credit to GDP. Endogeneity test reject the null (H_0 : Variables are exogenous) except in column (4) where variables are weakly endogenous. Heteroskedasticity robust standard errors are in parentheses.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

The results of the full sample data indicate that financial indicators, capital account liberalisation and institutional quality are statistically significant determinants of long-term growth. Furthermore, we also found an economically large and statistically significant effect of the interaction term on growth. All three techniques, IV-2SLS, IV-GMM and Fixed Effects, show the statistically significant and economically relevant relationship between financial development, capital account, institutional quality and economic growth. Moreover, the diagnostic and sensitivity tests of all three estimation techniques support the suitability of the instrumental variables. Thus, the strong link between capital account liberalisation, financial development, institutional quality and growth is not due to simultaneity bias.

Table 2.3a presents the results of high income countries; liquid liabilities have a positive and statistically significant impact on economic growth in high income countries, while capital account liberalisation has a positive but insignificant impact in columns (1) to (4), while Klein and Olivei (2008) found positive and significant impact in high income countries. When the interaction term is included in columns (2) and (4), the coefficient of liquid liabilities variable remains positive and significant, but the significance of liquid liabilities is diminished from the 5% level to 10% level. The included interaction term is also significant at the 10% level. Similarly, in table 2.3b, both private sector credit and capital account liberalisation have a positive and significant impact on economic growth in columns (1) to (4). Furthermore, the results in column (5) of tables 2.3a and 2.3b explain that financial sector indicators and the impact of liberalisation is positive but not statistically significant. One possible justification is the numerous banking crises caused by a large proportion of non-performing loans; another reason is that these economies are highly saturated. These results seem to suggest that both financial development indicators and capital account liberalisation has

Table – 2.3a, Liquid Liabilities, Capital Account Liberalisation and Growth
25-High Income Countries, 1985-2004

Dependent variable GDP growth	IV-2SLS(robust)		IV-GMM (robust)		Fixed Effects
	1	2	3	4	5
Log of real GDP per capita	-0.160** (0.077)	-0.179** (0.097)	-0.143** (0.073)	-0.171* (0.092)	-0.366*** (0.102)
Ratio of liquid liabilities to GDP	0.230** (0.115)	0.327* (0.192)	0.233** (0.115)	0.320* (0.190)	0.0113 (0.058)
Capital account liberalisation	0.034 (0.024)	0.037 (0.028)	0.039** (0.022)	0.039 (0.026)	0.050 (0.052)
Ratio of trade openness to GDP	.0009* (.0005)	.0011 (.0007)	.0010** (.0004)	.0011* (.0006)	.0033*** (.0007)
Secondary school enrolment	.0003 (.0005)	.0005 (.0006)	.0002 (.0005)	.00049 (.0006)	.0010** (.0006)
Institutional quality	.0013 (.0019)	-	.0019 (.0017)	-	.0020*** (.0009)
Interaction of Liquid liabilities and ins. Quality	-	.0063* (.0035)	-	.0062* (.0034)	
Constant	1.52** (0.762)	1.76 (0.977)	1.31** (0.704)	1.67* (0.902)	3.24*** (0.887)
No. of Obs.	83	75	83	75	85
Wald chi-sq. (p-value)	20.71 (0.014)	15.40 (0.080)	24.55 (0.003)	17.01 (0.048)	271.8 (0.000)
Root MSE	0.095	0.117	0.097	0.115	-
Hansen j over id test (p-value)	0.508	0.793	0.508	0.793	-
Endogeneity test (p-value)	0.050	0.057	0.047	0.053	-
Time Dummies	Yes	Yes	Yes	Yes	No

Note: Dependent variable is growth rate over five year period. Here liquid liabilities are used as a financial development indicator. In IV-2SLS and IV-GMM, we instrumented the ratio of liquid liabilities to GDP by neighbouring countries' liquid liabilities to GDP and legal origin; while in Fixed Effects, the ratio of liquid liabilities to GDP is instrumented by lagged value of dependent variable. Endogeneity test reject the null (Ho: Variables are exogenous). Heteroskedasticity robust standard errors are in parentheses.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

a positive but smaller effect on economic growth in high income countries, as compared to the full set of countries.

The results for middle income countries are explained in tables 2.4a and 2.4b; capital account liberalisation as well as financial development indicators have a positive and statistically significant impact on economic growth. The significance levels of financial development indicators and capital account liberalisation in middle income countries are much larger than in high income countries. The results of financial development indicators are similar to Rioja and Valle (2004) and Demetriades and Law (2004). They also found the stronger and significant impact of financial development on economic growth in middle income countries. Similarly, Edison, Klein, Ricci and Slok (2004) suggested that middle income countries can attain more benefits from liberalisation and can enhance economic growth. The findings of low income countries are reported in tables 2.5a and 2.5b. The results in columns (1) to (5) show that liquid liabilities are positive but statistically insignificant, while in column (4) the coefficient of liquid liabilities is negative and insignificant. However, the interaction term between liquid liabilities and institutional quality is highly significant. These findings reveal that lower income countries can enhance growth by improving their financial sectors and institutional quality. The results in columns (1), (2) and (5) of table 2.5a also suggest that capital account liberalisation has a positive and significant impact on growth. When the interaction term is included in columns (2) and (4), the capital account liberalisation variable has not remained significant. Similarly in table 2.5b, the coefficient of private sector credit has a positive but insignificant impact in columns (1), (3) and (5) while the findings in columns (2) and (4) reveal that lower income countries can enhance economic activity in the presence of strong institutions and by decreasing non-payable loans. Similarly, the interaction term between private sector credit and institutional

**Table – 2.3b, Private Credit, Capital Account Liberalisation and Growth
25-High Income Countries, 1985-2004**

Dependent variable GDP growth	IV-2SLS(robust)		IV-GMM(robust)		Fixed Effects
	1	2	3	4	5
Log of real GDP per capita	-0.085** (0.043)	-0.064 (0.050)	-0.095*** (0.041)	-0.080* (0.048)	-0.396*** (0.125)
Ratio of private credit to GDP	0.127** (0.065)	0.131* (0.073)	0.124** (0.064)	0.125* (0.073)	0.198 (0.535)
Capital account liberalisation	0.039** (0.017)	0.049** (0.021)	0.042*** (0.016)	0.052*** (0.021)	0.032 (0.077)
Ratio of trade openness to GDP	.0002 (.0002)	.0001 (.0002)	.0002 (.0002)	.00003 (.0002)	.0035*** (.0013)
Secondary school enrolment	-.0001 (.0002)	-.00009 (.0002)	-.0001 (.0002)	-.00008 (.0001)	.0007 (.0026)
Institutional quality	.0019 (.0012)	-	.0020* (.0012)	-	.0026 (.0046)
Interaction of Private credit and ins. Quality	-	-.0062 (.0079)	-	-.0073 (.0076)	-
Constant	0.669 (0.473)	0.491 (0.550)	0.761 (0.463)	0.659 (0.528)	3.39*** (1.06)
No. of Obs.	84	84	84	84	73
Wald chi-sq. (p-value)	59.82 (0.000)	54.67 (0.000)	65.09 (0.000)	59.86 (0.000)	114.93 (0.000)
Root MSE	0.058	0.060	0.058	0.059	-
Hansen j over id test (p-value)	0.358	0.261	0.358	0.261	-
Endogeneity test (p-value)	0.067	0.087	0.075	0.092	-
Time Dummies	Yes	Yes	Yes	Yes	No

Note: Dependent variable is growth rate over five year period. Here private credit is used as a financial development indicator. In IV-2SLS and IV-GMM, we instrumented the ratio of private credit to GDP by neighbouring countries' private credit to GDP and legal origin; while in Fixed Effects, the ratio of private credit to GDP is instrumented by lagged value of dependent variable. Endogeneity test reject the null (Ho: Variables are exogenous). Heteroskedasticity robust standard errors are in parentheses.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

**Table – 2.4a, Liquid Liabilities, Capital Account Liberalisation and Growth
35-Middle Income Countries, 1985-2004**

Dependent variable GDP growth	IV-2SLS(robust)		IV-GMM(robust)		Fixed Effects
	1	2	3	4	5
Log of real GDP per capita	-0.059*** (0.022)	-0.056*** (0.022)	-0.061*** (0.022)	-0.057* (0.022)	-0.684*** (0.120)
Ratio of liquid liabilities to GDP	0.128*** (0.051)	0.187*** (0.070)	0.126*** (0.051)	0.189*** (0.071)	0.272 (0.319)
Capital account liberalisation	0.039** (0.017)	0.039** (0.016)	0.041*** (0.016)	0.041*** (0.016)	0.048*** (0.019)
Ratio of trade openness to GDP	-.0010* (.0005)	-.0011* (.0007)	-.0008 (.0005)	-.0011 (.0007)	.0001 (.0009)
Secondary school enrolment	-.0000004 (.000434)	-.00007 (.00048)	.00005 (.00042)	-.00001 (.00048)	-.0008 (.0013)
Institutional quality	.0021 (.0014)	-	.0016 (.0013)	-	.0022* (.0013)
Interaction of Liquid liabilities and ins. quality	-	.0066 *** (.0025)	-	.0068*** (.0025)	-
Constant	0.634*** (0.225)	0.733*** (0.251)	0.644*** (0.226)	0.730*** (0.253)	5.745*** (0.977)
No. of Obs.	104	98	104	98	94
Wald chi-sq. (p-value)	15.43 (0.079)	19.24 (0.023)	15.20 (0.085)	19.72 (0.019)	147.92 (0.000)
Root MSE	0.106	0.113	0.106	0.113	-
Hansen j over id test (p-value)	0.150	0.423	0.356	0.423	-
Endogeneity test (p-value)	0.042	0.029	0.055	0.027	-
Time Dummies	Yes	Yes	Yes	Yes	Yes

Note: Dependent variable is growth rate over five year period. Here liquid liabilities are used as a financial development indicator. In IV-2SLS and IV-GMM, we instrumented the ratio of liquid liabilities to GDP by neighbouring countries' liquid liabilities to GDP and legal origin; while in Fixed Effects, the ratio of liquid liabilities to GDP is instrumented by lagged value of dependent variable. Endogeneity test reject the null (H₀: Variables are exogenous). Heteroskedasticity robust standard errors are in parentheses.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

quality has a negative and significant impact on economic growth at the 1% level. These findings suggest that lower income countries should improve the quality of institutions by enhancing the rule of law, and by reducing corruption and uncertainty. The coefficient of the interaction term between liquid liabilities and institutional quality in table 2.4a also has a positive and significant impact on economic growth in middle income countries, which seems to suggest that a well-structured financial system enhances economic growth in a better institutional environment.

**Table – 2.4b, Private Credit, Capital Account Liberalisation and Growth
35-Middle Income Countries, 1985-2004**

Dependent variable GDP growth	IV-2SLS(robust)		IV-GMM(robust)		Fixed Effects
	1	2	3	4	5
Log of real GDP per capita	-0.062*** (0.020)	-0.042** 0.021	-0.052 (0.032)	-0.051*** (0.019)	-0.571*** (0.188)
Ratio of private credit to GDP	0.309* (0.187)	0.339* (0.191)	0.309 (0.187)	0.298* (0.183)	0.306 (0.382)
Capital account liberalisation	0.040*** (0.017)	0.033* (0.020)	0.040*** (0.017)	0.022 (0.018)	0.066*** (0.023)
Ratio of trade openness to GDP	-.0006 (.0004)	-.0005 (.0004)	-.0006 (.0004)	-.0006* (.0003)	.0004 (.0011)
Secondary school enrolment	.0002 (.0004)	.0005 (.0004)	.0002 (.0004)	.0003 (.0004)	.0007 (.0013)
Institutional quality	.0072* (.0038)	-	.0072* (.0038)	-	.0035 (.0023)
Interaction of Private credit and ins. Quality	-	-.0110 (.0286)	-	-.00005 (.0270)	-
Constant	0.243 (0.183)	0.231 (0.206)	0.243 (0.183)	0.350** (0.185)	4.545*** (1.445)
No. of Obs.	108	108	108	108	101
Wald chi-sq. (p-value)	18.87 (0.026)	14.83 (0.095)	18.87 (0.026)	16.58 (0.055)	105.25 (0.000)
Root MSE	0.124	0.127	0.124	0.122	-
Hansen j over id test (p-value)	0.288	0.148	0.288	0.148	-
Endogeneity test (p-value)	0.102	0.136	0.102	0.255	-
Time Dummies	Yes	Yes	Yes	Yes	Yes

Note: Dependent variable is growth rate over five year period. Here private credit is used as a financial development indicator. In IV-2SLS and IV-GMM, we instrumented the ratio of private credit to GDP by neighbouring countries' private credit to GDP and legal origin; while in Fixed Effects, the ratio of private credit to GDP is instrumented by lagged value of dependent variable. Endogeneity test reject the null (H₀: Variables are exogenous) except in column (2) and (4) where variables are weakly endogenous. Heteroskedasticity robust standard errors are in parentheses.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

Table – 2.5a, Liquid Liabilities, Capital Account Liberalisation and Growth
11-Lower Income Countries, 1985-2004

Dependent variable GDP growth	IV-2SLS(robust)		IV-GMM(robust)		Fixed Effects
	1	2	3	4	5
Log of real GDP per capita	-0.266* (0.152)	-0.052 (0.066)	-0.283 (0.148)	-0.020 (0.049)	-1.00 (1.03)
Ratio of liquid liabilities to GDP	0.216 (0.235)	0.010 (0.079)	0.229 (0.240)	-0.028 (0.058)	0.254 (0.495)
Capital account liberalisation	0.089** (0.044)	0.031 (0.025)	0.096** (0.042)	0.028 (0.021)	0.081** (0.044)
Ratio of trade openness to GDP	-.0001 (.0011)	-.0005 (.0004)	.00004 (.0011)	-.0004 (.0003)	.0004 (.0020)
Secondary school enrolment	.0012 (.0024)	-.0006 (.0005)	.0014 (.0025)	-.0006 (.0004)	.0022 (.0035)
Institutional quality	.0044* .0026	-	.0043 (.0027)	-	.0036 (.0027)
Interaction of Liquid Liabilities and ins. Quality	-	.0073*** (.0026)	-	.0067*** (.0023)	-
Constant	1.968 (1.300)	.4290 (.5028)	2.066 (1.293)	.1597 (.3710)	7.306 (7.983)
No. of Obs.	29	28	29	28	29
Wald chi-sq. (p-value)	16.46 (0.057)	62.43 (0.000)	15.05 (0.089)	79.00 (0.000)	17.92 (0.021)
Root MSE	0.128	0.054	0.133	0.048	-
Hansen j over id test (p-value)	0.422	0.252	0.422	0.252	-
Endogeneity test (p-value)	0.053	0.227	0.076	0.280	-
Time Dummies	Yes	Yes	Yes	Yes	Yes

Note:

Dependent variable is growth rate over five year period. Here liquid liabilities are used as a financial development indicator. In IV-2SLS and IV-GMM, we instrumented the ratio of liquid liabilities to GDP by neighbouring countries' liquid liabilities to GDP and legal origin; while in Fixed Effects, the ratio of liquid liabilities to GDP is instrumented by neighbouring countries' liquid liabilities to GDP. Endogeneity test reject the null (Ho: Variables are exogenous) except in column (2) and (4) where variables are weakly exogenous. Heteroskedasticity robust standard errors are in parentheses.

*(***) Coefficients are statistically significant at the 1% level.*

*(**) Coefficients are statistically significant at the 5% level.*

() Coefficients are statistically significant at the 10% level.*

**Table – 2.5b, Private Credit, Capital Account Liberalisation and Growth
11-Lower Income Countries, 1985-2004**

Dependent variable GDP growth	IV-2SLS(robust)		IV-GMM(robust)		Fixed Effects
	1	2	3	4	5
Log of real GDP per capita	-0.077** (0.033)	-0.0003 (0.0374)	-0.077*** (0.029)	0.021 (0.029)	-0.078 (0.592)
Ratio of Private credit to GDP	0.358 (0.247)	0.406** (0.227)	0.246 (0.199)	0.303** (0.165)	0.619 (0.587)
Capital account liberalisation	0.062* (0.035)	0.123*** (0.043)	0.065** (0.030)	0.133*** (0.029)	0.091 (0.057)
Ratio of trade openness to GDP	.0005 (.0008)	.0007 (.0008)	.0002 (.0006)	.0007 (.0006)	-.00001 (.00237)
Secondary school enrolment	-.0011 (.0007)	-.0016 (.0007)	-.0012* (.0007)	-.0018*** (.0006)	.0018 (.0031)
Institutional quality	.0030* (.0017)	-	.0038*** (.0014)	-	.0023 (.0035)
Interaction of Private credit and ins. Quality	-	-0.368*** (0.112)	-	-0.404*** (0.088)	-
Constant	0.354* (0.213)	-0.111 (0.293)	0.396** (0.207)	-0.235 (0.243)	0.173 (4.26)
No. of Obs.	32	32	32	32	32
Wald chi-sq. (p-value)	57.53 (0.000)	64.18 (0.000)	63.14 (0.000)	149.59 (0.000)	12.96 (0.080)
Root MSE	0.078	0.075	0.070	0.069	-
Hansen j over id test (p-value)	0.119	0.659	0.119	0.659	-
Endogeneity test (p-value)	0.022	0.042	0.089	0.032	-
Time Dummies	Yes	Yes	Yes	Yes	Yes

Note: Dependent variable is growth rate over five year period. Here private credit is used as a financial development indicator. In IV-2SLS and IV-GMM, we instrumented the ratio of private credit to GDP by neighbouring countries' private credit to GDP and legal origin, while in Fixed Effects, the ratio of private credit to GDP is instrumented by neighbouring countries' private credit to GDP. Endogeneity test reject the null (H_0 : Variables are exogenous). Heteroskedasticity robust standard errors are in parentheses.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

2.5. Summary and Conclusion:

Recent theoretical and empirical findings suggest that the openness of a country's capital account and financial sector development can affect economic growth. This chapter investigates the impact of capital account liberalisation and financial development on economic growth in seventy one developed and developing countries (including 25 high, 35 middle and 11 lower income economies) over the period 1985-2004 (five-year averaged data). Here, we are mainly concerned with liberalisation and financial development in middle and lower income countries, but also compare the results of middle and lower income countries to high income countries to analyse whether the importance of capital account liberalisation and financial sector development vary across levels of growth.

The results of the full sample data of 71 countries suggest that financial development and capital account liberalisation has a statistically significant and strong impact on growth. Specifically, financial development and capital account liberalisation also have an economically large and statistically significant relationship with growth in middle and lower income countries, although in high income countries capital account liberalisation has a positive but insignificant impact on economic growth. These statistics follow the findings of earlier studies, which suggest that the inflow of capital flight is much larger in middle and low income countries than in high income ones. Thus, the findings of this chapter are also suggested that middle and low income countries can obtain large advantages from capital account liberalisation. The empirical findings also suggest that measures of financial sector development have a strong and significant effect on economic growth. When financial systems are functioning well, the acceleration of economic growth is more likely to take place, when combined with good

institutions. In addition, empirical results also suggest that institutional quality has a direct and robust effect on economic growth in 71 developed and developing countries. Therefore, these results suggest that financial sector development and institutional development are pre-conditional for promoting growth. The interaction term of the financial development indicator, the ratio of private credit to GDP, and institutional quality indicator has a negative impact on growth in high and middle income countries while in low income countries the interaction term has a negative and significant impact on growth. These findings suggest that financial deepening may not increase growth and has an adverse effect because of high levels of corruption, political influence, property rights that are not well defined and a financial system that is not well functioning which may divert the resources into unproductive activities (Demetriades and Law, 2004).

Overall, this study contributes to the existing literature that examines how capital account liberalisation, financial development indicators and sound institutional quality enhance economic growth, particularly in middle and lower income countries.

Appendix-A2.1:

Hausman Test for Fixed Effects:

	Coefficients			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	FE	RE	Difference	S.E.
Log of Initial per Capita Income	-.6065492	-.0821001	-.5244492	.162313
Financial Development Indicator	.4957426	.1899527	.3057899	.2859819
Capital Account liberalisation	.0361671	.0232328	.0129343	.0076525
Institutional Quality	.0031768	.0027833	.0003935	.0010034
Secondary School Enrolment	.000597	.0000148	.0005822	.0007712
Trade Openness	.001378	4.87e-06	.0013732	.0005842

b = consistent under Ho and Ha; obtained from xtivreg

B = inconsistent under Ha, efficient under Ho; obtained from xtivreg

Test: Ho: difference in coefficients not systematic

$$\text{Chi2 (6)} = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

$$= 500.14$$

$$\text{Prob} > \text{Chi2} = 0.0000$$

Appendix-A2.2:

Descriptive Statistics of High, Middle and Low Income Countries, 1985-2004

	Growth (%)	Log of real GDP per capita (%)	Ratio of liquid liabilities to GDP (%)	Ratio of private credit to GDP (%)	Capital account liberalisation	Institutional quality	Ratio of trade openness to GDP (%)	Secondary school enrolment (%)
High Income Countries								
Observation	100	100	97	99	100	97	99	95
Mean	0.088	10.05	75.93	89.15	2.75	32.84	69.99	83.93
St. Deviation	0.073	0.279	37.58	37.42	0.53	8.44	50.25	33.52
Minimum Value	-0.097	8.915	28.43	25.8	0.6	8.06	17.68	3.311
Maximum Value	0.334	10.64	242.2	195.2	3	45	309.9	161.6
Middle Income Countries								
Observation	140	140	129	140	140	138	139	131
Mean	0.067	8.483	40.68	36.77	1.61	24.09	60.19	58.53
St. Deviation	0.109	0.545	23.89	27.74	0.97	6.98	31.24	25.99
Minimum Value	-0.254	7.099	4.502	4.89	0	0	13.42	9.767
Maximum Value	0.426	9.568	122.1	127.0	3	43.33	205.5	151.9
Low Income Countries								
Observation	43	44	38	42	44	44	41	39
Mean	0.048	7.116	25.76	15.67	1.18	24.59	57.63	34.92
St. Deviation	0.099	0.433	11.46	9.14	0.77	8.56	46.67	28.42
Minimum Value	-0.223	6.363	5.44	1.518	0	0	15.97	6.06
Maximum Value	0.252	8.017	48.2128	33.8	3	43.89	311.4	136.4

Note: Where, dependent variable is growth over five years. Log of real GDP per capita represents the logarithm of initial value which is reset at 5-years intervals (1985, 1990, 1995 and 2000). Similarly, capital account liberalisation, trade openness and secondary school enrolment represent the 5 years average values between t and $t+5$.

