Financial Liberalisation and Banking Crises in Sub Saharan Africa

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Abstract

This study aims to investigate the causal effect of financial liberalisation policies on the stability of banking sectors in selected countries in Sub Saharan Africa (SSA). The study is motivated by theoretical emphasis on the competing influence of financial liberalisation in fostering financial development, but also giving rise to financial systems that are more vulnerable to systemic risk.

This thesis addresses critical issues concerning measures of financial liberalisation used in empirical studies. While different research bodies have produced several liberalisation indices, most datasets cover developed and developing countries outside Africa. Most of the existing indices are therefore not useful in cross-country and panel studies in SSA. To address this measurement issue, this thesis constructs a new set of liberalisation indicators using country by country information on the timing of seven liberalisation policies. The study considers 12 SSA countries using the framework developed by Abiad et al. (2008). Thus, this study extends the financial liberalisation database of Abiad et al. (2008) from 14 to 26 SSA countries.

Making use of the expansive financial liberalisation dataset for the 26 countries, the study employs the ordered logit model to establish the response of financial liberalisation to systemic and non-systemic banking crises outcomes in 26 SSA countries for the period 1986 to 2006. The empirical results indicate that total financial liberalisation reduces the probability of either type of banking crises. Furthermore, specific policies such as privatisation of state-owned banks as well as bank regulation and supervision promote banking stability. However, other policies such as removal of entry and activity restrictions increase the probability of the occurrence of both systemic and non-systemic banking crises. Nevertheless, the destabilising effects of these liberalisation policies are minimal in stable economies that have well developed institutions.

To further analyse the influence of financial liberalisation on banking crises, this thesis employs a 2 step approach. Firstly, the study tests the effects of financial liberalisation on bank profits (proxy for franchise value). This follows theoretical claims that banks with high franchise value shun the risk of bankruptcy and hence are more stable. Thus, in the second empirical chapter, the study employs a two-step General Method of Moments (GMM) approach in a dynamic panel framework, to examine the impact of liberalisation policies on measures of bank profitability. Empirical evidence presented in this thesis shows that liberalisation policies that significantly impact on the competitive environment in which banks operate, have a negative causal effect on bank franchise value. These include elimination of entry restrictions and relaxing controls on security market policies. On the contrary, reforms on prudential regulation and bank supervision, as well as bank privatisation significantly increase bank profit levels.

The second step involves examining the consequent effects of bank profitability on banking crises. The third empirical chapter of this thesis examines the effects of liberalisation-induced changes in franchise value on banking sector stability in SSA. To do this, the study considers an indicator that captures changes in franchise value arising from financial liberalisation. The estimated values of this indicator are then used to relate the response of financial liberalisation to both systemic and non-systemic banking crises. Empirical results indicate a positive relationship between this indicator and the likelihood of either type of banking crises. The results suggest that some financial liberalisation policies affect banking sector crises through their impact on bank franchise value. This result is substantiated by empirical evidence established from a two-stage least squares methodology.

This study is the first attempt to tackle issues regarding the link between financial liberalisation policies and actual occurrence of both systemic and non-systemic crises in the SSA context. As such, the findings of this thesis have important policy implications. Since implementation of liberalisation policies is an on-going process, the study results suggest that policy measures should emphasise development of appropriate infrastructure concurrent with financial liberalisation. For instance, legal and institutional frameworks are crucial in curbing risk-taking incentives that may be a result of decline in franchise value following financial liberalisation. Such institutions will help contain the effects of liberalisation policies that adversely impact on banking stability. At the same time, well developed institutions are ideal for reinforcing the effects of policies that promote bank stability. In such an environment, there is no need to trade off efficiency and stability goals of competition arising from financial liberalisation.

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Any errors remain entirely mine. The acknowledged persons bear no responsibility for the deficiencies contained herein.

Dedication

To my late mother Milka, and my loving daughter Anashe Nicole.

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Chapter 1

Introduction

1.1 Background and Motivation of the Study

It is widely accepted that financial sectors play a crucial role as conduits for economic development. There is broad consensus in both theoretical and empirical research concerning this pertinent issue (Beck et al., 2000; Levine et al., 2000; King and Levine, 1993). This strand of literature argues that financial liberalisation cultivates efficient financial intermediation necessary for economic growth[1]. As such, the dawn of the 1980s saw many African countries replacing former protectionist economic policies, blamed for economic and financial instability, with more market oriented policies.

In recent years, there has been a shift of focus from analysing the growth enhancing effects of financial liberalisation, via financial deepening, towards its role in financial stability. Specifically, there is a perception based on a large body of scholarly work, that financial liberalisation produces banking systems that are more vulnerable to systemic risk (Caprio Jr and Honohan, 2009; Hellmann et al., 2000; Kaminsky and Reinhart, 1999; Caprio and Klingebiel, 1996). Systemic banking crises, in which large segments of the banking system become technically insolvent and/or illiquid, have occurred with increasing frequency across international markets since the 1970s. Bordo et al. (2001) show that the frequency of banking crises has increased following financial liberalisation of the 1980s to reach levels not witnessed since the great depression. The repercussions of these crises have been huge fiscal costs incurred as a result of both bailing out insolvent financial institutions, and in terms of output loss to economies.