Appendix-A2.3:

List of Countries:

High Income Countries:

1	Australia	36	Dominican Rep
2	Austria	37	Ecuador
3	Belgium	38	Egypt
4	Canada	39	El Salvador
5	Denmark	40	Guatemala
6	Finland	41	India
7	France	42	Indonesia
8	Germany	43	Jamaica
9	Greece	44	Jordan
10	Hong Kong	45	Malaysia
11	Ireland	46	Mexico
12	Israel	47	Morocco
13	Italy	48	Nicaragua
14	Japan	49	Nigeria
15	Korea	50	Pakistan
16	Netherlands	51	Paraguay
17	New Zealand	52	Peru
18	Norway	53	Philippines
19	Portugal	54	South Africa
20	Singapore	55	Sri Lanka
21	Spain	56	Thailand
22	Sweden	57	Tunisia
23	Switzerland	58	Turkey
24	United Kingdom	59	Uruguay
25	United States	60	Venezuela

Middle Income Countries:

26	Algeria
27	Argentina
28	Bolivia
29	Brazil
30	Cameroon
31	Chile
32	China
33	Colombia
34	Costa Rica
35	Cote de Ivoire

Low Income Countries:

61	Bangladesh
62	Burkina-Faso
63	Ethiopia
64	Ghana
65	Kenya
66	Madagascar
67	Mozambique
68	Senegal
69	Tanzania
70	Uganda
71	Zimbabwe

CHAPTER 3:

***IMPACT OF FINANCIAL LIBERALISATION AND BANKING SUPERVISION
ON NET INTEREST MARGINS: EVIDENCE FROM PANEL DATA***

3.1. Introduction:

The literature on finance and growth has proved that a well-functioning banking system and other financial intermediaries can play an important role in the process of economic development.²¹ Beck, Demirguc-Kunt and Levine (2008) further explain that the banking sector of emerging and developing countries keep a larger share in the financial system of the country and perform an essential role in the development function.

This chapter, therefore, considers the bank-specific and macro-specific determinants of net interest margins in more than 1300 individual banks. The empirical finding of this chapter reveals the fact that financial reforms, financial liberalisation and high banking regulation and supervision policies narrow bank interest margins by enhancing the competition and efficiency of financial sector. However, several studies explained that developing countries are still characterized by high banks' interest margin after the implementation of costly financial reform programmes, and cause of severe financial management problems in financial intermediaries.²² For instance, Barajas, Steiner and Salazar (1999) compared the interest rate spreads between pre-liberalisation (1974-1988) and post-liberalisation (1991-1996) periods and suggested that interest rate spreads remained the same both before and after liberalisation.

A number of studies on financial reforms and net interest margins have been conducted in Middle East and North Africa (MENA) countries. A detailed view of financial reform on net interest margins has been done by Chirwa and Mlachila (2004) on the commercial banking system on Malawi, which sums up the role of financial

²¹ See Demetriades and Fielding (2012); Demirguc-Kunt and Levine (2008).

²² See Tennant and Folawewo (2009); Ho and Saunders, (1981).

reforms by using data from 1989 to 1999, finding higher interest margins in the post-liberalisation period.

Demirguc-Kunt and Levine (2008) found strong evidence in a recent study on finance and growth literature that efficient and well-functioning financial systems are strongly linked with economic development. They further suggested that consistent macroeconomic policies and strong legal systems are a must for well-functioning financial systems. Banks help or support the economy as a financial intermediary through the process of capital accumulation in a more efficient way, and also by eliminating the asymmetric information between depositors and borrowers (Hawtrey and Liang, 2008; Brock and Suarez, 2000). By providing these financial services to lenders and borrowers, banks have earned revenue which is mainly based on interest margins. Net interest margins are the most important variable of the financial sector and are generally explained as the difference between the lending interest rate and the borrowing interest rate of total assets. On the one hand, high spreads limit the ability of financial intermediaries to participate in expansion and development; on the other hand, low return on deposits reduce the saving behaviour of potential depositors and minimize the finance for future borrowers, consequently decreasing potential investment activities and economic growth (see Barajas, Steiner and Salazar, 1999). Furthermore, Hanson and Rocha (1986) revealed that bank interest spreads in developing economies were considerably and constantly higher than in developed economies. In addition, Claeys and Vander (2008) examine the determinants of interest margins of banks in Central and Eastern European countries (CEEC) and indicate that the behaviour of interest margins holds an important place in policy making, and also suggest that an inefficient and non-competitive banking environment may enhance interest margins.

Brock and Suarez (2000) discussed the performance of banks in six Latin American countries during the mid-1990s and examined the determinants of the banks' spread. Their investigation suggested that high operating costs, high reserve requirements, high NPLs and unstable macroeconomic conditions are the main factors of higher spreads in the banks of Latin America.²³ Similarly, Tennant and Folawewo (2009) investigated the macro-specific and bank-specific variables of interest rate spreads in middle and low income countries and found significantly high bank interest margins in developing countries, but according to intuition that financial liberalisation enhances the competition among banks and converges bank interest margins at global level.

Demirguc-Kunt, Laeven and Levine (2004) used bank level data across 72 countries over the period 1990-1995 to examine the influence of bank regulations, bank concentration and institutional development on bank net interest margins and overhead costs. They suggested that barriers to bank entry and strict regulations on bank activities boost net interest margins, while they found a positive relationship between net interest margins and bank concentration.²⁴ Maudos and de Guevara (2004) used a single-stage procedure to investigate the determinants of net interest margins in five European banking systems (Germany, France, the United Kingdom, Italy and Spain) during the period 1993 to 2000. They suggested that the fall of bank interest margins in the principal European banking system does not depend only on the degree of competition,

²³ Naceur and Omran (2011) also investigate the determinants of bank margins in Middle East and North African (MENA) countries and found a positive and significant impact of bank-specific variables on net interest margins, specifically credit risk and bank capitalisation, while macroeconomic variables have no significant impact.

²⁴ Similarly, Demirguc-Kunt and Huizinga (1999) also assessed the impact of bank-specific variables, macro-specific variables and institutional variable on bank interest margins and profitability by using the bank level data for 80 countries during the period 1988-1995.

but also on the reduction of interest rate risk, credit risk and operation costs. Similarly, Angbazo (1997) used the Ho and Saunders (1981) dealership model to explore the determinants of net interest margins and extended this model by including default risk and its interaction with interest rate risk. He used Bank Call Report data over the period 1989-1993, and divided the data into sub-samples of money-centre, super-regional and regional banks. The empirical evidence of this study found a positive and significant impact of default risk on net interest margins, but not with interest rate risk in money-centre banks. In contrast, empirical findings further explained that net interest margins are sensitive to interest rate risk but not to default risk in super-regional and regional banks.

The main objective of this chapter is to assess the impact of financial reform, bank-specific variables and macro-specific variables on net interest margins through the single model framework. The conventional wisdom is that banks' interest margins have become important to examine, because it contains essential knowledge regarding the performance and efficiency of the banking system. Therefore, to estimate the individual impact of financial liberalisation and banking regulation and supervision on net interest margins, we have explicitly introduced financial reform as the main variable of net interest margins, and split reforms variable into a liberalisation index (included: credit allocation controls, interest rate liberalisation, entry barriers, privatization, capital accounts liberalisation, security market liberalisation) and a banking regulation and supervision index. This study will provide an important insight into the interest margins in seventy six developed and developing countries and will make some policy suggestions that could be beneficial for bank managers and policy makers. The main finding of this chapter is that financial reform and financial liberalisation have a negative and statistically significant impact on net interest margins. Specifically, these

results also explain that sound banking regulation and supervision, deregulation of interest rate control and the removal of entry barriers reduce net interest margins through the increasing competition and efficiency of banking sector. The results of this chapter also explain that bank credit risk, bank size, bank age, bank concentration and the share of government banks has increased interest margins in the 76 countries. In contrast, equity to assets ratio and the share of foreign banks reduces bank interest margins in these developing and developed countries. Moreover, we also found that real GDP per capita growth and GDP deflator lower the net interest margin.

The main contributions of this chapter into the existing literature are as follows. Firstly, by the inclusion of some new determinants such as financial reforms, bank age and the share of foreign and government banks. Secondly, by the use of the latest data set from Bank-scope, provided by Fitch/IBCA/Bureau Van Dijk, to analyse the balance sheets and income statements of more than thirteen hundred banks from seventy six developing and emerging countries over the period 2001 to 2005.²⁵ The third contribution of this chapter is applying a dynamic two-step system GMM panel estimation technique on large micro data to explore the relationship between financial reform and interest margins. This study tries to explore the in depth relationship of different levels of liberalisation and banking supervision with net interest margins.

The remainder of the chapter is organised as follows. The next section gives a brief review on the relationship between financial liberalisation and net interest margins in the banking system. Section 3 explains the data set and the determinants of the model. Section 4 discusses the empirical methodology of the econometric technique which has been used to estimate bank net interest margins. Section 5 represents the

²⁵ A full list of countries is available in Appendix-A4.5.

findings of the empirical analysis. Finally, summary and concluding remarks are described in the last section.

3.2. Financial Liberalisation and Net Interest Margins:

Prior to discussing financial liberalisation, the financial system plays an important part in economic growth and its role cannot be ignored in the development process. The main function of financial intermediaries in the financial sector is to convert depositor savings into profitable assets (see Chirwa and Mlachila, 2004). They further explained that banks as financial intermediaries also arrange funds, through screening and monitoring mechanisms, from individuals who have an abundance of liquid assets to those individuals who have a scarcity, and try to eliminate any moral hazards or adverse selection problems. The policy makers of developing countries found a strong relationship between finance and growth. Since the 1980s, they have also been aware of the significance of financial intermediaries and financial deepening for growth.²⁶ Therefore, a large body of literature sheds light the impact of financial liberalisation on enhancing economic growth. During the 1970s and 1980s most of the developing countries in Latin America implemented financial liberalisation policies with the purpose of enhancing the productivity, competition and efficiency of their banking sectors (Hermes et al, 2010).

They further described that financial reforms policies were more visible and widely applied by the developing countries during the 1990s. These policies became a main part of the Washington consensus, and were promoted by financial based institutions such as the IMF and the World Bank. The main objective of the IMF and World Bank reform programme is to reduce government influence and control of the

²⁶ See World Bank (1989); King and Levine (1993)

financial system of a country.²⁷ McKinnon and Shaw's (1973) paradigm shows that the efficiency and performance of financial institutions are adversely affected by the financial repression policies. These policies force banks and other financial intermediaries to pay low rates on financial savings, which decreases the saving behaviour of depositors, thus reducing the funds accessible for capital accumulation. Khatkhate (1988) and Agarwala (1983) did not find any evidence to support the view of McKinnon and Shaw (1973) that the elimination of financial repression leads the economy towards higher growth. However, King and Levine (1993); Levine (1997) and Khan and Sendadji (2000) revealed that financial liberalisation and growth move in the same direction and enhance economic growth.

The theoretical underpinning of the conventionalist view is that financial liberalisation can lead the economy towards higher economic growth by increasing bank efficiency and by high real interest rates. The high interest rate enhances the supply of loan able funds for new investors, and also attracts depositor savings to banks.²⁸ In contrast, Taylor and Van Wijnbergen (1983) argued that the demand of borrowing funds for new projects diminishes in a high interest rate environment and which leads the economy towards a reduction in economic growth. Similarly, Hermes et al (2010) also explained that banks are less motivated in financially repressed environment to enhance their performance by means of improving loans allocation, by increasing proper mobilization of deposits and by decreasing operating costs.

Most of the developing countries are identical in their financial systems; for instance, a high reserve requirement, domestic credit control, direct controls on interest

²⁷ (See http://en.wikipedia.org/wiki/Washington_Consensus)

²⁸ See Chirwa and Mlachila (2004).

rates and the limited role of commercial banks. A number of developing countries have experienced costly financial sector reform programmes. Thus, these countries are still facing high bank interest margins which contribute to high reserve requirement, high intermediation costs or taxation and lack of banking competition.²⁹ Chirwa and Mlachila (2004) also suggested that if financial reform does not correct the financial structure in which banks operate, then bank interest margins in developing countries will be high. Even after liberalisation, developing countries fail to converge net interest margins at international standards. Net interest margins are the satisfactory indicator of intermediation efficiency, and it is also assumed that efficiency and high competition in banking sector would decline interest margins.

3.3. The Data:

This study analyses the micro-panel data of more than 1300 banks of 76 developed and developing economies over the period 2001-2005.³⁰ The bank balance sheet information, financial ratios and income statements on individual banks have been obtained from Bank-scope. The raw statistics from these countries during the sample period 2001 to 2005 contains 24,330 observations from 4866 banks; after re-examining the inconsistencies and reporting errors of data, the data set consists of 3026 observations that include more than 1300 individual-banks. The selection criteria of 76 countries in this chapter are based on the “New Database of Financial Reforms” developed by Abiad Detragiache and Tressel (2008), which contains 91 developed and developing countries. In this chapter we consider only those countries which have a minimum 5 and maximum 300 banks. We do not include countries like the US, the UK,

²⁹ See Detragiache, Tressel and Gupta (2008); Tennant and Folawewo (2009)

³⁰ Availability of data limited use only for five years.

Germany, Italy, France, Switzerland, Spain, Canada, Australia, Austria, Korea and Sweden, because the number of banks in these countries are 22,081 out of 30,634, which may be capture the impact of financial reform on financial fragility in other countries.

To investigate the model, data has been collected from different resources. The data of bank-specific determinants including net interest margins, bank capital (proxy of equity to assets ratio), bank size (proxy of total assets), bank credit risk (proxy of loan to assets ratios) and bank age (calculated from bank establishment year), has been obtained from the Bank-scope database maintained by Fitch/IBCA/Bureau Van Dijk, which is a major data source for this study. The Bank-scope data set contains comprehensive coverage of the financial or income statements of over 30,000 banks across the world. Data on macroeconomics variables, such as GDP growth and GDP deflator has been taken from the World Development Indicators (*WDI*) data base; data of financial reform variables have been attained from the Abiad, Detragiache and Tressel (2008) data set. Finally, data of bank concentration has been accumulated or generated by using the bank level data from Bank-scope.³¹

The percentage or share of ownership of foreign banks and government banks are also extracted from the Bank-scope data set. Demirguc-Kunt and Huizinga (1999) suggested that the foreign banks have higher interest margins in developing countries and lower in developed countries, because in developing countries the credit allocation rules of foreign banks are less subjective, and it also reveals the fact that on the one hand foreign banks have technical advantages, but on the other hand they have distinct

³¹ Author applies the same formula for bank concentration- that is the assets of three largest banks as a share of all banks' assets in a country.

informational disadvantages in comparison with government banks. Lastly, the outlier from the data set has been eliminated in order to reduce the effect of measurement error. The explanation and construction of all variables has been provided in the next section.

3.3.1. Bank Specific Variables:

3.3.1.1. Net Interest Margins (NIM)

“Net interest margins (*NIM*), the dependent variable, equals the accounting value of a bank’s net interest income as a percentage of total earning assets. The higher this figures the cheaper the funding or the higher the margin the bank is commanding (see the Bank-scope database).” The net interest income is measured by the difference between the amount of interest income received from assets and interest income paid on liabilities. To follow Beck, Demirguc-Kunt and Levine (2009), we also used Bank-scope database measure of net interest margins.³² They suggested that lower (higher) levels of net interest margins show higher (lower) levels of banking competition and efficiency. The country-wise mean statistics of the data show that the highest value of net interest margins is found in Uganda, around 11.2%, while year- wise means of data show a declining trend, 5.5% in 2001 and 4.6 % in 2005 (see figure in Appendix-A3.5). Different studies on Small Island Developing States (SIDS) show that diseconomies of scale broadened net interest margins because of the small size of the market.³³ Some evidence also describes that greater market control of banks and high reserve requirements widened net interest margins (see Barajas et al 2000). Demirguc-Kunt and

³² They further discussed the dissimilarity between net interest margin and interest rate spreads and explained that the main difference is the lost of interest income on NPLs, so that spreads are normally higher than margins.

³³ Tennant and Folawewo (2009); Chirwa and Mlachila (2004); Jayaraman and Sharma (2003); Moore and Craig-well (2002); Demirguc-Kunt and Huizinga (1999)

Huizinga (1999) found that undeveloped financial institutions, a high level of corruption and an inefficient legal system are those factors that increase bank interest margins.

3.3.1.2. Bank Credit Risk (LAR)

Banks' credit risk is defined as the ratio of total loans to total assets, with a value between zero per cent to 99.9%, and the mean value of credit risk in these countries is 48.5%. The values of loan to assets ratio below zero and above 100% is considered as outlier and these observations are excluded from the data. The higher loan to asset ratio indicates that banks demand higher interest margins to meet or compensate for any expected and unexpected credit risk.³⁴ Since loans are more risky and a high return type of asset, interest profit should increase due to higher ratios. The relationship between net interest margins and credit risk is supposed to be positive.

3.3.1.3. Bank Capital (EAR)

Bank capital is a proxy of equity to total assets ratio and considered as a main determinant of bank solvency, with a mean of 17%.³⁵ This ratio also indicates the bank's creditworthiness and potential to compensate any type of losses. A number of studies reveal that the higher the equity to asset ratio means a bank is well-capitalized; a well-capitalized bank has fewer insolvency costs and the ability to cover any expected risk, thus lowering the additional cost of capital (Berger, Herring and Szego, 1995). Similarly, the lower the ratio of bank equity indicates that a bank is less capitalized and becomes more risky (see Demiguc-Kunt et al, 2008; and Podpiera, 2006). Thus, if bank

³⁴ Credit risk can also be used as a proxy by impaired loan to total assets, but here we followed Demetriades, and Fielding (2012); Andrianova et al (2011) and (2010); Maudos and Fernandez de Guvera (2004) and consider loans to total assets ratios as a proxy of credit risk.

³⁵ Summary of variables are explained in table 1.

equity and loan rates do not diverge to each other, then a high equity ratio can enhance the bank's efficiency and ability in a productive way (Berger 1995).

3.3.1.4. Bank Size (BS)

The logarithm of total assets in million USD uses bank size as a proxy instead of a logarithm of total loans.³⁶ Demirguc-Kunt and Huizinga (1999); and D'Auria et al (1999) used this proxy for bank size. Bank performance could be increased through bank size in high returns to scale in the banking sector. The expected sign between banks' size and net interest margins is negative because big banks have a tendency to charge lower margins.

3.3.1.5. Bank Age (AGE)

The data on bank age is extracted from the Bank-scope data set and the formation of this variable is of the author's own calculation, and considered the established year of a bank as a proxy of bank age. This variable has recently used by Demetriades and Fielding (2012) and Andrianova, Baltagi and Demetriades (2011).

3.3.1.6. Share of Government Banks and Foreign Banks

To explore the relationship between net interest margins and share of government and foreign banks, we used percentages of government banks and foreign banks in the banking system instead of using binary values 0 and 1.³⁷ The data of these variables were also obtained from the Bank-scope data set. The expected sign between net interest margins and foreign and government banks could be negative and positive

³⁶ See Maudos and de Guevara (2004), Shehzad et al (2010) and many others.

³⁷ Demetriades and Fielding (2012) and Andrianova et al (2011) also used the ownership of banks in percentage instead of dummy variables.

respectively. Claessens, Demirguc-Kunt and Huizinga (2001) explained that the huge entrance of foreign banks in the developing countries reduces bank interest margins and profitability, which is attributed to high competition.