This apparent linkage between liberalisation and banking instability prompted questions regarding this "dark side" of financial liberalisation. Theoretical research that finds a

[1]In this study financial liberalisation is synonymous with financial deregulation or financial reform, therefore these terms are used interchangeably.

positive relationship between banking crises and financial sector liberalisation, provides three rationales for this link. The first rationale stipulates that financial liberalisation erodes bank profits, as regulations that previously shielded banks from competition are relaxed. Low profits transmit to low bank franchise or charter value (i.e. the capitalised value of expected future bank profits), which in turn increases bank risk-taking incentives. On this front, the work of Hellmann et al. (2000), Demsetz et al. (1996), and Keeley (1990) establish that banks shun the risk of bankruptcy and are more conservative when they earn monopoly profits[2]. With moral hazard and limited liability, banks in competitive markets choose risky investments that yield high returns if the gamble succeeds, but bear little or no risk if the gamble fails.

The second rationale is based on institutional flaws arising from newly liberalised economies. Implicit and explicit deposit guarantees increase moral hazard problems in newly liberalised economies. Furthermore, financial liberalisation renders insufficient the capacity of regulators to monitor more banks with new and wider scope of bank activities, in periods following financial liberalisation. As such, liberalisation may increase bank fragility, and as a result countries with high quality supervision have experienced less costly banking crises (Noy, 2004; Rossi, 1999; Williamson and Mahar, 1998).

Lastly, the third rationale is based on the argument that financial liberalisation contributes much to uncertainty about prices and credit expansion. This heightens levels of credit risk, interest and exchange rate risk, and liquidity risk that banks face (Allen and Gale, 1998; Chari and Jagannathan, 1988; Kaufman, 1988). As demonstrated by Allen and Gale (1998,2001), growth in credit, which often follows after financial liberalisation, can cause a bubble in asset prices. However, when the bubble bursts, a decline in the market value of assets forces borrowers to default on loan payments and, as a result, banks incur huge non-performing loans.

Much empirical work has also been done in recent years to ascertain the theoretical claims and identify the causal effect of financial liberalisation on bank stability. One branch of empirical studies uses computed measures of bank risk (for example, ratio of risk weighted assets to total assets, market to asset ratio, volatility of credit to private sector and bank stock price volatility), to assess how such risk is associated with different measures of financial liberalisation or bank regulation (Gonzalez, 2005; Keeley, 1990; Furlong, 1988).

Another body of research employs a dummy variable for the occurrence (or non-occurrence) of systemic banking crises, using the limited dependent variable estimation technique. The probability of a banking crisis is expressed as a function of a set of control variables including different bank regulation or financial liberalisation measures (Angkinand et al.,

[2]A recent strand in the literature suggests a negative relationship between competition and bank risk taking. See for instance Boyd and De Nicolo (2005) and Boyd et al. (2006).

2009; Barth et al., 2004; Noy, 2004; Rossi, 1999; Demirguc-Kunt and Detragiache, 1998b). Studies that use different measures of bank risk, and those that use crisis dummy variables, also use different measures to proxy for financial liberalisation. The cited studies established that financial liberalisation significantly increases or decreases bank fragility. For instance, Rossi (1999) finds that moving from a repressed to a more liberalised banking system reduces the likelihood of banking crises, whereas Demirguc-Kunt and Detragiache (1998b) report contradictory findings.

As part of the greater debate on the link between liberalisation and bank fragility, some empirical literature focuses on the possible conduits through which liberalisation and/or bank regulation could affect financial stability. This stems from observations that deregulation of financial sectors is expected to contribute to drastic changes in financial market structures, which has implications for competition, concentration and consequently profitability in the financial sector. On this front, Keeley (1990) documents a decline in franchise value during deregulation periods in financial markets in the United States (US), and links this to increased bank risk-taking behaviour during periods of high failure rates for US banks. Demsetz et al. (1996) also find an inverse relationship between franchise value and measures of risk for bank holding companies in the US. Gonzalez (2005) and Hellmann et al. (2000) find that high regulatory restrictions reduce bank charter value, and banks with low charter value take on more risk than those with higher charter values.

While theory presents a strong case for the positive influence of financial liberalisation on banking crises, empirical work shows mixed evidence. Furthermore, studies that focus on Sub Saharan Africa (SSA) have been sparse. In addition to that, another challenge has been the unavailability of data on the measures of financial liberalisation and bank fragility that cover a wide array of countries in SSA. Most financial liberalisation measures examined in the available literature are limited both in terms of time coverage as well as in scope. The truncated nature of such data, limits its usefulness in analysing the effects of liberalisation on long run performance of financial sectors in cross-country and panel studies.

Although previous studies provide useful insights into the effects of some policies on bank fragility, they fail to account for the effects of a wide array of liberalisation policies. Kirkpatrick and Green (2002) point out that weak regulation, often a consequence of over-hasty implementation of a wide array of financial liberalisation policies, has been associated with economic decline and instability, with adverse effects on financial sector stability. Furthermore, Angkinand et al. (2009) point out that some degree of liberalisation is probably required to set the process of banking crises in motion. However, binary variables often used to proxy financial liberalisation in the literature, do not capture the levels and rates of implementation of policy changes, and hence have not been able to account for such

causal claims[3].

Lastly, not much attention has been given to empirical tests on the precise channels through which financial liberalisation could affect the actual occurrence of either systemic or borderline banking crises in SSA. This has been the case despite established theoretical suggestions on probable conduits, including bank franchise value.

This study is therefore motivated by the observation that, although theoretical developments recognise the potential adverse effects of financial liberalisation on financial stability, empirical evidence on the effects on countries in SSA is limited. This gap emanates partly from previous data limitations on liberalisation measures. On this front, this study extends the liberalisation database of Abiad et.al (2008), by constructing seven liberalisation indicators for 12 SSA countries, thereby extending the number of SSA countries from the Abiad et.al. database to 26. The compiled indicators provide liberalisation measures that capture the magnitude, pace, and timing of reform aspects, on a wide spectrum of SSA countries.

This thesis evaluates the effects of the seven financial liberalisation policies on the likelihood of systemic and non-systemic banking crises in 26 SSA countries from 1986 to 2006[4]. Specifically, the study focuses on seven liberalisation policies: (i) credit controls and reserve requirement, (ii) interest rate controls, (iii) entry and activity barriers, (iv) state ownership in the banking sector, (v) capital account restrictions, (vi) prudential regulation and supervision of the banking sector, and (vii) securities market policy.

The study uses this data in three empirical tests. First, this thesis examines the effects of the liberalisation policies on banking sector crises. Second, the link between financial liberalisation and bank profitability is examined. Lastly, the study tests if the link between financial liberalisation and banking crises can be explained by the influence of financial liberalisation on bank franchise value.

1.1.1 Justification for the research

The US subprime crises of 2007, though concentrated in high income countries, presented a reminder of the social and economic costs associated with periods of financial crises, and in particular, banking instability. Laeven and Valencia (2010) reiterate the commonalities between the subprime crises and banking crises witnessed in the past. These include observations that banking crises are often preceded by credit booms, large imbalances in

[3]Brownbridge and Kirkpatrick (2008) also note that data limitations on specific regulatory reforms have in the past forced quantitative analysis in this area to be supplemented by qualitative analysis from country case studies.

[4]A list of the study countries, banking crises episodes as well as the liberalisation periods is given in Table B.0.1 in the appendix.

private sector balance sheets, and growth in non-bank financial institutions (Laeven and Valencia, 2010). Such scenarios have often been associated with financial liberalisation in two ways. Firstly, weak regulatory oversight is akin to consequences of prudential regulation and supervision lagging behind financial liberalisation and innovation. Secondly, the credit boom and subsequent crash in asset prices, broadly resembles the boom-bust episodes, many of which followed periods of financial liberalisation. Consequently, the US crises stimulated renewed efforts in research regarding early warning indicators of banking crises, policy responses, prudential regulation and bank supervision.

Liberalisation of financial markets is a core element of policy reform especially for countries in SSA, whose poor economic performance hinges on a sufficiently developed and stable financial sector. This study explores the relationship between these two very important issues, namely financial liberalisation and banking sector stability.

The focus of this thesis is on banking crises, since banks are often at the centre of most financial crises[5]. The banking sector in SSA generally accounts for more than 90% of total financial sector assets, and as such, its stability is a major policy concern. In addition, banks play a crucial role in channelling funds to their most efficient use in the economy. Therefore, banking crises have the potential to cause serious damage to the economy, in the form of direct output loss and bailout costs. Laeven and Valencia (2010) document that the estimated output loss from the banking crises in Cameroon (1987) was 106% of GDP, whilst 50% and 10% was realised in Kenya (1992) and Zimbabwe (1995) respectively.

This study focuses on Africa, the least economically developed region in the world, whose economic and financial performance has increasingly become a concern in African policy circles. The banking industry in African countries provides a unique example of developing economies which have witnessed a large number of bank failures. Statistical evidence on banking crises in SSA reveal that from 1980 and 1990, 13 countries experienced systemic banking crises (18 crisis episodes in all), from 1991 to 1995, 14 countries experienced banking crises (21 episodes in all), and between 1996 and 2006, 9 countries experienced systemic banking crises (11 episodes).

A majority of African countries liberalised their financial sectors beginning as far back as the early 1980s. One of the main objectives of financial reform was removal of operating obstacles in the financial sectors to foster financial deepening and ensure financial stability. Prior to liberalisation, financial systems in the majority of countries in Africa had all the hallmarks of financial repression. This was a result of a widely held historical perception, that post-colonial governments could promote development through intervening in financial systems.

[5]Banking crises often coincide with currency crises and sovereign debt crises. See for example Kaminsky and Reinhart (1999) on banking and currency crises.

In the light of these observations, this thesis attempts to address the following pertinent questions: Has financial liberalisation led to more unstable financial systems? Is this effect dependent on specific types of liberalisation? Does the dynamic nature of liberalisation policies matter? What are the probable channels through which financial liberalisation could affect bank fragility?

While some of the literature have focused on various aspects of these questions, focus on the African region has been very limited. A lot of the work done on financial systems in SSA focuses more on financial intermediation, monetary policy, stock market and non-bank financial institutions development[6]. Factors underlying banking distress and crises in Africa have been surveyed in the work of Popiel (1994), Brownbridge (1998), Honohan (1993), and most recently Daumont et al. (2004). These qualitative surveys provide a framework from which this study draws the main determinants for empirical explorations.