3.3.2. Market Variable:

3.3.2.1. Bank Concentration (CONS.)

The determinant bank concentration can be measured as the assets of the three largest banks divided by the total assets of all banks in a given country. It is the main variable for competition in the banking sector; highly-concentrated banks show monopolistic behaviour. The lowest value of bank concentration is found in Brazil, at approximately 33%, and the highest value is in Ghana at around 98%, according to given data set. Like developing countries, developed countries are also experiencing high levels of bank concentration.³⁸

3.3.3. Macroeconomics Variables:

The macroeconomic variables real GDP per capita growth and GDP deflator control the macroeconomic environment in which the banking system works. A large number of studies have used growth for controlling business cycle fluctuation and found a negative and insignificant impact on net interest margins. Bernanke and Gertler (1989) suggested that the relationship between net interest margins and GDP growth is expected to be negative; firms borrow at a high rate because the quality of loan reduces in a period of economic recession. Similarly, Hanson and Rocha (1986) explained that net interest margins have positive relationship with inflation. Here, we also expect positive link between GDP deflator and net interest margins because a correlation

³⁸ Demirguc-Kunt, Laeven and Levine, 2004.

matrix shows that there is a positive and high correlation between net interest margins and GDP deflator, which confirms that high net interest margins are associated with a high rate of GDP deflator, especially in developing countries (see Honohan, 2000).³⁹

3.3.4. Financial Reform and Financial Liberalisation:

The data of the financial reform variable of 76 countries is obtained from a newly-constructed dataset, developed by Abiad et al., (2008).⁴⁰ This data set covers a wide range of reform processes in 91 countries over the period 1973 to 2005. The financial reform variable is categorized by seven different ways in each year. The first six dimensions measure financial liberalisation, whereas the seventh dimension coded as a reform and measures the strength of bank capital regulation and supervision. The first six dimensions of liberalisation are as follows: 1) Credit Allocation Controls and High Reserve Requirements; 2) Interest Rate Liberalisation; 3) Entry Barriers; 4) Privatization; 5) Capital Accounts Liberalisation; and 6) Securities Market Policy. The seventh dimension of financial reform is Banking Prudential Regulation and Supervision. The strength of first six dimensions of liberalisation is based on a four-point scale from fully repressed to fully liberalised (from 0 to 3), where 0, 1, 2 and 3 indicate fully repressed, partially liberalised, largely liberalised and fully liberalised respectively. The intensity of the seventh dimension of financial reform is also captured by the four-point scale (0 to 3) and is associated with unregulated and unsupervised, less regulated and less supervised, largely regulated and largely supervised and highly regulated and highly supervised (see Abiad, Detragiache and Tressel, 2008).

³⁹ See Appendix-A3.1.

⁴⁰ Hermes et al (2010) also used financial reform variable and found a positive impact of the financial reform programme on banking efficiency.

3.4. The Empirical Method:

The determinants of bank interest margins in developed and developing countries have been analysed by two alternative approaches: a dealership model approach and a single stage model approach. The theoretical framework of the dealership model was first proposed by Ho and Saunders (1981) and estimates net interest margins through a two-step estimation procedure. In the first step, the effect of the interest margin determinants is not reported into the theoretical model in order to obtain an estimate of the “pure” margins. In the second step, the relationship between the variable considered by the theoretical model and the “pure” margin is investigated. The advantage of this method is that the “pure” interest margins can be estimated through time series data. Saunders and Schumacher (2000) applied the Ho and Saunders (1981) model and followed the two-stage step procedure to investigate the determinants of net interest margins in seven OECD countries (six European countries and the US) during the period 1988 to 1995. They found a positive and significant impact of interest rate volatility on net interest margins. The theoretical model by Ho and Saunders (1981) has been extended and empirically estimated by other researchers as well, for instance, Allen (1988), Angbazo (1997), Brock and Suarez (2000), Maudos and de Guevara (2004) and Maudos and Solis (2009).

To estimate and analyse the determinants of net interest margins, this study follows Demirguc-Kunt et al (2004), Maudos and de Guevara (2004), Drakos (2003), Demirguc-Kunt and Huizinga (1999) and Angbazo (1997) and uses the single-stage regression model based on the banking firm approach in which various indicators of net interest margins are included. This study only covers the periods 2001 to 2005, so, the accessibility of yearly data does not allow the use of the Ho and Saunders approach,

because of possible heterogeneity across banks (Claeys and Vander, 2008). In the cross-country study, the following single regression model has been considered to generalize the relationship between the bank-specific, macro-specific and net interest margins. The regression shows that net interest margins are the function of bank-specific, financial reforms and macroeconomic variables.

$$NIM_{I,k,t} = \alpha_0 + \alpha_1 NIM_{i,k,(t-1)} + \alpha_2 Y_{i,k,t} + \beta_1 (FR_{k,t}) + \beta_2 (FS_{I,k,t}) + \beta_3 (GS_{I,k,t}) + \beta_4 X_{k,t} + \mu_{I,k} + \eta_t + \xi_{I,k,t} \text{-----}(3.1)$$

Where ' $NIM_{I,k,t}$ ', net interest margins, is the dependent variable of bank ' i ' in country ' k ' during the time ' t ' and ' $NIM_{I,k,t-1}$ ' is the lagged value of a dependent variable'. ' $Y_{I,k,t}$ ' is denoted the vector of the bank-specific variable of bank ' i ' in country ' k ' during the time ' t ' (included bank credit risk, bank size, bank age, bank concentration and bank capital) that has some influence on bank interest margins. ' $FR_{k,t}$ ' is the financial sector reforms of country ' k ' at the time ' t '. ' $FS_{I,k,t}$ ' and ' $GS_{I,k,t}$ ' are the proxy for the share of foreign banks and the share of government banks in the banking sector respectively; similarly, ' $X_{k,t}$ ' shows macroeconomic determinants (GDP growth and GDP deflator) of country ' k ' during the time ' t '. ' $\mu_{I,k}$ ' are the unobserved individuals specific effects, ' η_t ' is the time specific effects and ' $\xi_{I,k,t}$ ' is the error term. In model 2, we introduce financial liberalisation (containing the six measures of liberalisation) as an explanatory variable, and analysed its impact on net interest margins. In this model, we have replaced the financial reform by financial liberalisation index.

$$NIM_{I,k,t} = \alpha_0 + \alpha_1 NIM_{i,k,(t-1)} + \alpha_2 Y_{i,k,t} + \alpha_3 (FL_{k,t}) + \beta_2 (FS_{I,k,t}) + \beta_3 (GS_{I,k,t}) + \beta_4 X_{k,t} + \mu_{I,k} + \eta_t + \zeta_{I,k,t} \text{-----}(3.2)$$

Where ' $FL_{k,t}$ ' indicates financial liberalisation in country k during the time t . Similarly, in model 3, we introduced both the financial liberalisation index and the banking regulation and supervision index separately and analysed their impact on net interest margins.

$$NIM_{I,k,t} = \alpha_0 + \alpha_1 NIM_{i,k,(t-1)} + \alpha_2 Y_{i,k,t} + \alpha_3 (FL_{k,t}) + \alpha_4 (BRS_{k,t}) + \beta_2 (FS_{I,k,t}) + \beta_3 (GS_{I,k,t}) + \beta_4 X_{k,t} + \mu_{I,k} + \eta_t + \zeta_{I,k,t} \text{-----}(3.3)$$

Where ' $FL_{k,t}$ ' shows financial liberalisation and ' $BRS_{k,t}$ ' is a proxy for banking regulation and supervision. The relationships of financial reform, financial liberalisation, banking supervision and regulation and net interest margins have been explored by estimating the single regression model by using two different econometric techniques. First, the above panel regression was analysed by ordinary least square (OLS) and then by a dynamic two-step system Generalized Method of Moments (GMM) panel estimation technique, to correct the potential problem of inconsistency from the empirical model as proposed by Arellano and Bond (1991) and Blundell and Bond (1998).⁴¹ It is assumed that variables in the model, including the lagged dependent

⁴¹ Baltagi (2001) suggested that in a dynamic relationship, fixed effect or random effect estimation techniques provide biased and inconsistent estimates, particularly when N is quite larger than T; normally fixed effect or random effect estimation models apply in a static relationship.

variable and bank specific variables, in-particular bank credit risk and bank capital, are correlated to the disturbance term ($\xi_{I,k,t}$).

To meet the possibility of endogeneity, two steps of the Generalized Method of Moments (GMM) estimation techniques were used, recommended by Blundell and Bond, with Windmeijer (2005) finite sample correction, which provides robust standard errors, instead of classical or modern instrumental variable technique, because in this study N (number of banks) is quite larger than T (number of years). The two-step GMM is asymptotically more efficient and suitable for analysis than the one-step, and it also reports the possibility of correlation between any right hand side variables of the model with error term (see Baltagi, 2001). In the Blundell and Bond (1998) GMM estimator, there is no correlation between the difference of disturbance term ($\Delta\xi_{I,k,t}$) of the model and the higher order lagged of level variables. Similarly, the disturbance term ($\xi_{I,k,t}$) is not correlated with the lagged difference of these variables; the assumption of moment conditions in two-step GMM is applicable for each t. In addition, the basic intuition of Blundell and Bond's estimator is that the lagged values of the regressor are used as an instrument for right hand side variables. Secondly, by taking the first difference, the unobserved fixed effects are eliminated into the regression, as well as estimating both the regressions in level and in first difference simultaneously. Along with the Sargan test, the test of auto regressive of order one AR (1) and auto regressive of order two AR (2) were also conducted. Normally, the Sargan test of over-identifying restriction is used to ensure the validity of the instruments in the model if the null hypothesis cannot be rejected, which suggests that over- identifying restrictions are valid, and the AR test of order one and order two are used to test the autocorrelation in disturbance term ($\xi_{I,k,t}$). It is supposed that $\xi_{I,k,t}$ in Blundell and Bond's estimator is an independent idiosyncratic error term, so that the first order AR (1) test may reject the null hypothesis

($H =$ No Autocorrelation), while the second order AR (2) test may not reject the hypothesis of no or zero correlation.

3.5. Empirical Results:

As can be seen, table 3.1 provides the detailed summary of net interest margins and all its determinants, endogenous and exogenous, used in the empirical analysis. This table shows the units of measurement, mean, standard deviation, minimum and maximum characteristics of the above-mentioned variables. The values of all bank-specific variables have been restricted between 0 to 99.9% and the values below and above are considered as outliers. The mean value of net interest margins in the banks of seventy six countries is approximately 4.9% and ranges from 0.3% to 16%. Similarly, the mean value of the financial reform variable in 76 countries is around 16, the minimum index value is 7 and the maximum index value is 21. The mean value of bank credit risk is 48.5%⁴² approximately, which is below the international standards, and ranges from zero to 99.9%. The mean value of banks' total assets is 6.1 million USD; here bank total assets are considered as a proxy of bank size; the minimum value of bank assets is 0.12 million USD and the maximum value is approximately 14.1 million USD. Furthermore, the mean value of the equity to assets ratio is around 17%, with a minimum value of 0% to a maximum value of 86.9%. The mean age of banks in developing countries is 35 years, and the range of bank age is from newly-established (zero years) to 258 years, with a high standard deviation as shown by its wide range. The share of government banks and foreign banks in the banking sector is around 5.53% and 17.3% respectively, and the minimum and maximum value of government and

⁴² See Demetriades and Fielding (2012).

foreign shares in the banking industry are 0% to 100%.⁴³ Similarly, the mean value of bank concentration is 64%, and the low and high percentage of bank concentration is 25% and 100%. In addition, the mean value of GDP per capita growth rate in these countries is 3.53%, the minimum growth rate is -2.64% and the maximum growth rate is 13.6%. Lastly, the mean rate of the GDP deflator is 5.39% and ranges from 0.18% to 14.9%.

Table 3.2 highlights the pair-wise correlations between net interest margins and bank size, bank age, bank credit risk, bank capital, bank concentration, financial reform and other explanatory variables. It is noteworthy that bank size and GDP deflator are highly correlated with net interest margins, which are -36.2% and 36.5% respectively. Table 2 also indicates that the correlation between net interest margins and all variables are statistically significant at the 5% level, except the share of foreign banks. Moreover, bank size, financial reform, financial liberalisation, age, GDP per capita growth and the share of government banks are negatively correlated with net interest margins, while bank credit risk, bank capital, bank concentration, GDP deflator and the share of foreign banks have a positive correlation with net interest margins. The pair-wise correlation of net interest margins with financial reforms and financial liberalisation is around -0.162 and -0.131, which suggests that as the competition among banks increases, net interest margins will decrease. Similarly, bank size and bank age also have a negative relation with net interest margins at -0.112% and -0.62% respectively, which indicates that as bank size and bank age increases – the net interest margins decreases. The correlation between bank interest margins and growth is -0.034%, which shows that better growth

⁴³ In number of studies researchers use dummy values (0 and 1) for government-owned and foreign-owned banks, but here we followed Demetriades et al (2012) and Andrianova et al (2011) and used percentages of government ownership and foreign ownership in the banking industry.

is inversely linked with net interest margins. Importantly, the correlation between credit risk and net interest margins is 0.051%, which also reveals that as the ratio increases banks will demand high interest rates to avoid any credit risk. Furthermore, bank capital and bank concentration are positively correlated with banks' interest margins at 0.171% and 0.065% correspondingly. In addition, the correlation between deflator and interest margins is 0.365%, which is according to expectation. Furthermore, the pair-wise correlation matrix also explains that the share of foreign banks has a positive correlation with net interest margins, while the share of government banks has a negative correlation with net interest margins. The relationships of the coefficients propose that it is necessary to restrict a range of factors in measuring the impact of any of these country characteristics on the cost of financial intermediation.

The estimated results of the model with time dummies for the whole sample are highlighted in column (1)-(4) of all tables. First, we regressed the equation with a very basic estimation technique, OLS, without including the dynamic consideration. All the right hand side variables are statistically significant to net interest margins at the 1% and 5% levels, while bank concentration, per capital growth, share of foreign banks and share of government banks are insignificant. This basic estimation technique could be biased and inconsistent. Therefore, we included the dynamic consideration in the remainder of the columns of tables 3.3 – 3.7 and introduced a lagged dependent variable in the model. Furthermore, the results of an explanatory variable could be biased because of potential endogeneity. So, the problem of endogeneity is targeted by using the system GMM estimation technique. The Wald chi-squares test statistic, the Sargan test for over-identifying restriction and the test of autocorrelation order (1) and the test of autocorrelation order (2) are also reported in the table, which supports the validity of the results.

Table 3.1: Summary statistics of all variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
Net Interest Margin (%)	8398	4.89	3.51	.298	15.9
Bank Credit Risk (%)	9440	48.5	24.7	.001	99.9
Bank Capital (%)	9608	17.0	16.4	0	86.9
Bank Size Million USD	10050	6.14	2.26	.129	14.1
Financial Reform	24330	15.7	3.51	7	21
Share of Foreign banks (%)	24330	17.3	34.9	0	100
Share of Govt. banks (%)	24330	5.53	21.2	0	100
Bank Concentration (%)	24276	64.0	19.9	25.2	100
Bank Age	15453	36	37.6	0	258
GDP Per Capita Growth (%)	22498	3.53	3.02	-2.64	13.6
GDP Deflator (%)	20041	5.39	3.38	0.18	14.9

Notes:

1. Above table describes the number of observation of the determinants that are used in the model to analyse the net interest margins of 76 countries over the period from 2001-2005.
2. Log of total assets indicate bank size, equity to assets ratio indicates bank capital and loans to assets ratio use as proxy of bank credit risk. Bank concentration variable is constructed by using the bank-scope data, assets of three largest banks to total assets of all banks. Similarly, bank age is calculated from bank established year.
3. Country name and number of banks in each country is reported in Appendix-A4.5.

Source: Bank Scope Data set maintained by Fitch/IBCA/Bureau Van Dijk.

Table 3.2: Pair-wise correlation matrix of all variables

	1	2	3	4	5	6	7	8	9	10	11	12
Net interest margin	1.000											
Bank credit risk	0.051* (0.000)	1.000										
Bank capital	0.171* (0.000)	-0.184* (0.000)	1.000									
Bank size	-0.362* (0.000)	0.005 (0.629)	-0.445* (0.000)	1.000								
Financial reform	-0.162* (0.000)	0.030* (0.002)	-0.053* (0.000)	0.103* (0.000)	1.000							
Financial liberalisation	-0.131* (0.000)	0.014 (0.171)	-0.038* (0.000)	0.078* (0.000)	0.981* (0.000)	1.000						
Bank concentration	0.065* (0.000)	0.020 (0.052)	-0.045* (0.000)	-0.227* (0.000)	0.138* (0.000)	0.139* (0.000)	1.000					
Bank age	-0.112* (0.000)	0.009 (0.425)	-0.130* (0.000)	0.223* (0.000)	0.162* (0.000)	0.154* (0.000)	0.038* (0.000)	1.000				
GDP per capita growth	-0.034* (0.002)	-0.021* (0.042)	0.033* (0.002)	0.019 (0.057)	-0.255* (0.000)	-0.279* (0.000)	-0.034* (0.000)	-0.183* (0.000)	1.000			
GDP deflator	0.365* (0.000)	-0.072* (0.000)	0.104* (0.000)	-0.208* (0.000)	-0.289* (0.000)	-0.271* (0.000)	-0.146* (0.000)	-0.077* (0.000)	0.072* (0.000)	1.000		
Share of foreign banks	0.010 (0.353)	0.002 (0.815)	-0.022* (0.027)	-0.025* (0.010)	0.048* (0.000)	0.036* (0.000)	0.045* (0.000)	-0.118* (0.000)	0.075* (0.000)	-0.016* (0.023)	1.000	
Share of gov. banks	-0.064* (0.000)	-0.109* (0.000)	-0.068* (0.000)	0.225* (0.000)	-0.081* (0.000)	-0.078* (0.000)	0.001 (0.817)	0.060* (0.000)	0.026* (0.000)	0.014* (0.040)	-0.108* (0.000)	1.00

Note: (*) indicates the 5 % significance level.

The p-values of the Sargan test and AR (2) test are quite larger than 0.05, which suggest that the null hypothesis of over-identification and AR (2) serial correlation cannot be rejected. The results of both specification tests prove the validity of the instruments and also confirmed that these estimated coefficients are free from endogeneity bias. Along these diagnostics statistics the coefficient of the lagged dependent variable, net interest margins, is also significant at the 1% level, which shows that there is high serial correlation, and confirms the selection of the dynamic system GMM technique. Bank size is treated as a predetermined variable, while bank capital and credit risk are considered as endogenous variables with a lagged structure in all tables.

Tables 3.3 – 3.7 describe the empirical findings of financial reform, financial liberalisation, banking supervision, bank-specific and macro-specific variables on net interest margins for the entire sample of 76 countries. The first column of table 3.3 – 3.6 shows the standard results of the model, while the remaining column includes the share of foreign and government banks variable. Table 3.3 includes the financial reform variable, while the aggregate value of financial liberalisation is added in table 3.4. In table 3.5, to investigate the aggregate impact of liberalisation on net interest margins, we examined the data when banking regulation and supervision is not highly regulated and highly supervised (when banking regulation and supervision < 3), while in table 3.6, we included the banking regulation and supervision index separately with the aggregate index of liberalisation. In table 3.7, we introduced all the six different dimensions of liberalisation with banking regulation and supervision to explore whether these six dimensions give additional information to compare to the aggregate dimensions of liberalisation.

In table 3.3, results explain that financial reforms have a negative and significant impact on net interest margins at the 1% level in all columns. These analytical findings validate the hypothesis that the deregulation of interest rate control and removal of barriers to entry from the financial market would lead to enhanced bank competition and efficiency, which reduces the net interest margins of financial intermediaries. Thus, low bank interest margins reduce the cost of financial intermediaries, and enhance investment opportunity and employment, resulting in high growth of the economy. Chirwa and Mlachila (2004) found a positive relation between financial sector reform and interest rate spread in the Malawian banking system, and suggested that in a more liberalised environment an increasing trend of interest margins is attributed to a high reserve requirement and non-financial costs. In addition, a highly competitive environment also enhanced the level of default loans, so banks will charge high interest rates. As expected, credit risk has a positive and significant relationship with net interest margins, which indicates that as bank credit increases, banks will compensate any expected and unexpected risk through charging high interest margins. These results are also consistent with the findings of Demircuc-Kunt and Huizinga (1999); Claessens et al (2001); and Maudos et al (2004).⁴⁴ Similarly, bank capital has a negative but insignificant impact on interest margins; the inverse relationship between net interest margins and bank capital explains that banks will take more risk and invest in highly profitable businesses which are attributed to a low equity ratio. Kasman et al (2010), examined the data during the consolidation (merger and acquisition) period and after the consolidation period of new European Union (EU) countries, suggesting that the equity to asset ratio entered positively with a significant impact during the consolidation period, while a negative and significant impact was found after the consolidation period

⁴⁴ See Hanson and Rocha (1986) and Denizer et al (2000).

**Table 3.3: Dynamic panel estimation of net interest margin with financial reform
in 76 countries during sample period 2001 to 2005**

	(1)	(2)	(3)	(4)
Net interest margin _(t-1)	0.694*** (0.086)	0.693*** (0.088)	0.704*** (0.101)	0.705*** (0.097)
Bank size	0.309 (0.673)	0.486 (0.645)	0.392 (0.786)	0.602 (0.627)
Bank capital	-0.004 (0.038)	-0.010 (0.036)	-0.002 (0.040)	-0.009 (0.038)
Bank credit risk	0.088** (0.040)	0.081** (0.042)	0.092** (0.046)	0.088* (0.046)
Bank age	0.037* (0.023)	0.029* (0.017)	0.037* (0.023)	0.029* (0.017)
Bank concentration	0.251 (0.493)	0.259 (0.491)	0.247 (0.493)	0.253 (0.489)
Financial reform	-0.154*** (0.057)	-0.147*** (0.058)	-0.156*** (0.057)	-0.149*** (0.058)
Per capita growth	-0.051 (0.040)	-0.047 (0.041)	-0.053 (0.042)	-0.050 (0.042)
GDP deflator	-0.019 (0.018)	-0.021 (0.018)	-0.021 (0.018)	-0.023 (0.018)
Share of foreign banks	-	-0.019 (0.022)	-	-0.020 (0.022)
Share of govt. banks	-	-	0.007 (0.034)	0.011 (0.028)
No. of obs.	3026	3026	3026	3026
No. of Instrument	33	33	33	33
Wald Chi square (p-value)	129.7 (0.00)	147.0 (0.00)	128.0 (0.00)	148.5 (0.00)
Sargan test (p-value)	20.96 (0.28)	21.24 (0.21)	20.86 (0.23)	20.98 0.17
AR(1) test (p-value)	-3.92 (0.00)	-3.83 (0.00)	-3.76 (0.00)	-3.69 (0.00)
AR(2) test (p-value)	-1.37 (0.16)	-1.31 (0.18)	-1.36 (0.17)	-1.32 (0.18)

Note:

The dependent variable is Net interest margins. Equity to assets ratio, loan to assets ratio and lagged value of net interest margins are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Natural logarithm of total assets treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

On net interest margins, as capital increases mean banks will operate more carefully because more capital is at risk.⁴⁵ In addition, bank size, bank age and bank concentration have a positive relationship with net interest margins, but only bank age has a statistically significant impact on net interest margins at the 10% level, suggesting that longer-established banks have sought high interest margins. Macro-specific variables such as real GDP per capita growth and GDP deflator have a negative and insignificant impact on net interest margins. These findings are also similar to other studies such as Demirguc-Kunt and Huizinga (1999); Brock and Suarez (2000); Denizer, (2000) and Claessens et al., (2001). The share of foreign banks has a negative and insignificant impact on net interest margins, suggesting that the large entrance of foreign banks in a domestic financial market narrows net interest margins. These findings are also consistent with Unite et al (2003) and Peria and Mody (2004).⁴⁶ The share of government banks has a positive but not significant impact on net interest margins, while Dimiriguc-Kunt, Laeven and Levine (2004) found a positive and significant impact of state-owned banks and net interest margins.