This thesis provides the first attempt to explore the empirical link between a wide array of financial liberalisation policies and actual occurrence of systemic and non-systemic banking sector crises in SSA. While countries in SSA continue to implement and modify financial liberalisation polices, this thesis responds to policy concerns regarding the effects of liberalisation on banking sector stability. As such, results from this exercise should guide policy makers to understand the dynamics of financial reform and banking system stability in SSA.

1.1.2 Objectives of the research

This study has three key objectives shaped around the empirical chapters of this thesis. The first objective is to establish the causal effect of financial sector liberalisation on the occurrence of systemic and non-systemic banking crises, in a sample of SSA countries. To achieve this, the study examines if any new evidence can be drawn from testing the impact of each of the seven liberalisation dimensions, and indices constructed from the seven policies, on banking sector stability.

The second objective is to investigate the influence of financial liberalisation on bank profitability. The study uses amongst other liberalisation measures, an index of competitive liberalisation, constructed using data on three liberalisation policies pertaining to (1) entry and activity barriers, (2) capital account restrictions, and (3) securities market policy. These policies have a direct effect on bank competition, and hence on performance outcomes. The liberalisation data is compiled from Abiad et.al (2008), which is extended in this thesis.

[6] Allen et al. (2011) provide a more detailed and most recent review of financial systems in Africa.

The third objective is to test if the linkage between liberalisation and banking crises can be accounted for through the influence of financial liberalisation on bank franchise value. This is done by assessing how changes in bank franchise value, resulting from financial liberalisation, impact on banking sector stability. To achieve this, the study considers an indicator that captures how much franchise value co-varies with financial liberalisation, and uses the indicator in a model for the likelihood of occurrence of banking sector crises.

1.1.3 Structure of the thesis

Chapter 1 provides an introduction to the thesis. It gives the main theme, motivation and the objectives of the thesis.

Chapter 2 gives the background to banking crises in Africa. A brief discussion of the macroeconomic and financial system developments in SSA is provided. In addition, details on the correlations between financial liberalisation and frequency of banking crises are provided.

Chapter 3 provides an overview of theories on banking crises. This chapter seeks to establish the theoretical framework that will be used in the empirical analysis.

Chapter 4 presents the first empirical analysis. This chapter investigates the relationship between overall financial liberalisation, and specific liberalisation dimensions, and the actual occurrence of either systemic or non-systemic crises. This chapter also answers questions pertaining to whether the liberalisation effect depends on institutional development characteristics inherent in the liberalised economies. On this aspect, a pertinent question amongst scholars is why prudential regulations already in place, and those still being implemented, fail to effectively contain banking sector crises.

Chapter 5 further investigates the findings presented in Chapter 4, by examining possible channels through which the effect of financial liberalisation may lead to banking crises. Drawing from previous scholarly work, the thesis hypothesises that one such channel is the reduction in bank franchise value. Therefore, in this chapter the thesis investigates the determinants of bank profitability accounting for the effects of financial liberalisation on two main bank performance outcomes: return on assets and return on equity. The empirical analysis is conducted in a dynamic panel framework, to account for persistence of profits over time, using both country and bank-level data.

Chapter 6 investigates whether the changes in franchise value tested in Chapter 5 have any significant marginal probaility effects on the occurrence of either systemic or non-systemic banking crises. In a two stage framework, the study constructs a liberalisation-franchise value indicator in the first stage. This indicator is then included as a regressor in

the second stage, in an ordered logit model for the likelihood of having no crisis, a systemic crisis or a non-systemic crisis.

Chapter 7 concludes by first making a summary of the empirical findings and then suggests policy recommendations based on these findings.

Chapter 2

Background to Banking Crises in Africa

2.1 Introduction

This chapter presents an overview of the economic landscape that characterised most economies in SSA over the last few decades. Indeed, many of the banking sector crises recorded over the years have been inextricably linked with macroeconomic instability, in a way that makes it difficult to unravel the direction of causality (Caprio Jr and Honohan, 2009). This makes it important to identify both the micro and macroeconomic indicators that were recorded before, during, and after banking crises.

The second part of this chapter discusses the underlying causes of banking sector crises established in previous studies. This chapter concludes by presenting some trends in financial liberalisation and banking crises in SSA. Thus, this chapter creates a platform for the empirical work presented in subsequent chapters.

2.2 Economic Development

The 21st century has witnessed the recovery of overall growth in SSA. The economic growth rate in SSA has averaged 1% from as far back as the early 1980s to around 1990, and 3% for the period 1991-1999[1]. The comparable rate for the Organisation for Economic Co-operation and Development (OECD) was 2.1%, while Latin America averaged 1.7%, during the period 1980 to 2000. The growth rate of Gross Domestic Product (GDP), improved from 3% recorded during the late 1990s, to 5% in 2007. However, economic

[1]In this section the statistics for SSA refer to the 26 countries in the study sample.

growth tumbled from an average of 6% in 2008 to 2% in 2009, before improving slightly to 4% in 2010. The economic recovery has been attributed partly to economic and financial sector reforms that have been implemented since the 1980s (Allen et al., 2011).