In table 3.4, we have included the aggregate index of liberalisation instead of the financial reform variable. It is interesting to note that all the results in table 3.4 in columns (1)-(4) hold the same results as obtained in table 3.3, but the impact of financial liberalisation on net interest margins is much greater than (more than double) the impact of financial reform; however, the significance level reduces from the 1% level to the 5% level.

⁴⁵ However, Saunders and Schumacher (2000); Brock and Suarez (2000); Abreu and Mendes (2003) and Maudos and de Guevara (2004) found a positive relationship between equity to assets ratio and net interest margins.

⁴⁶ Drakos' (2003) study on the banks of CEE countries revealed that entrance and ownership of foreign banks reduces the interest rate spread.

Table 3.4: Dynamic panel estimation of net interest margin with financial liberalisation in 76 countries during sample period 2001 to 2005

	(1)	(2)	(3)	(4)
Net interest margin _(t-1)	0.707*** (0.088)	0.706*** (0.091)	0.716 (0.105)	0.719*** (0.100)
Bank size	0.167 (0.644)	0.365 (0.623)	0.234 (0.765)	0.484 (0.598)
Bank capital	-0.003 (0.036)	-0.010 (0.034)	-0.002 (0.039)	-0.009 (0.037)
Bank credit risk	0.083** (0.039)	0.074* (0.041)	0.087** (0.044)	0.080* (0.045)
Bank age	0.033 (0.021)	0.025* (0.015)	0.034* (0.021)	0.025* (0.015)
Bank concentration	0.196 (0.492)	0.214 (0.489)	0.193 (0.493)	0.209 (0.489)
Financial liberalisation	-0.356** (0.167)	-0.332** (0.171)	-0.358** (0.167)	-0.334** (0.171)
Per capita growth	-0.050 (0.041)	-0.044 (0.042)	-0.052 (0.042)	-0.048 (0.042)
GDP deflator	-0.018 (0.018)	-0.020 (0.018)	-0.020 (0.018)	-0.022 (0.018)
Share of foreign banks	-	-0.021 (0.022)	-	-0.022 (0.023)
Share of govt. banks	-	-	0.006 (0.034)	0.011 (0.028)
No. of obs.	3026	3026	3026	3026
No. of Instrument	33	33	33	33
Wald Chi square (p-value)	129.3 (0.00)	151.8 (0.00)	127.9 (0.00)	154.4 (0.00)
Sargan test (p-value)	22.93 (0.19)	23.30 (0.13)	22.92 (0.15)	23.08 (0.11)
AR(1) test (p-value)	-3.99 (0.00)	-3.85 (0.00)	-3.82 (0.00)	-3.72 (0.00)
AR(2) test (p-value)	-1.41 (0.15)	-1.33 (0.18)	-1.39 (0.16)	-1.35 (0.17)

Note:

The dependent variable is Net interest margins. Equity to assets ratio, loan to assets ratio and lagged value of net interest margins are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Natural logarithm of total assets treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

Table 3.5 explores the impact of financial liberalisation on net interest margins when banking regulation and supervision is not highly regulated and highly supervised (when banking supervision < 3). Columns (1)-(4) show some different results as found in tables 3.3 and 3.4. The results of table 3.5 explain that financial liberalisation reduces net interest margins but it has no significant impact here. These findings suggest that financial liberalisation does not enhance the competition and efficiency of the banking sector significantly in a weak regulatory and supervisory environment. Therefore, sound and effective banking regulation and supervision policies are conditional for financial liberalisation to enhance competition and efficiency. Bank size has a positive and highly significant impact on net interest margins at the 1% level. Similarly, the estimated coefficients of bank capital become positive to negative which reveals that in a weakly-regulated environment, high competition stimulates banks to take more risks in order to obtain high profits. This result is consistent with findings of Saunders and Schumacher (2000); they found a positive and significant relationship between interest margins and bank capital. In table 3.6, we have included the banking regulation and supervision index separately with the aggregate index of liberalisation and found a negative and significant impact on net interest margins at the 1% level. These results indicate that financial liberalisation and a highly-regulated and supervised environment reduces interest margins in financial institutions. The results of bank credit risk and bank age have a positive and significant relationship with net interest margins in a sound banking environment. These findings are still consistent with the previous results in table 3.3 and table 3.4.

Table 3.5: Dynamic panel estimation of net interest margin with financial liberalisation in 76 countries during sample period 2001 to 2005, when banking regulation and supervision is not strongly supervised

Banking regulation and supervision < 3				
	(1)	(2)	(3)	(4)
Net interest margin _(t-1)	0.684*** (0.095)	0.583*** (0.162)	0.664*** (0.099)	0.525*** (0.190)
Bank size	2.894*** (0.935)	2.612*** (1.047)	2.857*** (0.961)	2.555*** (1.102)
Bank capital	0.044 (0.055)	0.054 (0.063)	0.050 (0.056)	0.060 (0.066)
Bank credit risk	0.044** (0.019)	0.055** (0.027)	0.031 (0.027)	0.036 (0.033)
Bank age	0.047 (0.032)	0.004 (0.069)	0.047 (0.031)	0.011 (0.071)
Bank concentration	0.608 (0.813)	0.455 (0.762)	0.671 (0.831)	0.444 (0.774)
Financial liberalisation	-0.223 (0.186)	-0.158 (0.192)	-0.232 (0.186)	-0.138 (0.209)
Per capita growth	-0.079* (0.042)	-0.068 (0.048)	-0.068 (0.046)	-0.053 (0.049)
GDP deflator	-0.035 (0.023)	-0.034 (0.027)	-0.028 (0.024)	-0.021 (0.030)
Share of foreign banks	-	-0.044 (0.055)	-	-0.036 (0.051)
Share of govt. banks	-	-	-0.026 (0.042)	-0.050 (0.051)
No. of obs.	2281	2281	2281	2281
No. of Instrument	35	35	35	35
Wald Chi square (p-value)	113.9 (0.00)	93.0 (0.00)	112.8 (0.00)	86.3 (0.00)
Sargan test (p-value)	26.07 (0.16)	22.39 (0.26)	25.91 (0.13)	19.96 (0.33)
AR(1) test (p-value)	-2.91 (0.00)	-2.46 (0.01)	-2.77 (0.00)	-2.10 (0.03)
AR(2) test (p-value)	-0.71 (0.47)	-0.76 (0.44)	-0.68 (0.49)	-0.71 (0.47)

Note:

The dependent variable is Net interest margins. Equity to assets ratio, loan to assets ratio and lagged value of net interest margins are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Natural logarithm of total assets treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

*(***) Coefficients are statistically significant at the 1% level.*

*(**) Coefficients are statistically significant at the 5% level.*

() Coefficients are statistically significant at the 10% level.*

Table 3.6: Dynamic panel estimation of net interest margin with financial liberalisation and banking supervision in 76 countries during sample period 2001 to 2005

All values of banking supervision				
	(1)	(2)	(3)	(4)
Net interest margin _(t-1)	0.676*** (0.083)	0.676*** (0.085)	0.693*** (0.095)	0.691*** (0.093)
Bank size	0.437 (0.712)	0.586 (0.689)	0.602 (0.793)	0.751 (0.656)
Bank capital	-0.006 (0.039)	-0.010 (0.037)	-0.003 (0.041)	-0.007 (0.039)
Bank credit risk	0.090*** (0.040)	0.086** (0.042)	0.100** (0.046)	0.096** (0.047)
Bank age	0.041* (0.024)	0.034* (0.020)	0.042* (0.024)	0.035* (0.020)
Bank concentration	0.376 (0.494)	0.375 (0.490)	0.371 (0.490)	0.368 (0.487)
Financial liberalisation	-0.448*** (0.172)	-0.428*** (0.176)	-0.457*** (0.172)	-0.437*** (0.177)
Banking supervision	-0.494*** (0.211)	-0.483*** (0.211)	-0.515*** (0.215)	-0.498*** (0.215)
Per capita growth	-0.048 (0.039)	-0.045 (0.041)	-0.053 (0.041)	-0.051 (0.041)
GDP deflator	-0.016 (0.018)	-0.017 (0.018)	-0.018 (0.018)	-0.020 (0.018)
Share of foreign banks	-	-0.015 (0.022)	-	-0.016 (0.022)
Share of govt. banks	-	-	0.014 (0.033)	0.015 (0.029)
No. of obs.	3026	3026	3026	3026
No. of Instrument	34	34	34	34
Wald Chi square (p-value)	133.2 (0.00)	143.9 (0.00)	129.3 (0.00)	142.5 (0.00)
Sargan test (p-value)	19.34 (0.37)	19.62 (0.29)	18.81 (0.33)	18.95 (0.27)
AR(1) test (p-value)	-3.89 (0.00)	-3.83 (0.00)	-3.70 (0.00)	-3.66 (0.00)
AR(2) test (p-value)	-1.36 (0.17)	-1.31 (0.18)	-1.36 (0.17)	-1.34 (0.17)

Note: The dependent variable is Net interest margins. Equity to assets ratio, loan to assets ratio and lagged value of net interest margins are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Natural logarithm of total assets treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

*(***) Coefficients are statistically significant at the 1% level.*

*(**) Coefficients are statistically significant at the 5% level.*

() Coefficients are statistically significant at the 10% level.*

In table 3.7, besides the banking regulation and supervision index, we have also regressed the six dimensions of liberalisation one at a time on net interest margins. The results in column (1)-(6) indicate that in a highly regulated and supervised environment, banking regulation and supervision enhance bank efficiency, which leads to a reduction in banks' interest margins. The impact of banking supervision and regulation on net interest margins is consistently significant at the 1% level. However, two of the liberalisation indices – interest rate controls and entry barriers in columns (2) and (3) – have a negative and significant effect on net interest margins at the 5% and 10% level respectively. These results suggest the removal of interest rate control and barriers to entry would lead to increased competition among banks and reduce the interest margins of the banking sector. Demirguc-Kunt et al (2004) also explained that tighter regulation on bank entry and restriction on bank activities enhances the net interest margins. The negative and significant impact of removal of entry barriers also suggested that a large number of banks entrances will mitigate the monopolistic or dominating behaviour of banks through competition. The insignificant impact of bank concentration on net interest margins also confirms that as the number of banks increases, bank will lose their market power. Moreover, the coefficients of credit allocation controls, privatization, capital account liberalisation and security market liberalisation are negatively related to net interest margins and appear insignificant, suggesting that none of these liberalisation indices have a meaningful impact on net interest margins. The results of bank credit risk ratio remain positive and significant at 5% level in all columns of table 3.7, while bank age is not significant in column (1) and column (5).

Table 3.7: Dynamic panel estimation of net interest margin with all dimensions of financial reform in 76 countries during sample period 2001 to 2005

banking supervision with different dimensions of liberalisation						
	(1)	(2)	(3)	(4)	(5)	(6)
Net interest margin _(t-1)	0.670*** (0.089)	0.697*** (0.087)	0.679*** (0.090)	0.692*** (0.087)	0.699*** (0.085)	0.694*** (0.089)
Bank size	0.325 (0.724)	0.243 (0.682)	0.282 (0.704)	0.349 (0.688)	0.394 (0.658)	0.255 (0.667)
Bank capital	-0.008 (0.039)	-0.003 (0.036)	-0.002 (0.037)	-0.001 (0.035)	0.001 (0.033)	-0.001 (0.033)
Bank credit risk	0.094** (0.044)	0.081** (0.038)	0.083** (0.037)	0.088** (0.040)	0.073** (0.036)	0.082** (0.036)
Bank age	0.041 (0.028)	0.036* (0.021)	0.036* (0.021)	0.033* (0.020)	0.030 (0.020)	0.032* (0.020)
Bank concentration	0.360 (0.491)	0.386 (0.489)	0.389 (0.496)	0.272 (0.504)	0.413 (0.475)	0.319 (0.485)
Per capita growth	-0.050 (0.039)	-0.042 (0.040)	-0.047 (0.039)	-0.048 (0.040)	-0.044 (0.039)	-0.046 (0.039)
GDP deflator	-0.018 (0.019)	-0.010 (0.017)	-0.008 (0.017)	-0.011 (0.018)	-0.012 (0.017)	-0.010 (0.018)
Banking supervision	-0.449** (0.214)	-0.392** (0.206)	-0.372* (0.211)	-0.408 (0.210)	-0.456** (0.210)	-0.396** (0.205)
Credit allocation controls	-0.188 (0.211)	-	-	-	-	-
Interest rate liberalisation	-	-0.201** (0.112)	-	-	-	-
Entry barriers	-	-	-0.357* (0.210)	-	-	-
Privatization	-	-	-	-0.171 (0.148)	-	-

Capital accounts liberalisation	-	-	-	-	-0.192 (0.138)	-
Securities market policy	-	-	-	-	-	0.021 (0.252)
No. of obs.	3026	3026	3026	3026	3026	3026
No. of Instrument	34	34	34	34	34	34
Wald Chi square (p-value)	125.7 (0.00)	140.9 (0.00)	129.0 (0.00)	139.3 (0.00)	149.2 (0.00)	134.7 (0.00)
Sargan test (p-value)	20.85 (0.28)	22.25 (0.22)	21.57 (0.25)	21.49 (0.25)	23.12 (0.18)	23.4 (0.17)
AR(1) test (p-value)	-3.83 (0.00)	-3.99 (0.00)	-3.87 (0.00)	-3.98 (0.00)	-3.98 (0.00)	-4.02 (0.00)
AR(2) test (p-value)	-1.48 (0.13)	-1.29 (0.19)	-1.50 (0.13)	-1.54 (0.12)	-1.47 (0.14)	-1.50 (0.13)

Note:

The dependent variable is Net interest margins. Equity to assets ratio, loan to assets ratio and lagged value of net interest margins are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Natural logarithm of total assets treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

(*)** *Coefficients are statistically significant at the 1% level.*

()** *Coefficients are statistically significant at the 5% level.*

(*) *Coefficients are statistically significant at the 10% level.*

3.6. Summary and Concluding Remarks:

Globally, the financial intermediaries of the countries differ extensively in terms of their functions and size. These financial institutions are also facing different institutional environments, macroeconomic conditions, taxing criteria and financial market situations. This chapter assessed whether financial reform policies in the developed and developing world have enhanced the banks' efficiency. This study used the comprehensive dataset of more than 1300 banks' determinants in seventy six countries during the period 2001 to 2005, obtained from the Bank-scope database, provided by Fitch/IBCA/Bureau Van Dijk. To analyse the impact of financial reform, bank-specific and macro-specific variables on net interest margins, we have utilised the single stage regression model. The empirical results of dynamic two-step system GMM estimation have provided the evidence that financial liberalisation and banking supervision have a negative and statistically significant impact on bank interest margins in a large number of countries. Specifically, it is important to note that in a weakly-regulated and supervised environment (when banking supervision < 3)⁴⁷; financial liberalisation has a negative and insignificant impact on net interest margins. Thus, these empirical findings suggest that sound and strong financial reform policies have played a significant role in narrowing interest margins in developed and developing countries' data set, which indicates the competitiveness of the banking system. Along with the aggregate index of liberalisation, we have also regressed the individual index of liberalisation, including credit allocation controls, interest rate liberalisation, entry

⁴⁷ Banking regulation and supervision is zero, which means that banking regulation and supervision is unregulated and unsupervised; at 1 it indicates that banking regulation and supervision is less regulated and supervised, at 2 it is largely regulated and supervised and at 3 it is highly regulated and supervised (See Abiad et al, 2008).

barriers, privatization, capital accounts liberalisation and security market liberalisation. These results have also provided some new empirical evidence that two out of six liberalisation indices – interest rate liberalisation and barriers to entry have a negative and statistically significant impact on net interest margins, which suggests that the deregulation of interest rate controls and removal of entry barriers into the financial sector enhanced the competition and efficiency of the banking sector, thus lowering the bank interest margins. Additionally, the results of this study have also revealed that bank credit risk and bank age have a positive and significant impact on bank interest margins. The high ratio of credit risk indicates that banks have charged high interest margins to avoid any future risk.

To sum up, the empirical findings of this chapter explain that the huge entrance of banks, the removal of interest rate controls, strong banking regulation and supervision, and effective liberalisation policies have reduced net interest margins in developed and developing countries. The policy implications for those countries facing high interest margins could reduce bank interest margins by taking measures such as deregulation of interest rate controls, the removal of entry barriers, low financial taxation and the strengthening of the regulatory and supervisory environment. These procedures will increase competition and the efficiency and stability of banking system, leading to the reduction of net interest margins.

Appendix-A3.1:

**Ordinary least square estimation of net interest margins in 76 countries during
sample period 2001 to 2005**

Variables	OLS
Net interest margins _(t-1)	-
Bank size	-0.398*** (0.041)
Bank capital	0.032*** (0.007)
Bank credit risk	0.017*** (0.002)
Bank age	-0.003** (0.001)
Bank concentration	0.293 (0.264)
Financial reform	-0.098*** (0.019)
Per capita growth	-0.002 (0.015)
GDP deflator	0.091*** (0.010)
Share of foreign banks	0.001 (0.001)
Share of govt. banks	-0.002 (0.002)
No. of banks	1704
Wald Chi square (p-value)	457.37 (0.000)
R-Squared Value	0.220

Note:

The dependent variable is net interest margins. Figures in parenthesis are robust standard errors.

(*)** *Coefficients are statistically significant at the 1% level.*

()** *Coefficients are statistically significant at the 5% level.*

(*) *Coefficients are statistically significant at the 10% level.*

Appendix-A3.2:

Descriptive Statistic, Including Between and within Variations, 2001-2005:

Variables		Mean	Std. Dev.	Min	Max	Observations
Net interest margin	overall	4.89	3.51	0.30	15.97	N = 8398
	between		3.54	0.30	15.96	n = 2965
	within		1.24	-3.34	14.64	T-bar = 2.83
Bank credit risk	overall	48.55	24.79	0.00	99.99	N = 9440
	between		24.98	0.00	99.99	n = 3150
	within		6.91	0.65	107.48	T-bar = 2.99
Bank capital	overall	17.01	16.46	0.00	86.98	N = 9608
	between		16.68	0.00	86.35	n = 3233
	within		5.60	-30.42	66.21	T-bar = 2.97
Bank size	overall	6.15	2.27	0.13	14.13	N = 10050
	between		2.32	0.26	14.13	n = 3346
	within		0.36	2.48	10.88	T-bar = 3.00
Financial reform	overall	15.72	3.52	7.00	21.00	N = 24330
	between		3.47	7.80	21.00	n = 4866
	within		0.58	12.92	18.22	T = 5
Share of foreign banks	overall	17.35	34.91	0.00	100.00	N = 24330
	between		34.92	0.00	100.00	n = 4866
	within		0.00	17.35	17.35	T = 5
Share of govt. banks	overall	5.53	21.20	0.00	100.00	N = 24330
	between		21.20	0.00	100.00	n = 4866
	within		0.00	5.53	5.53	T = 5
Bank concentration	overall	64.03	19.90	25.22	100.00	N = 24276
	between		15.76	33.04	97.76	n = 4866
	within		12.14	32.04	109.53	T-bar = 4.98
Bank age	overall	36.17	37.62	0.00	258.00	N = 15453
	between		37.59	0.00	256.00	n = 3113
	within		1.41	34.17	38.17	T-bar = 4.96
GDP per capita growth	overall	3.53	3.03	-2.65	13.69	N = 22498
	between		2.53	0.19	10.00	n = 4738
	within		1.70	-3.57	9.17	T-bar = 4.74
GDP deflator	overall	5.40	3.38	0.18	14.96	N = 20041
	between		2.91	1.02	14.66	n = 4691
	within		1.94	-0.98	11.59	T-bar = 4.27

Note: Log of total assets indicate bank size, equity to assets ratio indicates bank capital and loans to assets ratio use as proxy of bank credit risk. Bank concentration variable is constructed by using the bank-scope data, assets of three largest banks to total assets of all banks. Similarly, bank age is calculated from bank established year.