Despite these remarkable developments, Africa has been regarded as the least developed region in the world over the years. As presented in Table 2.2.1, GDP per capita for SSA averages more than 50% lower than that of developing economies in Latin America and the Caribbean since 1980. Table 2.2.1 also shows that in 2010, GDP per capita for Africa was US$ 1,659 compared to US$8,650 for Latin America and the Caribbean, and US$ 22,435 for the more developed countries in Europe and Central Asia. This has been the trend since the 1980s.

Table 2.2.1: GDP per capita in Selected Regions

	Europe and Central Asia	Latin America and Caribbean	Middle East and North Africa	Sub Saharan	Africa
1980-95	7749	2393	2216	575	713
1996	12380	3952	2646	565	732
1997	11713	4242	2697	571	746
1998	11991	4176	2587	525	716
1999	11852	3653	2720	512	713
2000	11121	3995	3002	515	726
2001	11221	3819	2919	488	691
2002	12267	3360	2860	500	680
2003	14914	3556	3143	623	803
2004	17335	4054	3568	758	946
2005	18381	4865	4168	863	1075
2006	19840	5662	4789	983	1225
2007	23110	6613	5488	1112	1395
2008	25270	7603	6713	1242	1606
2009	22101	7043	5814	1144	1482
2010	22435	8650	6585	1309	1659

Figures are in US$.Source: World Development and Africa Development Indicators, World Bank (2012)

At country level, the growth experiences are enormously diverse. While countries such as Botswana and Cape Verde have grown consistently, other countries like Madagascar recorded persistent declines in economic growth over the years. Table 2.2.2 reports that growth rates declined by a minimum of 3% (2.5 standard deviations) in Benin and 8% (3 standard deviations) in Cameroon. Countries such as Zimbabwe and Cote d'Ivoire, are amongst those countries that experienced positive growth in the early and late 1980's, but

have witnessed economic decline in recent years.

Table 2.2.2: Macroeconomic Indicators in Selected Countries

	GDP Growth				Inflation			
	86-90	91-95	96-00	01-06	86-90	91-95	96-00	01-06
Cameroon	5.65	2.92	0.42	0.78	3.75	8.61	0.53	1.74
Cote d'Ivore	1.93	3.71	4.46	1.35	2.99	1.08	2.89	0.72
Senegal	2.96	2.04	1.9	2.33	2.75	6.91	0.68	3.27
Chad	8.43	10.7	3.58	11.32	3.41	2.2	1.63	1.79
Botswana	4.96	2.11	2.08	1.02	0.18	0.23	0.18	0.26
Ghana	0.88	0.79	0.4	0.9	0.38	0.77	0.54	0.72
Kenya	1.2	2.02	1.71	2.08	2.01	7.87	0.58	0.96
Nigeria	4.38	1.67	1.76	3.69	2.75	0.27	1.1	0.62
Uganda	3.04	3.06	1.89	0.81	0.99	79.47	52.7	3.23
Zambia	2.96	5.55	3.16	1.21	0.51	1.1	0.37	0.40

Source: Author's calculations based on International Financial Statistics (IMF 2012) and World Development Indicators (World Bank, 2012)

Data calculated as standard deviations of annual percentage changes.

Regarding inflation, Table 2.2.2 shows that inflation was high and volatile in the early 1990s, especially in Nigeria, Uganda and Zambia. In Zambia, inflation accelerated to 193% in 1993, shortly before the first series of bank failures. In Nigeria, inflation reached 70% while in Uganda it skyrocketed to 230% in the 1990's. Interest rates were liberalised in most countries around the same time, as such, nominal lending rates were high. Consequently, real interest rates were substantially negative.

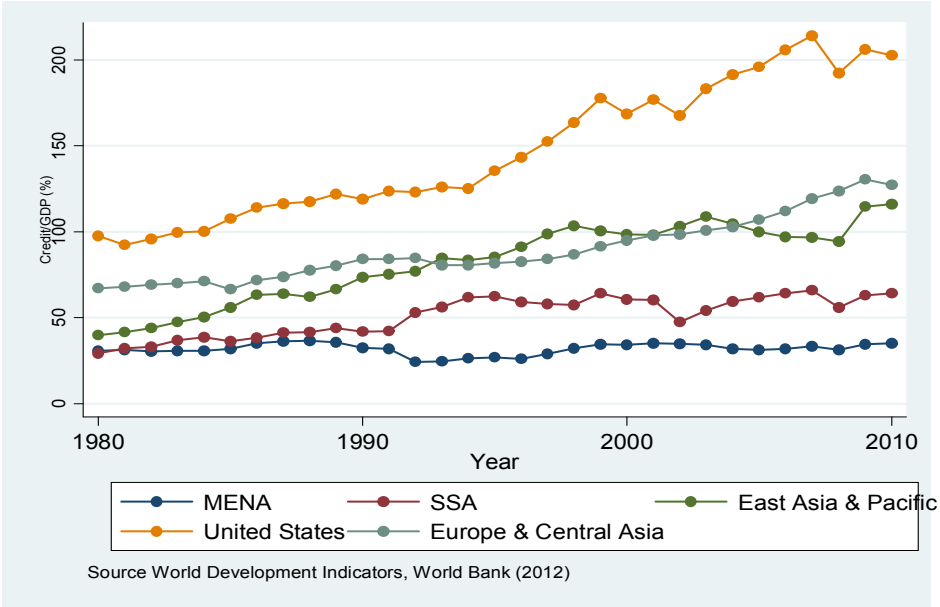
2.3 Financial Sector Development

Financial systems in the SSA region have recorded significant developments since the turn of the 21st century. Along with economic performance, financial indicators have on average been on an upward trend since 1980 through to 2007. Credit extensions to the private sector rose from an average of 11% between 1986 and 1990, to 12.1% for the period 1991 to 1995. During the period 1996 to 2000, private sector credit decreased to 10%. This ratio took an upward trend again between 2001 and 2006 and increased to an average of 16%. These improvements have been linked to economic and financial sector reforms that SSA countries have implemented in the recent past (Allen et al., 2011).

Although overall credit extended to the private sectors in SSA improved between 1986 and

2006, this was attained at very low levels and at a slower pace than in other developing countries. Figure 2.1 depicts the low levels of credit that banks grant to the private sector (%GDP) in SSA in comparison with other developing and developed economies. Private sector credit has been below 20% since 1980 in SSA, whilst attaining levels in other developing and developed economies of 25% and above 100% respectively.

Figure 2.1: Private Sector Credit in Selected Regions, 1980-2010



MENA refers to Middle East and North Africa

Although there is an upward trend in credit extensions to the private sector at the regional level, the trend in individual SSA countries is less smooth. Both Benin and Cameroon recorded a downslide from 25% to 14% and 9% respectively from 1985 to 2006, while Chad experienced a decline from 12% to 3% during the same period. On the other hand, countries with well developed financial infrastructure, including South Africa, Mauritius and Seychelles, recorded higher ratios. For instance, the ratio of private sector credit to GDP in South Africa averaged 76% from 1986 to 1990, 88% from 1991 to 1995, 124% from 1996 to 2000, and 129% from 2001 to 2006.

On the liability side of the financial intermediaries' balance sheets, both the ratio of financial system deposits and liquid liabilities to GDP have improved over the years, albeit at a very slow pace (See Table A.0.1 in the Appendix). The ratio of liquid liabilities was in the 25%-35% range during the period 1986 to 2007. The other regional blocks including (1) Other developing countries, (2) East Asia and the Pacific, (3) Latin America and the Caribbean, had figures no less than 40% during the 1995 to 2007 period. In fact this score was above 50% in East and North Africa throughout the same period. The only notable exceptions are South Africa and Seychelles which had high scores for both liquid liabilities and financial sector deposits as a percentage of GDP.

2.4 Structure of the Financial Sector

2.4.1 Banking sector

The banking sector has the largest share in terms of total financial sector assets in a majority of countries in SSA. In some SSA countries, banks contribute close to 90% of total financial assets (Quintyn and Taylor, 2007). Such countries include Gambia (97%), Madagascar (98%), Mali (95%), Mozambique (95%), Mauritius (95%) as well as Nigeria (90%). The financial systems in countries such as Ethiopia (88%), Seychelles (87%), Gabon (84%), Tanzania (78%), Zimbabwe (77%), and Malawi (71%) also exhibit high ratios of bank assets to total assets. On the other hand, Botswana and South Africa are characterised by low banking sector dominance in their financial systems, with the share of bank assets in total financial assets of 40% and 25% respectively (Quintyn and Taylor, 2007).

The banking systems in SSA are highly concentrated and dominated by either a few large foreign-owned banks, or state-owned banks. The presence of foreign-owned banks has been attributed to financial sector reforms implemented across the region from the 1980s. The share of foreign-owned banks as a percentage of total banks increased from 40% to 56% in East Africa, and from 48 % to 56% in Southern Africa during the period 1998 to 2006 (Allen et al., 2011). Overall, foreign banks account for an average of between 40% to 60% of total bank assets in most SSA countries. Financial sector reforms have also resulted in a reduction in state-owned banks as countries privatise state-owned banks.

2.4.2 Stock market

Significant strides have been made in Africa to develop stock markets (Table 2.4.1). This has been attributed to the specific financial sector reform policies that targeted development of capital markets. Whilst there were only five stock markets in SSA before 1989, liberalisation of financial markets propelled the growth of existing markets and the establishment of several others (Yartey and Adjasi, 2007). As at 2010**,** there were 29 stock exchanges in operation in Africa, 17 of which are in SSA with about 945 listed companies. Furthermore, a regional stock exchange that serves eight West African countries, the Bourse Regionale des Baleurs Mobilieres (BRVM), was established in 1998 in Abidjan, Cote d'Ivoire.