Appendix-A3.3:

Descriptive Statistic of Developed and Developing Countries, 2001-2005:

	Obs.	Mean	Std. Dev.	Min	Max
<u>Developed Countries (20)</u>					
Net interest margin	2707	3.53	2.79	0.30	15.80
Bank credit risk	2982	51.44	28.64	0.00	99.99
Bank capital	3088	16.64	17.37	0.00	86.93
Bank size	3243	6.69	2.32	0.26	14.13
Financial reform	9225	18.63	2.25	14.00	21.00
Share of foreign banks	9225	17.11	35.56	0.00	100.00
Share of govt. banks	9225	3.16	16.38	0.00	100.00
Bank concentration	9225	0.68	0.20	0.25	1.00
Bank age	6026	44.01	45.50	0.00	258.00
GDP per capita growth	8669	2.90	2.62	-2.65	10.67
GDP deflator	7713	3.97	2.64	0.30	12.40
<u>Developing Countries (56)</u>					
Net interest margin	5691	5.54	3.63	0.30	15.97
Bank credit risk	6458	47.22	22.68	0.00	99.23
Bank capital	6520	17.19	16.01	0.00	86.98
Bank size	6807	5.89	2.19	0.13	14.07
Financial reform	15105	13.93	2.91	7.00	21.00
Share of foreign banks	15105	17.50	34.51	0.00	100.00
Share of govt. banks	15105	6.98	23.55	0.00	100.00
Bank concentration	15051	0.62	0.20	0.27	1.00
Bank age	9427	31.15	30.55	0.00	197.00
GDP per capita growth	13829	3.92	3.20	-2.09	13.69
GDP deflator	12328	6.29	3.49	0.18	14.96

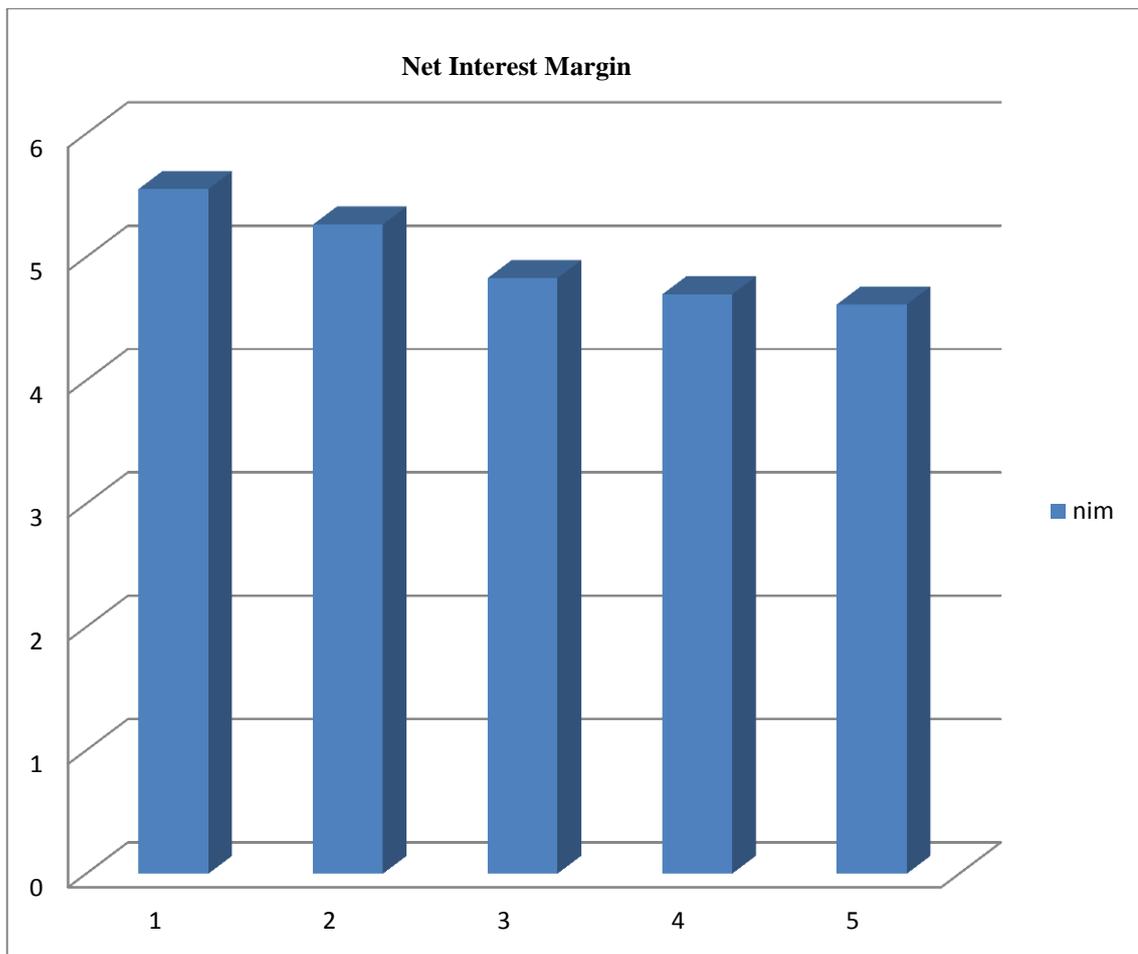
Appendix-A3.4:

**Composition of the Sample In Terms of Banking Supervision Index for Developed
and Developing Countries, 2001-2005:**

	Ranges of Banking Supervision Index			
	0	1	2	3
Developed Countries	0	1106	3802	4317
Developing Countries	259	6136	8078	632
Total Observations	259	7242	11880	4949

Appendix-A3.5:

Year wise mean of net interest margin in 76 developed and developing countries
over the period form 2001-2005.



Source: Bank Scope Data set maintained by Fitch/IBCA/Bureau Van Dijk.

CHAPTER 4:

***FINANCIAL REFORM, LIBERALISATION AND FRAGILITY: A PANEL DATA
ANALYSIS***

4.1. Introduction:

Over the last several years, increasing financial liberalisation, integration into the international financial markets, technological advancement and innovation, rapid development of new financial products and increasing competition in the banking sector have become an important challenge in shielding financial stability in the current global financial system. The recent financial crisis all over the world, which initiated in the US, was preceded by a high level of Non-Performing Loans (NPLs) and due to this the international financial system needs substantial bail-outs to avoid any large collapses of banks.⁴⁸

Until now, most research studies have investigated the determinants of NPLs by using either bank-specific or country-specific variables (or both). For example, Guy and Lowe (2011) examined the problem of NPLs in the Barbadian banking system by using bank and macroeconomic variables during the period 1996 to 2010 and suggested that both bank-specific and macro-specific variables are important in recognizing the behaviour of NPLs. They applied various macroeconomic shocks on the Barbadian banking sector and found high NPLs under different macroeconomic stresses.⁴⁹ Moreover, Fofack (2005) studied the main factors of high NPLs in Sub-Saharan African countries during 1990s and found a strong correlation between NPLs and economic growth, real exchange rate appreciation, real interest rates, interbank loans and net interest margins; these results also highlight the importance of micro and macro-specific determinants. Shehzad et al (2010) similarly used the data of 500 banks from more than

⁴⁸ See Koutsomanoli-Filippaki (2009); Moshirian (2008)

⁴⁹ Another study by Salas and Saurina (2002) includes both microeconomic and macroeconomic variables as determinants of NPLs in the Spanish banking system. They also suggested that any future changes in NPLs can be highly identified by bank-specific variables in the saving banks than commercial banks.

50 countries during the period 2005 to 2007. They suggested that ownership concentration has negative effect on banks' NPLs if the share of ownership is more than 50%.

In the same way, along with bank specific variables another strand of the literature has also highlighted the relationship between macroeconomic variables and NPLs. Louzis et al (2012) examined the influence of macroeconomics variables on NPLs in the Greek banking sector by using dynamic panel data. They further explained that NPLs can be described by macroeconomic variables such as real GDP growth, unemployment, interest rates and public debt and found strong effects of these macroeconomic variables on NPLs. Their findings also suggested that management quality and inefficiency may be considered as important indicators for future NPLs. Festic et al (2011) studied five new European Union (EU) member states and revealed that the amount of available finance and credit growth may impair banking performance and worsen NPLs due to overheating of economies. Similarly, Espinoza et al (2010) studied the link between macroeconomic variables and NPLs of 80 individual banks in the Gulf Cooperative Council (GCC) countries. They suggested that high rates of NPLs are generally attributed to high interest rates and adverse macroeconomic conditions. Moreover, other studies, for example Boudriga et al (2010); Berger and Boye (2007); Rinaldi and Sanchis (2006); and Ranjan and Dhal (2003) also include macroeconomic determinants as an explanatory variable of NPLs.⁵⁰

This chapter goes beyond these studies by considering the financial reform, financial liberalisation and banking regulation variables as determinants of financial

⁵⁰ Shen and Chen (2008) also used GDP growth in his paper and found that growth has a significant negative effect on NPLs.

fragility, along with both bank-specific and macro-specific variables.^{51, 52} The most closely related studies to this chapter are Delis (2012) and Hermes et al (2009). Delis (2012), estimates the impact of financial reforms and the quality of institutions of banks in 84 countries of the world. He found that financial reform policies have a significant impact on banking competition and reduce the market power of banks, especially in developed economies where institutions are advanced, while this importance diminishes and does not improve banking competition in countries, where institutions are fragile and not well functioning. Similarly, Hermes et al (2009) examined the impact of financial reform on the bank efficiency of 41 countries. They also measure the impact of financial liberalisation and banking regulation on bank efficiency. To calculate bank efficiency, they applied a stochastic frontier analysis approach at the individual bank level. Their findings suggest that financial liberalisation policies have a significant and positive impact on bank efficiency.

The main objective of this study is to fill the gap in existing empirical literature and provide an in-depth relationship between financial reform and financial fragility in developing and developed economies by applying a dynamic two-step system GMM panel estimator technique. Subsequently, we examine whether financial reform policies reduce or increase financial fragility of the seventy six countries.⁵³ Moreover, the main aspect of this study is to analyse the relationship of both financial liberalisation policies and the quality of banking regulation and supervision on financial fragility. We investigate whether the effect of financial liberalisation policies on financial fragility of

⁵¹ Surprisingly, only a few studies investigate the effect of bank specific and country specific variables on NPLs.

⁵² Here, financial fragility is defined by impaired loans to gross loans.

⁵³ A list of the countries is available in Appendix-A4.5.

the banking system is conditional on the quality of banking regulation and supervision. In a less regulated and supervised environment (when banking regulation and supervision less than 3)⁵⁴, the positive coefficient of liberalisation explains that financial liberalisation policies have enhanced the probability of financial fragility in a weak regulatory and supervisory environment.⁵⁵ The further results of this study also explain that the lagged value of the loan growth and unemployment contribute to enhancing financial fragility in these countries. In contrast, the equity to assets ratio, the natural log of total assets and the share of foreign banks reduces the financial vulnerability in these developing and developed countries. Moreover, we also found that real GDP per capital growth and GDP deflator decrease the possibility of financial fragility. The negative relationship between GDP per capital growth and financial fragility suggest that an expansionary phase of the economy improves the ability of economic agents to pay their obligations (Louzis et al, 2012).

This study aims to contribute to the existing literature of NPLs in two different ways. First, we utilised the sample of a multi-country bank-level dataset, provided by Fitch/IBCA/Bureau Van Dijk, of seventy six developed and developing economies, based on 779 banks over the period 2001 to 2005. Second, along with the financial reform variable, we have also examined the impact of financial liberalisation and the banking regulation and supervision index, individually, on financial fragility by

⁵⁴ Banking regulation and supervision is zero, which means that banking regulation and supervision is unregulated and unsupervised; at 1 it indicates that banking regulation and supervision is less regulated and less supervised, at 2 it is largely regulated and largely supervised and at 3 it is highly regulated and highly supervised (see Abiad et al, 2008).

⁵⁵ Demirguc-Kunt and Detragiache (1998) also examined the link between the banking crisis and financial liberalisation. They also explained that financial liberalisation leads to the enhanced financial weakness of banks because the removal of the interest rate ceiling or the reduction of barriers to entry decreases bank monopoly powers, thus worsening the moral hazard problems.

utilizing the new index of financial reform. The index of financial reform contains comprehensive information on the different sub-indexes of financial reform policies that also enables us to see how these policies may affect the banks' effectiveness at a country level.

The organization of this chapter is as follows: a brief discussion of data and definitions of the variables are described in section 2; the empirical model of financial fragility is explained in section 3. The empirical findings are reported in Section 4, while the summary and conclusions of this study are provided in section 5.

4.2. Data Sources, Financial Fragility and Determinants of Financial Fragility:

4.2.1. Data Sources

The data of bank-specific and macroeconomics-specific variables come from different sources. The data on bank-specific variables included: impaired loans to gross loans (as a proxy for financial fragility), cost to income ratio (as a proxy for bank efficiency), equity to assets ratio, growth of gross loans and a logarithm of total assets. These have been obtained from the Bank-scope database maintained by Fitch/IBCA/Bureau Van Dijk. The bank-level data covers 4866 banks in 76 countries over the period 2001 to 2005.⁵⁶ The data of the share of foreign banks and the share of government banks is also extracted from the Bank-scope data set. For macroeconomic-specific variables such as GDP per capita growth, GDP deflator and unemployment rates, the data of these variables has been taken from the World Development Indicator (*WDI*), while the financial reform data are attained from the "New Database of Financial Reforms" developed by Abiad, Detragiache and Tressel (2008). The selection

⁵⁶ The selection of countries was chosen by the availability of the data of financial reform index.

criteria of countries in this chapter are also based on Abiad et al (2008) data set, which contain 91 developed and developing countries. In this chapter we consider only those countries which have minimum 5 and maximum 300 banks. We do not include countries like the US, the UK, Germany, Italy, France, Switzerland, Spain, Canada, Australia, Austria, Korea and Sweden, because the number of banks in these countries are 22,081 out of 30,634 which may be capture the impact of financial reform on financial fragility in other countries. The summary statistics of these countries during the sample period 2001 to 2005 contains 24330 observations from 4866 banks; after re-examining the inconsistencies and reporting errors of data, the final data set consists of 1586 observations, which includes total of 779 individual banks. The description and construction of all variables have been provided in the next section.

4.2.2. Financial Fragility

“In macroeconomics, the term financial fragility is used loosely to refer to a financial system’s susceptibility to large-scale financial crises caused by small routine shocks” (Lagunoff and Schreft, 2001:220). In this study we have employed impaired loans (the accounting term for NPLs) to gross loans used as a proxy for financial fragility.⁵⁷ The ratio of impaired loans to gross loans is defined as the amount of loans which are impaired or doubtful. This measure explains that the higher (lower) the ratio, the lower (better) the asset quality. Shen and Chen (2008) used NPLs as a proxy of banking fragility, while Shehzad et al (2010) considered impaired loans to gross loans as an indicator of bank riskiness. The graphical representation of financial fragility in seventy six countries shows that the highest mean value of financial fragility is in

⁵⁷ Rinaldi’s and Sanchis-Arellano’s (2006) also used ratio of non-performing loans and suggested that it is the best available measure of financial fragility.

Tunisia, which is around 24.26%, while the lowest mean value is in Finland, which is around 0.67% (see Appendix-A4.4 & A4.5).

4.2.3. Determinants of Financial Fragility

There are a number of factors that enhance the financial fragility of banks. Here in this chapter, along with reform and regulation indicators, we have also considered both bank-specific and macroeconomic determinants of financial fragility of seventy six countries for the period 2001-2005. Below we have explained the related variables in used.

Financial Reform

The data of the financial reform variable is obtained from a newly-constructed dataset, created by Abiad et al (2008).⁵⁸ This data set covers a wide range of reform processes in 91 countries over the period from 1973 to 2005.⁵⁹ The financial reform variable is based on seven different dimensions. The first six dimensions measure financial liberalisation, whereas the seventh dimension measures the strength of bank capital regulation and supervision. The first six dimensions of liberalisation are as follows: 1-Credit Allocation Controls and High Reserve Requirement; 2-Interest Rate Liberalisation; 3-Entry Barriers; 4-Privatization; 5-Capital Accounts Liberalisation; 6-Securities Market Policy. The seventh dimension of financial reform is coded as Banking Prudential Regulation and Supervision. The strength of first six dimensions of liberalisation are based on a four-point scale from fully repressed to fully liberalised (0-

⁵⁸ Hermes et al (2009) also used Abiad et al (2008) index of financial reform variables and found a positive impact of financial reform programme on banking efficiency.

⁵⁹ The banking sector reforms indices in the European Bank for Reconstruction and Development (EBRD) are smaller in terms of years and countries (see Delis, 2012).

3), where 0, 1, 2 and 3 shown as fully repressed, partially liberalised, largely liberalised and fully liberalised respectively. The intensity of the seventh dimension of financial reform is also captured by a four-point scale (0-3) and is associated with unregulated and unsupervised, less regulated and less supervised, largely regulated and largely supervised and highly regulated and highly supervised, respectively.

Delis (2012) used the financial reform variable and found that financial liberalisation policies decrease the banks' market power, especially in developed economies. In this chapter, we also treated the financial liberalisation index and banking regulation and supervision indices separately in the regression, and analysed their impact on financial fragility.

Equity to Assets Ratio

The equity to assets ratio is used to capture the level of banks' capitalisation and is also considered as an important measure of leverage, with a value between 0 to 86.9% and a mean of 17%. The equity to assets ratio also shows a bank's capability to face any kind of unexpected loss. The higher equity to asset ratio indicates that banks are well-capitalized, which suggests that they become more secure and the chances of bank default decreases.⁶⁰ Demirguc-Kunt and Huizinga (2011) also include equity to assets ratio in their study and considered it to represent the banks' moral hazard (which plays an important role in increasing risk to the banking sector), because less capitalised banks are insecure and have a high chance of default, which enhances the moral hazard and risk taking behaviour of banks in order to capture a larger market, so banks will invest in highly risky asset portfolios for higher profits and emphasize more on profit,

⁶⁰ Delis (2012) and Soedarmono et al (2011) also used equity to asset ratio to control for bank capitalisation.

less on risk which leading towards high financial crisis. The expected sign between financial fragility and equity to assets ratio is negative.

Growth of Gross Loan

The growth of gross loans compares the current year's gross loans as a percentage of previous years'. Excessive loan growth over-inflation and loan growth in the economy can be a warning sign of deteriorating underwriting standards.⁶¹ Foos et al (2010) examined the effects of loan growth on the riskiness of banks in 16 countries during the period 1997-2007 and suggested that loan growth is an important factor for bank riskiness. Similarly, Clair (1992) examined a data set from banks in Texas during the sample period 1976 to 1990 and explored the relationship between loan quality (used as proxy of NPLs and charge-off rate) and loan growth rates. He found a negative and significant impact of loan growth on both NPLs and charge-off rate in initial years, while finding a positive effect of loan growth on NPLs and charge-off rate in lagged years. We also expect that loan growth leads to an increase of NPLs after one or more years. So, the lagged value of loan growth is included in the regression as a control variable and the expected sign between financial fragility and the lagged of loan growth is positive because of rapid credit growth and a possible decline in loan quality during an economic contraction, Rapid credit growth could deteriorate the ability of banks to monitor borrowers cautiously, thus enhancing the ratio of bad debts (Clair, 1992).

⁶¹ See Bank-Scope data definitions.

Total Assets

To measure the impact of size effects of bank on financial fragility, the natural logarithm of total assets is also included in the model.⁶² Demircuc-Kunt and Huizinga (2011) also used the logarithm of total assets to measure the absolute size of a bank. The sign of the log of total assets is expected to be negative to financial fragility. The reason could be that big banks are more equipped in risk management strategies, and have enough resources to deal with defaulters.⁶³ While, Mishkin (2006) and Kane (2000) documented that the “too big to fail” effect in large size of banks can also be the main reason of higher risk taking.

Cost to Income Ratio

Cost to income ratio (used as a proxy of bank efficiency) is also included as a control variable in the model of financial fragility. This ratio measures the efficiency and overheads of the bank. The lower (higher) the ratio, the better (worse) the efficiency,⁶⁴ which implies that efficient banking system could reduce the probability of loan default. Shehzad et al (2010) and Espinoza et al (2010) also used cost to income ratio as a proxy of bank efficiency and found a positive relation with impaired loans to gross loans.

⁶² We also estimate the equation with the lagged value of total assets. However, we do not find any significant change in results (see Appendix-A4.6).

⁶³ See Louzis et al (2012).

⁶⁴ See Bankscope definitions.

Share of Government Banks and Foreign Banks

To analyse the relationship between financial fragility and the share of government and foreign banks, consider the percentage of government banks and foreign banks in the banking system instead of using binary values 0 and 1.⁶⁵ The data of these variables come from the Bank-scope data set. Boudriga et al (2010) also used these variables against NPLs in MENA countries.⁶⁶ They found a negative relationship between foreign participation from developed countries and NPLs. Similarly, Boudriga et al (2010); Caprio and Martinez (2000) reported that government ownership has a positive and significant relationship with bank fragility.⁶⁷ They also found that the likelihood of a banking crisis was high in those countries where more than 50% of banks' assets were government-owned. However, Barth et al (2004) do not find any strong associations between government ownership and NPLs. We expect a positive coefficient of government-owned banks and a negative coefficient of foreign-owned banks with financial fragility because foreign banks are more efficient in terms of risk management skills and technology as compared to government banks.

Macroeconomic Variables

Several studies in banking and finance literature have considered macroeconomic variables (such as GDP growth, inflation, changes in unemployment, real wages and real interest rates) and examined their relation to NPLs. Most of the empirical studies suggest that NPLs are closely associated with macroeconomic factors.

⁶⁵ Demetriades and Fielding (2012) and Andrianova et al (2011) also used the ownership of banks in percentage instead of dummy variables.

⁶⁶ They used dummy values as proxy of ownership structure.

⁶⁷ Hu et al (2004) found a positive linkage between government-owned banks and NPLs in the Taiwanese banking sector.

For instance, Salas and Surina (2002) used GDP growth rate and found a significantly negative impact on NPLs. Similarly, Fofack (2005) reported a negative sign of GDP per capita and also documented that in the recession phase of the economy, coupled with declining per capita GDP, the possibility of loan default is enhanced. Furthermore, Espinoza and Prasad (2010) also explained that real GDP growth has negative and significant impact on NPLs in GCC banking system. Unfavourable macroeconomic conditions deteriorate the banking sector by enhancing the ratio of impaired loans to gross loans. So, in this chapter, we include real GDP per capita growth, the unemployment rate and GDP deflator in a base line model as macroeconomic control variables.

4.3. Estimation Framework:

As we stated above, the main objective of this study is to estimate the link between financial reform (and its component) and financial fragility in the banking sector. Moreover, we have also investigated the impact of financial liberalisation and the quality of banking regulation and supervision on financial fragility. Here, financial fragility is used as a dependent variable and financial reform as an explanatory variable. Furthermore, we also included some bank-specific and macro-specific control variables in the model. The equations 1, 2 and 3 specify a dynamic model of financial fragility by introducing a lagged of the dependent variable (Arellano and Bond, 1991; Blundell and Bond, 1998). This inclusion of the lagged of the dependent variable renders the OLS estimation technique inconsistent and biased. In equation 1, we introduce financial reform as the main explanatory variable and analyse its impact on financial fragility. Thus, in order to estimate the financial fragility of banks, we consider the standard model used in empirical studies (see Louzis et al, 2012; Merkl and Stolz, 2009; and

Salas and Saurina, 2002). A dynamic panel specification is specified in the following model:

$$FF_{i,j,t} = \beta_0 + \beta_1 FF_{i,j,t-1} + \beta_2 Y_{i,j,t} + \alpha_1 (FR_{j,t}) + \alpha_2 (FS_{i,j,t}) + \alpha_3 (GS_{i,j,t}) + \alpha_4 X_{j,t} + \mu_{i,j} + \eta_t + \xi_{i,j,t} \text{-----}(4.1)$$

Where ‘ $FF_{i,j,t}$ ’ is the dependent variable (i.e., financial fragility) of bank ‘ i ’ in country ‘ j ’ during time ‘ t ’ while ‘ $FF_{i,j,t-1}$ ’ is the lagged value of a dependent variable. ‘ $Y_{i,j,t}$ ’ denotes the bank-specific variable (which includes bank efficiency, equity to assets ratio, the lagged value of growth of gross loans and log of total assets), ‘ $FR_{j,t}$ ’ is financial reform in country ‘ j ’ during time t , ‘ $FS_{i,j,t}$ ’ and ‘ $GS_{i,j,t}$ ’ represented as the share of foreign banks and the share of government banks in the banking sector respectively; similarly, ‘ $X_{j,t}$ ’ indicates the macroeconomic variables (which includes real GDP growth, GDP deflator and unemployment rate); ‘ $\mu_{i,j}$ ’ are the unobserved individuals specific effects, ‘ η_t ’ is the time specific effects and ‘ $\xi_{i,j,t}$ ’ is the error term.

In equation 2, we have introduced the overall index of financial liberalisation (containing the six indices of liberalisation namely: 1- Credit Allocation Controls and High Reserve Requirement; 2- Interest Rate Liberalisation; 3- Entry Barriers; 4- Privatization; 5- Capital Accounts Liberalisation; 6- Securities Market Policy) as an explanatory variable and analysed its impact on financial fragility. In this model, we have replaced the financial reform index by financial liberalisation.

$$FF_{i,j,t} = \beta_0 + \beta_1 FF_{i,j,(t-1)} + \beta_2 Y_{i,j,t} + \beta_3 (FL_{j,t}) + \alpha_2 (FS_{i,j,t}) + \alpha_3 (GS_{i,j,t}) + \alpha_4 X_{j,t} + \mu_{i,j} + \eta_t + \xi_{i,j,t} \text{-----}(4.2)$$

Where ‘ $FL_{j,t}$ ’ indicates financial liberalisation in country ‘ j ’ during the time ‘ t ’. Similarly in equation 3, we have introduced both the aggregate index of liberalisation and the banking regulation and supervision index separately and analysed their impact on financial fragility.

$$FF_{i,j,t} = \beta_0 + \beta_1 FF_{i,j,(t-1)} + \beta_2 Y_{i,j,t} + \beta_3 (FL_{j,t}) + \beta_4 (BRS_{j,t}) + \alpha_2 (FS_{i,j,t}) + \alpha_3 (GS_{i,j,t}) + \alpha_4 X_{j,t} + \mu_{i,j} + \eta_t + \xi_{i,j,t} \text{-----}(4.3)$$

Where ‘ $FL_{j,t}$ ’ shows financial liberalisation and ‘ $BRS_{j,t}$ ’ indicates banking regulation and supervision in country ‘ j ’ during the time ‘ t ’.

To address the potential problem of endogeneity and the possibility of correlation between any right hand side variable of the model with error term ($\xi_{i,j,t}$), we used a dynamic two-step system GMM panel estimator technique instead of one-step GMM because dynamic two-step system GMM is asymptotically more efficient and suitable for analysis than one-step.⁶⁸ We also employ Windmeijer (2005) finite sample correction (which provides robust standard errors) to compensate the downward biased standard errors of two-step GMM. In the Blundell and Bond (1998) GMM estimator, there is no correlation between the difference of disturbance term ($\Delta\xi_{i,j,t}$) of the model and the higher order lagged of level variables. Similarly, the disturbance term ($\xi_{i,j,t}$) is

⁶⁸ Baltagi (2001) documented that in a dynamic relationship, fixed effect or random effect estimation techniques provide biased and inconsistent estimates, particularly when N is quite larger than T; normally a fixed and random effect estimation technique applies in a static relationship.

not correlated with the lagged difference of these variables. The assumption of moment conditions in two-step GMM are applicable for each t . In addition, the basic intuition of the Blundell and Bond estimator is that the lagged values of the regressor are used as an instrument for right hand side variables. Secondly, by taking the first difference, the unobserved fixed effects are eliminated into the regression and the regression in levels and in first differences are estimated simultaneously. Along with the Sargan test, the test of auto regressive of order one AR (1) and auto regressive of order two AR (2) were also conducted. Normally, the Sargan test of over-identifying restriction is used to ensure the validity of the instruments in the model, if the null hypothesis cannot be rejected, which suggests that over-identifying restrictions are valid, and the AR test of order one and order two are used to test the autocorrelation in disturbance term ($\xi_{i,k,t}$). It is supposed that $\xi_{i,k,t}$ in Blundell and Bond's estimator is an independent idiosyncratic error term, so that the first order AR (1) test may reject the null hypothesis ($H_0 = \text{No Autocorrelation}$), while the second order AR (2) test may not reject the hypothesis of no or zero correlation.

4.4. Empirical Results:

The detailed summary of financial fragility and all its bank-specific and macro-specific variables are explained in table 4.1, which are used in the empirical analysis. This table shows the units of measurement, mean, standard deviation, minimum and maximum values of these variables. All variables are in percentages (%) except financial reform index. The mean value of the financial fragility in seventy six countries is around 9.8% and moves from a minimum value of zero to a maximum value 86.9%⁶⁹.

⁶⁹ The ratio of impaired loans to gross loans is very high by international standards (see Demetriades and Fielding (2012)).

The asset quality amongst the lending institutions is extensively measured by NPLs, and often financial crises in both developed and developing countries are linked with NPLs (Guy and Lowe, 2011). The sample mean value of the log of total assets is 6.14 million USD with a minimum and maximum value of 0.129 million USD and 14.12 million USD respectively. The growth of gross loans is 18.72% on average with a standard deviation of 25.89%, and the minimum and maximum percentage of loan growth is 29.8% and 160.22% accordingly. Similarly, the average ratio of equity to assets is around 17.01%, with a minimum value of zero to a maximum value of 86.98%. The mean value of cost to income ratio is 57% approximately. Here, cost to income ratio was used as a proxy for bank efficiency, minimum and maximum value moving between 0 to 100%. Similarly, the mean value of the financial reform index is around 15.71; the minimum index value is 7 and the maximum index value is 21. The share of government banks and the share of foreign banks in the banking sector is around 5.53% and 17.35% respectively; the minimum and maximum shares of government and foreign banks are 0% and 100%. Beside with the bank-specific variables, the mean value of per capita growth rate in these countries is 3.53%, the minimum value of growth rate is -2.64% and the maximum value of growth rate is 13.69%. The average rate of the GDP deflator is 5.39% and ranges from 0.18% to 14.96%. Lastly, the average unemployment rate is around 9.22% with minimum and maximum values of 1.3% and 31.22%.

Table 4.2 presents the pair-wise correlations matrix of the dependent variable with bank-specific and country-specific variables. The correlation matrix has shown that financial fragility and all explanatory variables are statistically significant at the 5% level, except bank efficiency. It is important to note that the correlation between the log of total assets and the growth of gross loans is very high; that is, around -45%.

Table 4.1: Summary statistics of all variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
Financial Fragility (%)	5043	9.80	12.8	0	86.9
Total Assets Million USD	10050	6.14	2.26	0.12	14.1
Growth of Gross Loans (%)	6980	18.7	25.8	-29.8	160.2
Equity to Asset Ratio (%)	9608	17.0	16.4	0	86.9
Cost to Income Ratio (%)	8666	57.1	20.8	0	100
Financial Reform	24330	15.7	3.51	7	21
Share of Foreign banks (%)	24330	17.3	34.9	0	100
Share of Govt. banks (%)	24330	5.53	21.2	0	100
GDP Per Capita Growth (%)	22498	3.53	3.02	-2.64	13.6
GDP Deflator (%)	20041	5.39	3.38	0.18	14.9
Unemployment (%)	18770	9.22	5.78	1.30	31.2

Notes:

1. Above table describe the number of observations of the determinants that are used in the model to analyse the financial fragility of 76 countries over the period from 2001-2005.
2. Financial fragility used as a proxy of impaired loans to gross loans for and cost to income ratio used as proxy for bank efficiency.
3. Country name and number of banks in each country is reported in Appendix-A4.5.

Source: Bank Scope Data set maintained by Fitch/IBCA/Bureau Van Dijk.

Table 4.2: Pair-wise correlation matrix of all variables

	1	2	3	4	5	6	7	8	9	10	11	12
Financial fragility	1.000											
Cost to income ratio	0.013 (0.345)	1.000										
Equity to assets ratio	0.202* (0.000)	-0.061* (0.000)	1.000									
Growth of gross loans	-0.209* (0.000)	0.011 (0.366)	-0.025* (0.038)	1.000								
Log of total assets	-0.191* (0.000)	-0.182* (0.000)	-0.445* (0.000)	-0.101* (0.000)	1.000							
Financial reform	-0.110* (0.000)	0.041* (0.000)	-0.053* (0.000)	-0.104* (0.000)	0.103* (0.000)	1.000						
Financial liberalisation	-0.083* (0.000)	0.054* (0.000)	-0.038* (0.000)	-0.110* (0.000)	0.078* (0.000)	0.981* (0.000)	1.000					
GDP per capita growth	-0.041* (0.004)	-0.031* (0.004)	0.024* (0.021)	0.160* (0.000)	0.053* (0.000)	-0.134* (0.000)	-0.161* (0.000)	1.000				
GDP deflator	0.058* (0.000)	0.033* (0.005)	0.073* (0.000)	0.120* (0.000)	-0.123* (0.000)	-0.108* (0.000)	-0.097* (0.000)	-0.033* (0.000)	1.000			
Unemployment	0.139* (0.000)	0.039* (0.001)	0.086* (0.000)	-0.025 (0.063)	-0.150* (0.000)	0.069* (0.000)	0.077* (0.000)	-0.018* (0.014)	0.130* (0.000)	1.000		
Share of foreign banks	-0.065* (0.000)	0.007 (0.473)	-0.022* (0.027)	0.052* (0.000)	-0.025* (0.010)	0.048* (0.000)	0.036* (0.000)	0.067* (0.000)	0.002 (0.704)	0.031* (0.000)	1.000	
Share of govt. banks	0.093* (0.000)	-0.063* (0.000)	-0.068* (0.000)	-0.070* (0.000)	0.225* (0.000)	-0.081* (0.000)	-0.078* (0.000)	0.013* (0.047)	-0.006 (0.387)	0.034* (0.000)	-0.108* (0.000)	1.00

Note: (*) indicates the 5 % significance level.

Similarly, the correlation coefficient of equity to assets ratio, the growth of gross loans and log of total assets with financial fragility is 20.2%, -20.9% and -19.1% respectively. The pair-wise correlation matrix also explains that the growth of gross loans, the log of total assets, financial reform, financial liberalisation, per capita growth and share of foreign banks are negatively correlated with financial fragility while the correlation between financial fragility and cost to income ratio, equity to assets ratio, GDP deflator, unemployment and share of government banks is positive.

The dynamic estimation results of financial fragility in 76 countries during the sample period 2001 to 2005 are explained in tables 4.3 – 4.6. The equity to assets ratio and lagged value of financial fragility are treated as an endogenous variable in the models, whereas the bank efficiency variable is treated as a predetermined variable, meaning that “GMM style” instruments are used. The lagged dependent variable and bank efficiency variable have instrumented by its lagged value in all regressions. The p-value of the Sargan test and AR (2) is quite larger than the 5% level, which suggests that the null hypothesis of over-identification and AR (2) serial correlation cannot be rejected. These diagnostic tests provide evidence of the validity of instruments used.

Tables 4.3 and 4.4 contain the main results of the econometric investigation for the whole sample, regardless of the level of banking regulation and supervision quality. Table 4.3 reports the results of model 1, in which financial fragility has been regressed on financial reform, bank-specific (equity to assets ratio, bank efficiency, log of total assets, lagged value of growth of gross loans and share of foreign and government banks) and macro-specific (per capita growth, GDP deflator and unemployment rate)

variables.⁷⁰ The lagged dependent variable is positive and highly significant at the 1% level in all regressions of table 4.3, which confirms the selection and underlines the appropriateness of the dynamic panel model and explains that financial weakness in previous year is likely to exacerbate current year financial fragility.

The results of equation 1 are described in table 4.3. In column (1), the equity to assets ratio and log of total assets obtains coefficients that are negative and significant at the 5% and 10% level respectively; implying that 1% increase in bank capital stock and big size of banks reduces the chance of financial fragility by -0.17 and -1.06 percentage points, respectively.⁷¹ The inverse relationship between equity to assets ratio and financial fragility suggest that less capitalised banks are unsecure and high chance of default, which enhances the moral hazard and risk taking behaviour of banks in order to capture the larger market, so bank will invest in highly risky assets portfolios for higher profits and emphasize more on profit less on risk which leads toward high financial vulnerability.

The result of the log of total assets is also consistent with Salas and Saurina (2002) who found a negative relation between bank size and NPLs and suggested that bigger banks provide more diversification opportunities, which reduces credit risk.

⁷⁰ Here, financial reform is used in a broader way and contains all the six dimensions of liberalisation and the banking regulation and supervision index.

⁷¹ We also estimated the equations by using the lagged value of total assets (LTA_{t-1}) instead of the current value of log of total as.sets (LTA_t). The results of the lagged value of total assets in all tables are approximately the same as the results of the log of total assets except equity to assets ratio and share of government banks, which has no significant impact on financial fragility in tables 4A to 4D and table 4C, respectively (see Appendix-A4.6).

Table 4.3: Dynamic panel estimation of financial fragility with financial reform in 76 countries during sample period 2001 to 2005

	(1)	(2)	(3)	(4)
Financial fragility _(t-1)	0.692*** (0.097)	0.584*** (0.108)	0.698*** (0.094)	0.582*** (0.108)
Cost to income ratio	0.096 (0.117)	0.012 (0.096)	0.101 (0.114)	0.017 (0.099)
Equity to assets ratio	-0.170** (0.084)	-0.063 (0.096)	-0.194** (0.084)	-0.059 (0.099)
Growth of gross loans _(t-1)	0.033*** (0.009)	0.025*** (0.010)	0.033*** (0.010)	0.025*** (0.010)
Log of total assets	-1.064* (0.649)	0.820 (1.193)	-1.241* (0.702)	0.885 (1.264)
Financial reform	0.309* (0.168)	0.133 (0.160)	0.299* (0.169)	0.137 (0.164)
GDP per capita growth	-0.012 (0.138)	0.081 (0.133)	-0.005 (0.145)	0.077 (0.137)
GDP deflator	-0.053 (0.066)	0.055 (0.076)	-0.048 (0.068)	0.055 (0.076)
Unemployment	0.246* (0.143)	0.374** (0.177)	0.227* (0.139)	0.374** (0.176)
Share of foreign banks	-	-0.404** (0.179)	-	-0.413*** (0.177)
Share of govt. banks	-	-	0.110 (0.131)	-0.021 (0.152)
No. of obs.	1586	1586	1586	1586
No. of Instrument	33	33	33	33
Wald Chi square (p-value)	145.3 (0.00)	145.1 (0.00)	146.3 (0.00)	149.9 (0.00)
Sargan test (p-value)	22.77 (0.24)	11.55 (0.86)	21.13 (0.27)	11.58 (0.82)
AR(1) test (p-value)	-2.58 (0.00)	-2.03 (0.04)	-2.62 (0.00)	-2.05 (0.04)
AR(2) test (p-value)	1.34 (0.17)	1.26 (0.20)	1.36 (0.17)	1.25 (0.21)

Note:

The dependent variable is financial fragility, which is considered as a proxy of impaired loans to gross loans. Equity to assets ratio and lagged value of impaired loans to gross loans are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Cost to income ratio treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

The coefficient of growth of gross loans (ggl_{t-1}) is positive and significant at the 1% conventional level, which implies that high growth of loans in previous year also enhances the financial fragility (see Espinoza and Prasad, 2010), whereas financial reform and unemployment are positive and significant at the 10% levels. Louzis et al (2012) also found a positive and significant impact of unemployment on NPLs in Greece. This could suggest that 1% increases in loan growth, financial reform and unemployment enhances financial fragility by 0.03, 0.30 and 0.24 percentage points, while bank efficiency, per capita growth and GDP deflator do not have a significant impact on financial fragility. The results of the log of total assets and loan growth are also consistent with the findings of Salas and Saurian (2002) and Fernandez de Lis et al. (2001).

The inclusion of the share of foreign banks' variable in column (2) eliminates the significant impact of the equity to assets ratio, the log of total assets and financial reform on financial fragility. Adding the share of government banks' variable in the model in column (3) does not change the results of the baseline model. The results in column (2) and (4) of table 4.3 also show that the share of foreign banks have a negative and statistically significant impact on financial fragility at the 5% and 1% level respectively, which implies that the strict control (due to a more restricted regulatory structure), technological advancement and the efficient financial system in foreign banks reduces financial fragility and enhances banking system stability. This result is consistent with the findings of Barth et al (2002), who also found a negative relationship between the share of foreign banks and NPLs, whereas the share of government banks has a positive but insignificant impact on fragility; the plausible justification of this finding could be weaker credit recovery ability.

In table 4.4, the dependent variable, financial fragility, is regressed on the overall index of financial liberalisation.⁷² The results of table 4.4 show that the sign of the variables remain unchanged but the coefficients are three times larger than the coefficients of table 4.3. Therefore, these findings support the view that in the absence of banking regulation and supervision financial liberalisation raises financial fragility with a higher rate. This result is consistent with the findings of Demirguc-Kunt and Detragiache (1998) who also suggested that financial liberalisation enhances the probability of banking crisis.

The results of equation 3 are reported in tables 4.5 and 4.6; here, we scaled the data by considering different levels of banking regulation and supervision. Table 4.5 explains the result of financial fragility determinants, when banking regulation and supervision is not highly supervised (banking supervision less than 3). In column (1), the lagged value of the dependent variable and the lagged value of loan growth have a positive and significant impact on financial fragility at the 1% conventional level, whereas unemployment is significant at 5% the level. Similarly, the equity to assets ratio and the log of total assets have a negative and significant relationship with financial fragility at the 5% level. It is important to note that the relationship of financial liberalisation with financial fragility is positive, which implies that financial vulnerability is also increased in a weak banking environment (when banking regulation and supervision is not highly regulated and supervised) because bank regulators and supervisors are less capable to doing better risk assessment, have less skill for screening and fail to improve bank efficiency, stability and performance (Barth et al, 2004). These results suggest that regulators and supervisors have a low ability to screen and are unable to do better risk assessment, as well as failing to promote bank stability and

⁷² Here, banking regulation and supervision is excluded from the financial reform variable.