Table 2.4.1: Stock Market Development Indicators in SSA 2008

Country	Stock exchange Year founded	Number of listed companies	Market capitalisation (%GDP)	Stock Traded Total(% GDP)	Stock Traded Turnover ratio(%)
Botswana	1989	44	26.4	1.07	3.05
Cameroon	2001	2			
Cote d'Ivoire	1998	39	30	1	4
Ghana	1990	28	11.9	0.52	5.19
Kenya	1954	50	35.8	4.7	11.8
Malawi	1995	8	43.7	1.4	3.4
Mauritius	1988	40	35.7	4.2	8.9
Mozambique	1999				
Nigeria(Lagos)	1960	223	24.9	9.6	29.3
South Africa	1887	410	179.4	146.6	60.6
Swaziland	1990	10	0.002*	0.03*	3.8*
Tanzania	1998	17	6.2	0.13	2.1*
Uganda	1997	14	21.3	0.5	5.4*
Zambia(Agric)	2007				
Zambia	1994	16	11.1*	0.21*	2.1*
Zimbabwe	1993	81	487*	16.5*	6.2*
SSA		943	76.1	15.5	12.1
SSA**			61.2	3.3	7
Brazil			35.63	44	74
Indonesia			19.36	21.7	71.3
Mexico			21.25	9.88	34.33

* 2006 data **Average excluding South Africa

Source: World Bank Development Indicators (World Bank, 2012) & authors calculations

Despite these developments, stock exchanges in SSA remain thin and illiquid compared to markets in both developed countries as well as other developing countries (Table 2.4.1). The average ratio of market capitalisation to GDP in SSA was 76% in 2008. The ratio of total stock traded to GDP was 16% in 2008 compared to 44% in Brazil and 22% for Indonesia. However, these ratios were largely driven by the stock exchanges of South Africa and Zimbabwe. South Africa recorded average market capitalisation ratios of 166% (1994-1999), 186% (2000-2006), and 179% in 2008, while 487% was recorded for Zimbabwe in 2008. South Africa also recorded 147% in the ratio of total stock traded to GDP in 2008. This score for SSA drops from 16% to 3% if South Africa is excluded.

In terms of liquidity, the stocks traded turnover ratio for SSA countries was low compared to other developing countries. For instance, in 2008 this ratio was 6% in Zimbabwe, 29%

in Nigeria, and 3% in Botswana compared to 74% in Brazil, 71% in Indonesia and 34% in Mexico during the same period. The Johannesburg stock exchange in South Africa was an exception, being liquid with 61% of stocks traded turnover ratio in 2008.

2.4.3 Other financial institutions

The other financial sectors, including the insurance sector, bond markets, derivative markets, as well as other non-bank financial institutions are still in their infancy. There are a few exceptions, for instance, markets in South Africa, Mauritius, Seychelles and Nigeria are well developed. However, in most countries these markets have started to grow and could potentially alter the structure of financial systems in the near future.

2.4.4 Institutional framework

The financial systems in SSA, like those in many developing countries, have for long been characterised by impediments to effective prudential supervision. The structural and institutional indicators provided by Mehran (1998) highlight deficiencies in the institutional environment in many SSA countries. In fact, the legal frameworks in most countries are reported to be ineffective in facilitating the enforcement of financial contracts and recovery of loans and collateral. Furthermore, Gelbard and Leite (1999) report that the loan recovery process was difficult in 28 SSA countries, and financial sector legislation was barely adequate in 14 countries in their sample. Other institutional impediments to effective supervision include shortage of skilled personnel, poor accounting standards, lack of published financial data on banks, as well as minimal penalties for submitting inaccurate reports to the supervisors (Goldstein and Turner, 1996).

The institutional challenges that most countries face are a result of legal frameworks put in place during the colonial eras of the 1970s and 1980s which have become outdated and deficient. One of the major challenges of these regulatory frameworks has been lack of provisions for supervision of non-bank financial institutions and stock markets. Furthermore, most countries adopted the supervisory structures of their colonial powers. Former British colonies housed bank supervision in the central bank, whereas former French colonies set up independent agencies to carry out bank supervision (Quintyn and Taylor, 2007). Therefore, central banks became the dominant bank supervisors across SSA. However, central banks often lack independence, and the critical resources necessary for effective examination and supervision of the financial intermediaries.

Furthermore, while financial liberalisation opened up the banking sector and facilitated the lifting of restrictions on asset choices of banks, minimal compensatory actions were

put in place to strengthen regulatory oversight. In several countries, the capabilities of central banks to provide regulatory oversight have not been upgraded to keep up with the new financial structures and instruments. These developments have prompted several SSA countries to implement further reforms in order to update and modernise banking laws and build bank supervisory capacities. While some progress has been made, prudential regulation and supervision of banks in SSA remain highly constrained.

2.5 Determinants of Banking Crises

This section discusses the main determinants of the banking crises that affected countries in SSA over the last few decades. These form the basis for the explanatory variables that are used for empirical analysis. Caprio Jr and Honohan (2009) define a bank as being in financial distress when it is technically insolvent and/or illiquid, and a systemic banking crisis occurs when a large segment of the banking system becomes financially distressed. Such crises involve widespread insolvency of banks leading to closures, mergers, takeovers, or injection of government resources in response to the crisis.

Systemic and non-systemic banking crises experienced in SSA stemmed from both macroeconomic and bank fundamentals. Shocks to economic fundamentals including unstable interest rates, inflation and growth rate fluctuations as well as poorly developed financial systems are all part of the internal factors affecting banking crises. The exogenous factors include deteriorating terms of trade, unstable international interest rates, exchange rate volatility, decline in international capital flows, and economic recessions. Nevertheless, it is important not to ignore the role that financial liberalisation plays in engendering banking sector crises amidst fragile macroeconomic environments.