Table 4.4: Dynamic panel estimation of financial fragility with financial liberalisation in 76 countries during sample period 2001 to 2005

	(1)	(2)	(3)	(4)
Financial fragility _(t-1)	0.684*** (0.096)	0.586*** (0.107)	0.691*** (0.094)	0.584*** (0.108)
Cost to income ratio	0.098 (0.118)	0.012 (0.097)	0.105 (0.115)	0.016 (0.100)
Equity to assets ratio	-0.167** (0.084)	-0.065 (0.096)	-0.192** (0.084)	-0.063 (0.099)
Growth of gross loans _(t-1)	0.032*** (0.009)	0.025*** (0.010)	0.033*** (0.010)	0.025*** (0.010)
Log of total assets	-1.042* (0.650)	0.818 (1.196)	-1.225* (0.704)	0.854 (1.273)
Financial liberalisation	0.969** (0.521)	0.554 (0.480)	0.957* (0.523)	0.561 (0.492)
GDP per capita growth	-0.013 (0.139)	0.080 (0.133)	-0.006 (0.145)	0.077 (0.137)
GDP deflator	-0.050 (0.067)	0.055 (0.077)	-0.046 (0.068)	0.055 (0.077)
Unemployment	0.246* (0.143)	0.369** (0.178)	0.224* (0.138)	0.369** (0.177)
Share of foreign banks	-	-0.398** (0.179)	-	-0.403** (0.178)
Share of govt. banks	-	-	0.114 (0.130)	-0.015 (0.153)
No. of obs.	1586	1586	1586	1586
No. of Instrument	33	33	33	33
Wald Chi square (p-value)	147.9 (0.00)	150.1 (0.00)	149.3 (0.00)	154.4 (0.00)
Sargan test (p-value)	22.61 (0.25)	11.64 (0.86)	20.84 (0.28)	11.68 (0.81)
AR(1) test (p-value)	-2.56 (0.01)	-2.04 (0.04)	-2.59 (0.00)	-2.05 (0.03)
AR(2) test (p-value)	1.34 (0.17)	1.27 (0.20)	1.36 (0.17)	1.26 (0.20)

Note:

The dependent variable is financial fragility, which is considered as a proxy of impaired loans to gross loans. Equity to assets ratio and lagged value of impaired loans to gross loans are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Cost to income ratio treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

*(***) Coefficients are statistically significant at the 1% level.*

*(**) Coefficients are statistically significant at the 5% level.*

() Coefficients are statistically significant at the 10% level.*

efficiency. In column (2), the relationship between financial fragility and the share of foreign banks is still negative and significant at 10%. Furthermore, the result of column (3) shows that the share of government banks has a positive and significant impact on financial fragility. These findings suggest that as the percentage of government banks increases, the financial system becomes more fragile, especially in developing countries.

In table 4.6, financial fragility is regressed against the banking regulation and supervision index separately, with the overall index of liberalisation. Results in columns (1)-(4) show that banking regulation and supervision has a negative (as expected) impact on financial fragility. Barth, Caprio and Levine (2004) also documented that strong regulation reduces the likelihood of NPLs. These results suggest that financial fragility in seventy six developed and developing countries could be reduced by sound and efficient banking supervision and regulation.

Table 4.5: Dynamic panel estimation of financial fragility with financial liberalisation in 76 countries during sample period 2001 to 2005, when banking supervision is not strongly supervised

Banking regulation and supervision < 3				
	(1)	(2)	(3)	(4)
Financial fragility _(t-1)	0.690*** (0.097)	0.666*** (0.125)	0.697*** (0.102)	0.685*** (0.105)
Cost to income ratio	0.028 (0.126)	-0.162 (0.130)	-0.069 (0.137)	-0.173 (0.165)
Equity to assets ratio	-0.155** (0.078)	-0.058 (0.113)	-0.196** (0.089)	-0.135 (0.098)
Growth of gross loans _(t-1)	0.035*** (0.009)	0.024** (0.012)	0.032*** (0.010)	0.026** (0.012)
Log of total assets	-1.466** (0.642)	0.339 (1.927)	-1.637* (0.932)	-0.673 (1.457)
Financial liberalisation	0.685 (0.580)	0.262 (0.583)	0.633 (0.550)	0.394 (0.609)
GDP per capita growth	0.113 (0.218)	0.367* (0.228)	0.304 (0.236)	0.429* (0.259)
GDP deflator	-0.018 (0.099)	0.129 (0.141)	0.066 (0.103)	0.136 (0.129)
Unemployment	0.349** (0.176)	0.433** (0.220)	0.349** (0.184)	0.412** (0.216)
Share of foreign banks	-	-0.230* (0.135)	-	-0.143 (0.122)
Share of govt. banks	-	-	0.408* (0.236)	0.356* (0.222)
No. of obs.	1380	1380	1380	1380
No. of Instrument	33	33	34	34
Wald Chi square (p-value)	126.5 (0.00)	127.4 (0.00)	115.9 (0.00)	120.9 (0.00)
Sargan test (p-value)	24.93 (0.16)	19.04 (0.38)	17.05 (0.58)	14.89 (0.66)
AR(1) test (p-value)	-2.41 (0.01)	-2.29 (0.02)	-2.22 (0.02)	-2.30 (0.02)
AR(2) test (p-value)	1.30 (0.19)	1.42 (0.15)	1.41 (0.15)	1.46 (0.14)

Note:

The dependent variable is financial fragility, which is considered as a proxy of impaired loans to gross loans. Equity to assets ratio and lagged value of impaired loans to gross loans are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Cost to income ratio treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

Table 4.6: Dynamic panel estimation of financial fragility with financial liberalisation and banking supervision in 76 countries during sample period 2001 to 2005

All values of banking supervision				
	(1)	(2)	(3)	(4)
Financial fragility _(t-1)	0.676*** (0.107)	0.575*** (0.115)	0.676*** (0.104)	0.575*** (0.115)
Cost to income ratio	0.093 (0.114)	0.015 (0.098)	0.096 (0.110)	0.017 (0.103)
Equity to assets ratio	-0.162* (0.086)	-0.064 (0.099)	-0.184** (0.084)	-0.065 (0.101)
Growth of gross loans _(t-1)	0.032*** (0.009)	0.024*** (0.010)	0.033*** (0.010)	0.024*** (0.010)
Log of total assets	-1.041* (0.647)	0.818 (1.230)	-1.236* (0.699)	0.797 (1.305)
Financial liberalisation	0.965* (0.527)	0.507 (0.503)	0.922* (0.530)	0.509 (0.518)
Banking Supervision	-0.105 (1.362)	-0.912 (1.402)	-0.433 (1.436)	-0.893 (1.426)
Per capita growth	-0.007 (0.137)	0.083 (0.134)	0.005 (0.144)	0.081 (0.140)
GDP deflator	-0.044 (0.067)	0.060 (0.081)	-0.034 (0.070)	0.059 (0.082)
Unemployment	0.249* (0.142)	0.375** (0.179)	0.230* (0.136)	0.374** (0.179)
Share of foreign banks	-	-0.388** (0.178)	-	-0.387** (0.177)
Share of govt. banks	-	-	0.128 (0.140)	-0.001 (0.157)
No. of obs.	1586	1586	1586	1586
No. of Instrument	34	34	34	34
Wald Chi square (p-value)	149.6 (0.00)	146.7 (0.00)	151.4 (0.00)	150.1 (0.00)
Sargan test (p-value)	22.82 (0.24)	11.46 (0.87)	20.96 (0.28)	11.52 (0.82)
AR(1) test (p-value)	-2.47 (0.01)	-1.95 (0.05)	-2.45 (0.01)	-1.96 (0.05)
AR(2) test (p-value)	1.33 (0.18)	1.25 (0.20)	1.35 (0.17)	1.25 (0.21)

Note: The dependent variable is financial fragility, which is considered as a proxy of impaired loans to gross loans. Equity to assets ratio and lagged value of impaired loans to gross loans are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Cost to income ratio treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

*(***) Coefficients are statistically significant at the 1% level.*

*(**) Coefficients are statistically significant at the 5% level.*

() Coefficients are statistically significant at the 10% level.*

4.5. Summary and Conclusions:

It has largely been accepted that over the past few years or so, raising competition, technological improvement, the development of financial products and increasing liberalisation have become a vital challenge to safeguard the financial stability of the international financial system. The recent waves of banking crises have been mainly attributed to a high ratio of loan default. The purpose of this study is to explore the impact of financial reform policies on financial fragility.

This chapter investigated the determinants of financial fragility of 76 developed and emerging countries by using bank-level data (that was obtained from the Bank-scope database maintained by Fitch/IBCA/Bureau Van Dijk) for a sample of 779 banks during the period 2001-2005. We have found that the financial vulnerability of banking sector can be affected not only by bank-specific and macro-specific variables, but also by financial liberalisation and banking regulation and supervision policies. We have also examined the influence of financial reform, financial liberalisation and the quality of banking regulation and supervision on financial fragility. Moreover, we have also explored the relationship of the financial liberalisation index and banking regulation and supervision index on financial fragility individually. The empirical findings of this study confirm the evidence that financial reform and financial liberalisation significantly enhance the likelihood of financial fragility, while strong and sound banking regulation and supervision have an inverse relationship with financial fragility. Furthermore, in a weak regulatory and supervisory environment, the financial liberalisation index has no more significant impact on financial fragility. These findings suggesting that the benefits of financial liberalisation can be achieved without the cost of financial fragility if strong and effective banking regulation and supervision is in

place. Thus, these findings confirm that financial reform and financial liberalisation are the main factors in terms of enhancing banking sector vulnerability, where financial systems are not fully established and well-functioning.

Appendix-A4.1:

Descriptive Statistic, Including Between and within Variations, 2001-2005:

Variables		Mean	Std. Dev.	Min	Max	Obs.
Financial fragility	Overall	9.81	12.85	0.00	86.90	N = 5043
	between		13.51	0.00	86.90	n = 1814
	Within		5.27	-28.99	51.58	T-bar= 2.78
Cost to income ratio	Overall	57.12	20.80	0.00	100	N = 8666
	between		19.76	0.00	100	n = 3094
	Within		8.57	4.94	117.9	T-bar= 2.80
Equity to assets ratio	Overall	17.01	16.46	0.00	86.98	N = 9608
	between		16.68	0.00	86.35	n = 3233
	Within		5.60	-30.42	66.21	T-bar= 2.97
Growth of gross loans	Overall	18.72	25.90	-29.80	160.2	N = 6980
	between		22.01	-29.80	102.6	n = 2488
	Within		17.26	-50.78	98.70	T-bar= 2.80
Log of total assets	Overall	6.15	2.27	0.13	14.13	N = 10050
	between		2.32	0.26	14.13	n = 3346
	Within		0.36	2.48	10.88	T-bar= 3.00
Lagged value of total assets	Overall	6.02	2.23	0.13	13.81	N = 7402
	between		2.28	0.26	13.81	n = 2843
	Within		0.32	2.77	8.75	T-bar =2.60
Financial reforms	Overall	15.72	3.52	7.00	21.00	N = 24330
	between		3.47	7.80	21.00	n = 4866
	Within		0.58	12.92	18.22	T = 5
GDP per capita growth	Overall	3.53	3.03	-2.65	13.69	N = 22498
	Between		2.53	0.19	10.00	n = 4738
	Within		1.70	-3.57	9.17	T-bar= 4.74
GDP deflator	Overall	5.40	3.38	0.18	14.96	N = 20041
	between		2.91	1.02	14.66	n = 4691
	Within		1.94	-0.98	11.59	T-bar = .27
Unemployment	Overall	9.23	5.78	1.30	31.22	N = 18770
	between		5.48	1.76	28.82	n = 4261
	Within		1.37	0.35	18.11	T-bar= 4.40
Share of foreign banks	Overall	17.35	34.91	0.00	100	N = 24330
	between		34.92	0.00	100	n = 4866
	within		0.00	17.35	17.35	T = 5
Share of government banks	overall	5.53	21.20	0.00	100	N = 24330
	between		21.20	0.00	100	n = 4866
	within		0	5.5313	5.5313	T = 5

Note: Financial fragility is a proxy of Impaired loans to Gross Loans and Cost to Income Ratio is used as a proxy of Bank Efficiency.

Appendix-A4.2:

Descriptive Statistic of Developed and Developing Countries, 2001-2005:

	Obs.	Mean	Std. Dev.	Min	Max
<u>Developed Countries (20)</u>					
Financial fragility	1139	7.85	14.45	0.00	100.00
Cost to income ratio	2667	57.17	22.20	0.00	100.00
Equity to assets ratio	3088	16.64	17.37	0.00	86.93
Growth of gross loans	2089	14.45	24.80	-29.80	100.00
Log of total assets	3243	6.69	2.32	0.26	14.13
Financial reforms	9225	18.63	2.25	14.00	21.00
GDP per capita growth	8669	2.90	2.62	-2.65	10.67
GDP deflator	7713	3.97	2.64	0.30	12.40
Unemployment	7501	8.45	5.32	2.54	23.13
Share of foreign banks	9225	17.11	35.56	0.00	100.00
Share of government banks	9225	3.15542	16.38039	0	100
<u>Developing Countries (56)</u>					
Financial fragility	3979	12.00	16.86	0.00	100.00
Cost to income ratio	5999	57.10	20.15	0.09	100.00
Equity to assets ratio	6520	17.19	16.01	0.00	86.98
Growth of gross loans	4891	20.54	26.15	-29.80	160.22
Log of total assets	6807	5.89	2.19	0.13	14.07
Financial reforms	15105	13.93	2.91	7.00	21.00
GDP per capita growth	13829	3.92	3.20	-2.09	13.69
GDP deflator	12328	6.29	3.49	0.18	14.96
Unemployment	11269	9.75	6.01	1.30	31.22
Share of foreign banks	15105	17.50	34.51	0.00	100.00
Share of government banks	15105	6.98	23.55	0.00	100.00

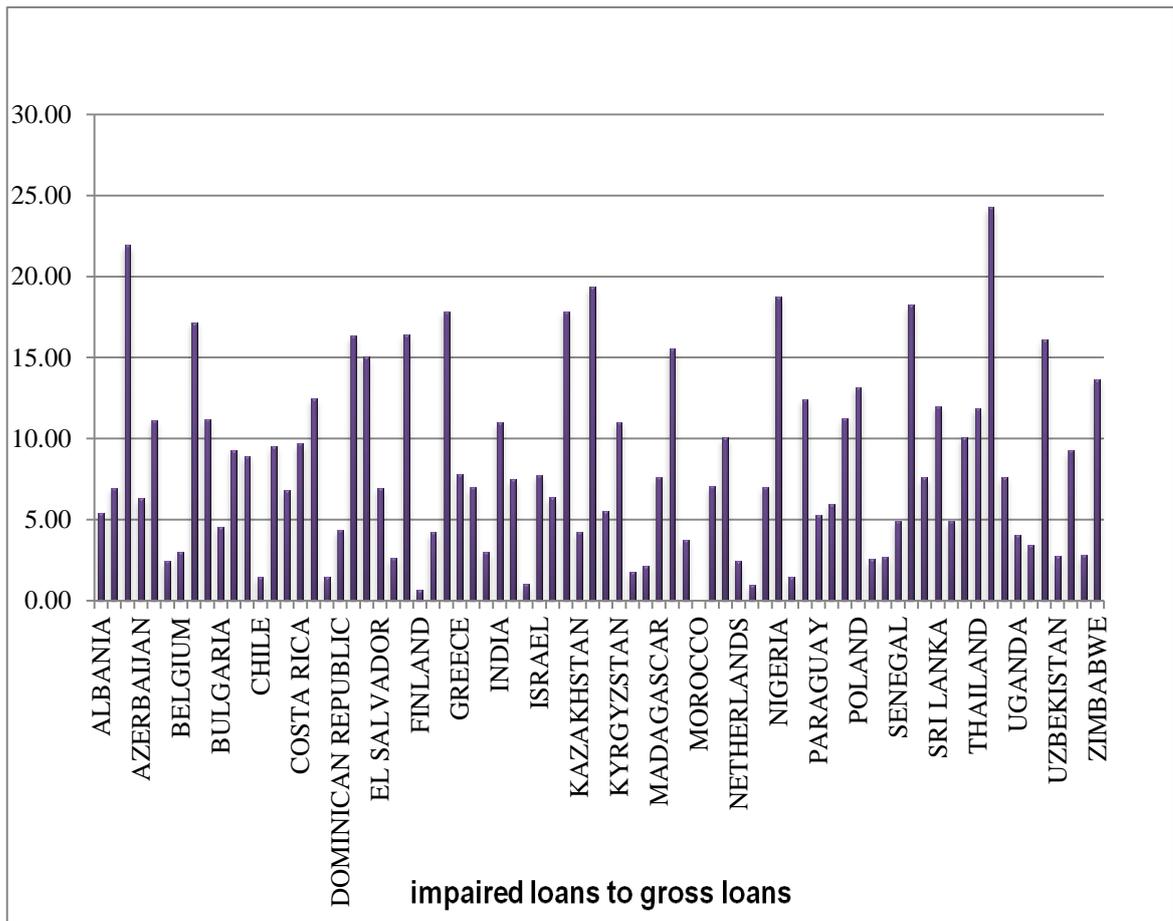
Appendix-A4.3:

**Composition of the Sample In Terms of Banking Supervision Index for Developed
and Developing Countries, 2001-2005:**

	Ranges of Banking Supervision Index			
	0	1	2	3
Developed Countries	0	1106	3802	4317
Developing Countries	259	6136	8078	632
Total Observations	259	7242	11880	4949

Appendix-A4.4:

Mean value of financial fragility in 76 developing and developed countries during sample period 2001-2005.



Source: Bank Scope Data set maintained by Fitch/IBCA/Bureau Van Dijk.

Appendix-4.5:

Mean value of financial fragility determinants of seventy six countries during sample period 2001-2005:

Country Name	Country ID	No. of Banks	Log of Total Assets	Equity to Assets Ratios	Impaired Loans to Gross Loans	Growth of Gross Loans	Cost to income ratio	GDP Per Capita Growth	Inflation, GDP Deflator	Un-employment	Banking Supervision	Financial Reform	Share of Foreign Bank	Share of Govt. Bank
Albania	1	15	5.05	14.60	5.39	26.34	52.23	5.11	3.92	22.68	2.20	15.50	59.50	6.67
Algeria	2	20	6.78	11.60	6.96	20.39	42.22	3.36	5.39	22.45	1.00	11.25	35.87	10.00
Argentina	3	163	4.93	28.81	21.96	16.45	65.20	8.02	9.52	15.10	1.60	14.60	10.25	7.82
Azerbaijan	4	33	3.41	25.73	6.31	47.21	52.81	9.61	4.99	8.58	1.40	13.60	16.37	4.55
Bangladesh	5	40	6.02	7.00	11.12	24.42	47.95	3.68	3.72	4.29	1.00	10.20	1.40	21.75
Belarus	6	28	4.92	20.48	2.44	33.53	68.11	7.72	-	-	1.00	10.50	39.20	14.33
Belgium	7	169	6.63	15.30	3.00	9.57	53.49	1.13	2.12	7.74	2.40	20.40	16.48	2.07

Bolivia	8	20	5.49	17.71	17.15	1.79	67.63	2.06	4.02	5.12	2.00	18.60	15.84	8.68
Brazil	9	263	6.32	21.76	11.16	20.50	54.66	1.45	9.70	9.27	1.80	11.80	14.31	3.33
Bulgaria	10	38	5.50	15.42	4.56	33.40	64.03	6.34	4.94	14.77	1.80	17.25	41.66	7.03
Burkina Faso	11	10	4.75	11.64	9.30	21.91	58.43	2.67	3.58	-	1.00	13.00	53.58	2.50
Cameroon	12	17	4.88	9.93	8.93	19.42	45.83	1.32	1.98	7.46	1.00	13.00	35.47	3.56
Chile	13	44	6.25	24.73	1.47	1.24	62.63	3.07	5.84	8.68	2.00	19.00	6.69	4.55
China	14	192	8.01	12.06	9.54	22.59	51.20	9.06	3.22	4.06	2.00	8.85	16.55	2.22
Colombia	15	71	6.66	19.04	6.82	8.90	61.34	2.01	6.33	13.05	1.00	15.00	7.76	5.63
Costa Rica	16	112	4.13	19.93	9.72	28.09	67.14	2.12	9.71	6.46	1.00	11.00	9.22	4.46
Czech republic	17	57	7.14	9.04	12.47	22.43	65.08	3.82	3.29	7.89	2.00	19.25	35.77	3.81
Denmark	18	165	6.05	15.38	1.49	13.29	56.45	0.96	2.33	4.90	3.00	21.00	4.49	0.62
Dominican	19	60	4.13	19.32	4.33	13.35	65.89	2.01	4.42	16.98	1.80	13.45	2.00	1.67

Ecuador	20	48	4.31	16.97	16.34	15.70	73.18	4.19	9.11	9.50	1.00	14.80	10.23	0.00
Egypt	21	46	7.12	9.70	15.05	7.44	52.50	1.59	5.94	10.40	2.40	14.80	33.87	18.82
El Salvador	22	23	5.88	15.66	6.95	11.65	62.89	1.87	3.06	6.82	2.00	16.80	29.52	4.35
Estonia	23	18	5.46	19.56	2.63	26.52	58.61	8.64	4.07	10.11	3.00	21.00	24.95	5.56
Ethiopia	24	14	5.57	13.69	16.41	23.91	38.98	5.99	8.85	14.25	1.00	7.80	0.71	30.36
Finland	25	35	7.40	21.34	0.67	8.54	59.44	2.35	1.18	8.83	1.00	17.00	10.55	8.15
Georgia rep. Of	26	20	4.16	23.15	4.23	38.47	57.06	8.07	6.20	12.34	2.80	19.05	25.53	5.00
Ghana	27	35	4.05	12.73	17.85	39.53	68.02	2.65	14.66	-	1.40	11.00	34.11	13.00
Greece	28	38	7.99	13.41	7.79	31.32	62.39	3.74	3.26	10.11	2.00	17.60	9.95	3.17
Guatemala	29	46	5.23	10.82	6.99	12.59	77.72	0.51	5.65	2.57	1.60	15.60	12.88	2.83
Hungary	30	65	6.44	13.92	3.01	17.59	61.52	4.54	5.73	6.14	3.00	20.25	42.13	4.28
India	31	131	7.20	11.56	10.98	17.39	46.60	5.41	4.65	4.40	2.00	12.40	10.55	21.50

Indonesia	32	131	6.28	16.05	7.48	23.55	54.68	3.36	9.71	9.55	1.00	13.60	18.39	5.78
Ireland	33	97	7.80	12.55	1.02	5.25	33.42	3.62	3.46	4.25	3.00	21.00	32.55	1.76
Israel	34	23	8.45	7.24	7.73	3.47	61.82	0.22	2.26	9.95	2.00	18.60	9.06	4.39
Jamaica	35	22	6.02	15.95	6.35	27.41	56.40	1.48	10.41	12.68	2.00	14.80	18.94	9.09
Jordan	36	21	7.08	11.82	17.87	15.07	47.44	3.85	1.78	14.95	2.00	19.25	30.99	10.72
Kazakhstan	37	43	5.01	25.77	4.24	48.66	54.39	10.00	9.23	9.00	2.00	13.60	23.68	0.85
Kenya	38	66	4.39	20.14	19.37	16.91	59.97	0.99	4.15	-	1.00	14.90	11.29	7.44
Korea rep. Of	39	121	8.44	18.52	5.55	15.17	61.38	4.01	2.87	3.65	1.00	15.00	3.37	2.32
Kyrgyzstan	40	15	3.49	22.87	11.02	46.70	54.88	2.89	5.12	9.38	1.20	15.80	19.14	14.00
Latvia	41	29	5.74	11.19	1.74	35.74	61.69	8.86	5.21	11.15	3.00	21.00	35.84	6.90
Lithuania	42	15	6.51	10.37	2.13	37.70	68.93	8.33	3.11	12.48	2.00	19.05	26.69	6.67
Madagascar	43	7	5.23	9.49	7.61	19.76	41.14	3.44	8.11	4.31	2.00	16.10	69.29	20.37

Malaysia	44	131	7.55	18.29	15.59	8.18	42.15	2.76	4.27	3.52	2.00	16.00	15.55	4.21
Mexico	45	107	7.11	20.33	3.75	16.93	65.31	0.82	6.61	3.11	2.00	20.00	16.14	6.63
Morocco	46	28	7.05	15.16	-	7.25	49.97	3.75	1.02	11.56	1.00	14.00	14.99	9.93
Mozambique	47	17	4.52	10.87	7.05	21.22	69.04	5.76	8.94	-	1.00	15.00	45.37	6.89
Nepal	48	28	4.88	12.66	10.08	20.72	49.18	1.12	5.74	8.81	0.80	9.00	11.13	6.37
Netherlands	49	146	7.93	9.01	2.41	10.58	51.35	0.83	2.85	3.53	2.80	20.80	25.86	1.37
New Zealand	50	33	6.71	12.87	0.93	17.46	45.59	2.47	2.52	4.66	2.00	20.00	9.56	3.03
Nicaragua	51	22	4.64	14.65	7.02	23.39	53.43	1.79	6.95	7.79	1.00	15.25	26.18	0.00
Nigeria	52	100	5.22	16.04	18.75	31.22	64.34	3.65	10.97	-	2.00	17.10	4.90	1.08
Norway	53	175	6.08	11.26	1.46	14.13	58.55	1.63	4.66	4.15	3.00	18.25	4.39	1.43
Pakistan	54	62	5.70	16.60	12.45	24.17	54.00	2.52	5.91	7.61	2.00	11.40	16.74	11.23
Paraguay	55	29	4.65	14.55	5.28	12.07	78.45	0.57	8.52	7.88	0.80	16.50	12.40	0.00

Peru	56	45	6.28	18.43	5.99	9.53	64.69	2.81	2.76	8.34	2.00	19.00	21.41	11.08
Philippines	57	83	5.78	19.06	11.24	7.91	58.63	2.51	5.45	10.67	1.00	16.20	11.01	4.46
Poland	58	86	6.71	15.44	13.17	13.60	62.87	3.25	2.57	18.91	3.00	17.90	40.34	3.73
Portugal	59	73	7.58	14.60	2.57	13.77	56.05	0.19	3.06	5.91	3.00	17.50	15.06	4.55
Romania	60	45	5.75	17.25	2.68	38.18	68.40	6.49	12.29	7.31	2.00	16.90	49.26	6.56
Senegal	61	14	5.23	9.37	4.91	22.56	60.54	1.99	1.84	-	1.00	14.40	50.44	1.32
Singapore	62	111	6.22	20.95	18.23	4.35	50.43	6.78	4.17	4.69	2.00	20.00	28.20	0.90
South Africa	63	104	6.83	21.14	7.62	20.67	56.76	2.39	7.16	28.82	2.00	18.25	9.93	5.39
Sri Lanka	64	22	5.85	11.44	12.00	19.31	59.65	2.97	9.97	8.20	1.40	14.00	3.38	13.51
Taiwan	65	128	8.08	21.80	4.90	4.89	53.34	-	-	-	1.60	14.15	5.83	5.64
Tanzania	66	38	4.41	14.86	10.11	33.92	69.21	4.22	6.86	5.12	2.00	16.60	35.37	16.21
Thailand	67	74	6.78	23.28	11.90	18.33	58.56	3.94	2.37	1.76	1.00	13.40	10.88	10.24
Tunisia	68	39	5.46	19.21	24.26	6.97	50.46	3.44	2.58	14.61	1.60	14.40	28.51	10.79

Turkey	69	119	6.34	22.98	7.59	28.35	53.84	5.87	9.74	10.15	2.00	15.50	17.24	2.77
Uganda	70	33	4.14	15.09	4.08	25.58	64.44	3.33	6.17	3.20	1.80	14.90	41.25	12.28
Ukraine	71	78	5.20	15.75	3.41	46.02	62.15	8.65	7.76	9.07	2.60	14.10	34.44	5.27
Uruguay	72	58	4.67	19.43	16.10	7.59	68.94	4.45	7.06	14.87	1.80	15.20	27.56	7.59
Uzbekistan	73	19	4.53	20.91	2.74	20.75	57.15	4.17	-	-	2.00	9.30	8.61	19.87
Venezuela	74	90	4.99	21.90	9.25	25.85	59.89	4.97	8.00	14.43	1.00	17.45	4.97	6.71
Vietnam	75	54	5.84	12.50	2.80	37.90	47.19	6.06	5.79	2.32	1.00	8.90	20.76	6.30
Zimbabwe	76	49	4.72	14.77	13.67	14.34	45.35	2.27	6.06	4.17	0.60	12.15	14.54	4.60

Sources:

- *Bank Scope Data set maintained by Fitch/IBCA/Bureau Van Dijk.*
- *World Development Indicator (WDI).*
- *A New Database of Financial Reforms by Abiad, Detragiache and Tressel (2008).*

Appendix-A4.6 (use lagged value of total assets):

Table 4.A: Dynamic panel estimation of financial fragility with financial reform in 76 countries during sample period 2001 to 2005

	(1)	(2)	(3)	(4)
Financial fragility _(t-1)	0.687*** (0.086)	0.623*** (0.101)	0.690*** (0.086)	0.620*** (0.100)
Cost to income ratio	0.120 (0.105)	0.042 (0.118)	0.110 (0.108)	0.043 (0.120)
Equity to assets ratio	-0.007 (0.137)	-0.037 (0.117)	-0.015 (0.134)	-0.034 (0.115)
Growth of gross loans _(t-1)	0.030*** (0.009)	0.026*** (0.010)	0.030*** (0.010)	0.026*** (0.010)
<i>Lagged value of assets_(t-1)</i>	<i>-1.216*</i> (0.742)	<i>0.506</i> (1.333)	<i>-1.267*</i> (0.782)	<i>0.591</i> (1.449)
Financial reform	0.296** (0.146)	0.163 (0.156)	0.295** (0.152)	0.164 (0.156)
GDP per capita growth	-0.061 (0.132)	0.055 (0.154)	-0.057 (0.138)	0.054 (0.155)
GDP deflator	-0.021 (0.058)	0.042 (0.069)	-0.017 (0.060)	0.043 (0.068)
Unemployment	0.238* (0.132)	0.375** (0.188)	0.213* (0.129)	0.379** (0.188)
Share of foreign banks	-	-0.283** (0.138)	-	-0.294** (0.145)
Share of govt. banks	-	-	0.070 (0.122)	-0.020 (0.176)
No. of obs.	1586	1586	1586	1586
No. of Instrument	33	33	33	33
Wald Chi square (p-value)	184.6 (0.00)	167.9 (0.00)	169.3 (0.00)	168.1 (0.00)
Sargan test (p-value)	25.18 (0.50)	15.71 (0.92)	23.59 (0.42)	15.68 (0.89)
AR(1) test (p-value)	-2.70 (0.00)	-2.29 (0.02)	-2.63 (0.00)	-2.30 (0.02)
AR(2) test (p-value)	1.14 (0.25)	1.19 (0.23)	1.15 (0.24)	1.18 (0.23)

Note:

The dependent variable is financial fragility, which is considered as a proxy of impaired loans to gross loans. Equity to assets ratio, lagged value of log of total assets and lagged value of impaired loans to gross loans are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Cost to income ratio treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

Table 4.B: Dynamic panel estimation of financial fragility with financial liberalisation in 76 countries during sample period 2001 to 2005

	(1)	(2)	(3)	(4)
Financial fragility _(t-1)	0.680*** (0.084)	0.624*** (0.100)	0.684*** (0.085)	0.623 (0.101)
Cost to income ratio	0.124 (0.107)	0.043 (0.122)	0.114 (0.109)	0.043 (0.124)
Equity to assets ratio	-0.002 (0.136)	-0.036 (0.118)	-0.010 (0.134)	-0.034 (0.116)
Growth of gross loans _(t-1)	0.030*** (0.009)	0.026*** (0.010)	0.030*** (0.010)	0.026*** (0.010)
<i>Lagged value of assets_(t-1)</i>	<i>-1.204*</i> (0.745)	<i>0.489</i> (1.358)	<i>-1.261*</i> (0.785)	<i>0.538</i> (1.479)
Financial liberalisation	0.958** (0.443)	0.644 (0.474)	0.978** (0.463)	0.645 (0.479)
GDP per capita growth	-0.064 (0.133)	0.054 (0.156)	-0.058 (0.139)	0.053 (0.158)
GDP deflator	-0.019 (0.059)	0.043 (0.070)	-0.013 (0.061)	0.044 (0.070)
Unemployment	0.238* (0.132)	0.373** (0.191)	0.211* (0.128)	0.375** (0.192)
Share of foreign banks	-	-0.274** (0.140)	-	-0.281** (0.149)
Share of govt. banks	-	-	0.073 (0.122)	-0.011 (0.178)
No. of obs.	1586	1586	1586	1586
No. of Instrument	33	33	33	33
Wald Chi square (p-value)	188.2 (0.00)	172.2 (0.00)	171.9 (0.00)	171.7 (0.00)
Sargan test (p-value)	24.81 (0.52)	15.83 (0.91)	23.12 (0.45)	15.82 (0.89)
AR(1) test (p-value)	-2.71 (0.01)	-2.29 (0.02)	-2.63 (0.00)	-2.30 (0.02)
AR(2) test (p-value)	1.14 (0.25)	1.20 (0.22)	1.15 (0.24)	1.19 (0.23)

Note:

The dependent variable is financial fragility, which is considered as a proxy of impaired loans to gross loans. Equity to assets ratio and lagged value of impaired loans to gross loans are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Cost to income ratio treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

Table 4.C: Dynamic panel estimation of financial fragility with financial liberalisation in 76 countries during sample period 2001 to 2005, when banking supervision is not strongly supervised

Banking regulation and supervision < 3				
	(1)	(2)	(3)	(4)
Financial fragility _(t-1)	0.660*** (0.087)	0.656*** (0.098)	0.686*** (0.091)	0.681*** (0.087)
Cost to income ratio	0.106 (0.114)	-0.047 (0.168)	0.021 (0.140)	-0.045 (0.171)
Equity to assets ratio	0.037 (0.137)	0.033 (0.128)	-0.033 (0.127)	-0.020 (0.119)
Growth of gross loans _(t-1)	0.033*** (0.010)	0.025** (0.013)	0.032*** (0.011)	0.028** (0.012)
<i>Lagged value of assets_(t-1)</i>	-1.643** (0.762)	<i>0.010</i> (1.847)	-1.634* (0.967)	-0.804 (1.528)
Financial liberalisation	0.820* (0.505)	0.686 (0.534)	0.735 (0.522)	0.632 (0.521)
GDP per capita growth	-0.041 (0.220)	0.174 (0.295)	0.134 (0.260)	0.211 (0.289)
GDP deflator	-0.010 (0.080)	0.096 (0.132)	0.040 (0.095)	0.082 (0.118)
Unemployment	0.290* (0.159)	0.349** (0.163)	0.289** (0.151)	0.342** (0.158)
Share of foreign banks	-	-0.188 (0.124)	-	-0.110 (0.118)
Share of govt. banks	-	-	0.268 (0.221)	0.219 (0.216)
No. of obs.	1380	1380	1380	1380
No. of Instrument	33	33	34	34
Wald Chi square (p-value)	168.2 (0.00)	172.2 (0.00)	151.4 (0.00)	164.1 (0.00)
Sargan test (p-value)	25.62 (0.48)	20.73 (0.70)	19.71 (0.76)	18.62 (0.77)
AR(1) test (p-value)	-2.58 (0.00)	-2.15 (0.03)	-2.26 (0.02)	-2.24 (0.02)
AR(2) test (p-value)	1.12 (0.25)	1.20 (0.22)	1.20 (0.22)	1.23 (0.21)

Note:

The dependent variable is financial fragility, which is considered as a proxy of impaired loans to gross loans. Equity to assets ratio and lagged value of impaired loans to gross loans are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Cost to income ratio treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

(***) Coefficients are statistically significant at the 1% level.

(**) Coefficients are statistically significant at the 5% level.

(*) Coefficients are statistically significant at the 10% level.

Table 4.D: Dynamic panel estimation of financial fragility with financial liberalisation and banking supervision in 76 countries during sample period 2001 to 2005

All values of banking supervision				
	(1)	(2)	(3)	(4)
Financial fragility _(t-1)	0.664*** (0.095)	0.612*** (0.103)	0.662*** (0.094)	0.612*** (0.105)
Cost to income ratio	0.119 (0.102)	0.052 (0.117)	0.109 (0.101)	0.050 (0.122)
Equity to assets ratio	0.011 (0.148)	-0.026 (0.122)	-0.007 (0.143)	-0.026 (0.121)
Growth of gross loans _(t-1)	0.029*** (0.009)	0.025*** (0.010)	0.029*** (0.010)	0.025*** (0.010)
Lagged value of assets _(t-1)	-1.196* (0.738)	0.439 (1.326)	-1.302* (0.785)	0.452 (1.500)
Financial liberalisation	0.918** (0.458)	0.620 (0.485)	0.921** (0.471)	0.625 (0.491)
Banking Supervision	-0.434 (1.268)	-0.876 (1.343)	-0.855 (1.406)	-0.902 (1.384)
GDP per capita growth	-0.055 (0.131)	0.051 (0.153)	-0.042 (0.137)	0.053 (0.156)
GDP deflator	-0.008 (0.060)	0.049 (0.071)	0.001 (0.064)	0.050 (0.072)
Unemployment	0.252* (0.134)	0.365** (0.186)	0.223* (0.128)	0.364** (0.187)
Share of foreign banks	-	-0.257** (0.134)	-	-0.254* (0.149)
Share of govt. banks	-	-	0.102 (0.137)	0.001 (0.188)
No. of obs.	1586	1586	1586	1586
No. of Instrument	34	34	34	34
Wald Chi square (p-value)	193.3 (0.00)	167.9 (0.00)	185.4 (0.00)	163.4 (0.00)
Sargan test (p-value)	24.75 (0.53)	15.35 (0.93)	22.75 (0.59)	15.28 (0.91)
AR(1) test (p-value)	-2.63 (0.00)	-2.28 (0.02)	-2.52 (0.01)	-2.27 (0.02)
AR(2) test (p-value)	1.12 (0.26)	1.17 (0.23)	1.13 (0.25)	1.17 (0.23)

Note: The dependent variable is financial fragility, which is considered as a proxy of impaired loans to gross loans. Equity to assets ratio and lagged value of impaired loans to gross loans are treated as endogenous. The lagged dependent variable is instrumented by its lagged value. Cost to income ratio treated as predetermine variable and instrumented by its lagged value. All regressions include a full set of time dummies but results are not reported in the table. Figures in parenthesis are robust standard errors obtained by the Windmeijer WC-robust estimator.

*(***) Coefficients are statistically significant at the 1% level.*

*(**) Coefficients are statistically significant at the 5% level.*

() Coefficients are statistically significant at the 10% level.*

CHAPTER 5:

CONCLUDING REMARKS

5.1. Concluding Remarks:

This thesis is about financial liberalisation and banking regulation and supervision policies in a large panel dataset of developed and developing countries. Recent theoretical and empirical findings suggest that the openness of a country's capital account and financial sector development can affect economic growth. Chapter 2 investigates the impact of capital account liberalisation and financial development on economic growth in seventy one developed and developing countries over the period 1985-2004. This Chapter also contributes into the existing literature that examines how capital account liberalisation, financial development indicators and sound institutional quality enhance economic growth, particularly in middle and lower income countries. The empirical findings of IV 2SLS, IV GMM and IV Fixed Effect estimation technique in the whole dataset of 71 countries suggest that financial development and capital account liberalisation has a statistically significant and strong impact on growth. These empirical results also suggest that financial development and capital account liberalisation also have an economically large and statistically significant relationship with growth in middle and lower income countries, although in high income countries capital account liberalisation has a positive but insignificant impact on economic growth. These statistics follow the findings of earlier studies, which suggest that the inflow of capital flight is much larger in middle and low income countries than in high income ones. The empirical findings also suggest that measures of financial sector development have a strong and significant effect on economic growth. When financial systems are functioning well, the acceleration of economic growth is more likely to take place, when combined with good institutions. In addition, empirical results also suggest that institutional quality has a direct and robust effect on economic growth in 71 developed and developing countries. Therefore, these results suggest that financial

sector development and institutional development are pre-conditional for promoting growth.

Chapter 3 studies the impact of financial reforms, bank specific and macro-specific variables on bank interest margin and assessed whether financial reform policies in the developed and developing world have enhanced the banks' efficiency because the financial system of countries across the world are different to each other in respect of their size and functions. This chapter has obtained the data of bank-specific determinants of more than 1300 individual banks in seventy six countries during the period 2001 to 2005, obtained from the Bank-scope database. The empirical findings of dynamic two-step system GMM estimation have provided the evidence that financial liberalisation and strong banking regulation and supervision have a significant and inverse relationship with bank interest margins. These results also suggested that in a weakly-regulated and supervised environment, financial liberalisation has a negative but insignificant impact on net interest margins. These findings explained that sound and better financial reform policies have played a significant role in narrowing interest margins in developed and developing countries through the competitiveness of the banking system. In this chapter, we have also regressed the individual component of liberalisation on net interest margins, and provide some new empirical evidence that two out of six liberalisation indices - interest rate liberalisation and barriers to entry - have a negative and statistically significant impact on net interest margins, which suggests that the deregulation of interest rate controls and removal of entry barriers into the financial sector enhanced the competition and efficiency of the banking sector, thus lowering the bank interest margins. In conclusion, the empirical findings of this chapter explain that the huge entrance of banks, the removal of interest rate controls, strong banking regulation and supervision, and effective liberalisation policies have reduced

net interest margins in developed and developing countries. The policy implications for those countries facing high interest margins could reduce bank interest margins by taking measures such as deregulation of interest rate controls, the removal of entry barriers, low financial taxation and the strengthening of the regulatory and supervisory environment. These procedures will increase competition and the efficiency and stability of banking system, leading to the reduction of net interest margins.

The purpose of chapter 4 is to explore the empirical link between financial reform policies and financial fragility because the recent waves of banking crises have been mainly attributed to a high ratio of loan default. This chapter investigated the determinants of financial fragility of 76 developed and developing countries by using bank-level data for a sample of 779 banks during the period 2001-2005. The empirical findings of dynamic two step system GMM estimation technique suggested that the financial vulnerability of banking sector can be affected not only by bank-specific and macro-specific variables, but also by financial reforms policies. In this chapter we have also examined the influence of financial liberalisation and the quality of banking regulation and supervision policies individually on financial fragility. The empirical findings of this chapter confirm the evidence that financial reforms and financial liberalisation have a positive and significant relationship with financial fragility and enhance the likelihood of financial vulnerability, while strong and sound banking regulation and supervision have an inverse relationship with financial fragility. Furthermore, these results also suggest that under the sound banking regulatory and supervisory environment, the financial liberalisation index has no more significant impact on financial fragility. Thus, these findings confirm that financial reform and financial liberalisation are the main factors in terms of enhancing banking sector vulnerability, where financial systems are not fully established and well-functioning.

The problem of high NPLs could be managed or reduced 1) if the banking system of these countries implement effective and sound practices that affect banking supervision and regulation policies to ensure the financial stability and development; 2) by avoiding moral hazards and the risk taking behaviour of banks; 3) by strengthening the regulation and supervision polices, increasing overall bank efficiency and improving risk management techniques. This study will also provide useful understanding to those countries currently in the phase of financial reform and liberalisation of their financial policies. Future extension of this work would be by considering the large data set in terms of time period and countries, as the data of this study is based on 5 years.

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