The determinants of banking crises discussed in this chapter are drawn mainly from previous work that focused on African countries, including studies by Brownbridge (1998), Brownbridge and Harvey (1998), as well as Kane and Rice (2001). Daumont et al. (2004) also provide a comprehensive discussion of the most important sources of banking crises in a sample of countries from SSA between 1985 and 1995.

2.5.1 Exogenous factors

Macroeconomic volatility

SSA economies were hit by a series of external shocks from the late 1980s. Figure A.1 in the appendix, shows the trends in terms of trade and foreign currency depreciation for

periods before and after major banking crises in selected SSA countries. There was an overall decline in terms of trade across all the countries over time. In addition, the official exchange rates in a selection of countries were highly volatile. The situation was aggravated by the less diversified and hence high export concentration nature of SSA economies.

Countries in the West African Economic Monetary Union (WAEMU) that rely heavily on agricultural exports were hard hit by the protracted decline in world prices of coffee, cocoa, cotton, and oil from the late 1980s. In Francophone West Africa, these problems were aggravated by the devaluation of the CFA franc. Similarly, the Ugandan economy was adversely affected by a decline in terms of trade shortly before the 1994 banking sector crises[2]. In Cameroon, terms of trade tumbled by 56% during 1985-1992. Ghana faced a large decline in cocoa exports in the late 1980's and a 1173% depreciation in its currency. During the same period, the US dollar depreciated significantly against major currencies from its all time high in 1985 across most SSA countries.

Together all these shocks were transmitted to the banking sectors through sharp alterations to the relationship between the values of bank assets and liabilities. The significant deterioration in terms of trade and decline in world agricultural prices impaired borrowers' ability to service loans. As a result, this exposed traders and banks across the region to losses. Caprio Jr and Klingebiel (1996) provide evidence that 75% of the developing countries in their study which experienced banking crises experienced a deterioration in terms of trade beforehand of at least 10%. Similarly, following the external shocks of 1987-1988 the banking systems in the WAEMU experienced severe crises; non-performing loans for the seven countries amounted to six times the sum of bank capital and reserves (Azam et al., 2004).

2.5.2 Internal factors

Inflation and growth rate fluctuations

Table 2.2.2 presented in the previous section shows a rising trend of volatility in inflation as well as economic growth rates across most countries. The acute macroeconomic volatility across most countries impaired loan quality and hence exposed banks to huge losses. In addition, economic contraction exacerbated non-performing loans, leaving banks unable to repay their customers' deposits. Countries with high inflation and growth volatilities also exhibited volatile behaviour in bank deposits and private sector credit as a share of GDP. For instance, share of deposits in GDP dropped significantly in Benin, Cameroon, Uganda, Nigeria and Zambia for the period 1990-2000. This was attributed to sluggish GDP growth

[2]The share of coffee in total exports was 78% in 1995/6 and 62% in 1998/90.

and government deficit financing which reduced government deposits to banks (Daumont et al., 2004). By contrast, countries such as Botswana, that recorded stable growth and low inflation rates over the years recorded good quality loan portfolios and experienced stable banking systems.

Underdeveloped financial markets

Inadequately developed financial markets in Africa have been blamed for the sluggish economic growth and fragile financial systems in the region since the 1980s. Although most countries took steps towards developing their financial systems through policy reforms, aggregate indicators of financial development have, on average either stagnated or declined. Mehran (1998) and Gelbard and Leite (1999) surveyed financial markets in Africa, and their overall financial development index suggests that financial markets in a majority of countries in SSA remain underdeveloped even by the standards of other developing countries.

Overall, poor development in financial markets negatively impacted on banking system stability as banks could not fully benefit from the advantages associated with large sized-markets, for instance greater efficiency, cost effectiveness and greater risk diversification (Daumont et al., 2004). Furthermore, limited financial instruments constrain bank liquidity bases, thereby making banks susceptible to shocks.

Weak institutional structures

As discussed earlier, SSA financial sectors are characterised by weak institutional structures. For the greater part of the period under study, the overall legal environment was not conducive to bank stability. For instance, statutes were not clear on restrictions on insider lending, investment in non-bank business and large credit exposures to a single borrower (Brownbridge and Harvey, 1998). Moreover, political interference also kept some banks insulated from inspections. Supervisors lacked political autonomy to inspect especially state-owned banks, thus they could not exercise prompt corrective action for distressed banks.

In addition, poor disclosure requirements denied creditors and depositors opportunities to evaluate and monitor banks and deter them from excessive risk-taking behaviour. On the other hand, bank supervisors could not monitor and discipline banks based on accurate information. The implication of such institutional weaknesses is failure to provide an environment where supervisors could inspect and regulate bank risk-taking. Banks also had no recourse against delinquent borrowers. As a result, bank risk-taking could not be curbed and non-performing loans accumulated across most banks in SSA.

Bank ownership structure

Most African countries upon attaining independence, created financial institutions in the public sector or nationalised previous privately-owned financial institutions. The objective was to enable the new governments to exert greater control over the financial system and ensure that credit allocation was more supportive of the overall economic strategy of the governments (Brownbridge, 1998). As a result, a majority of SSA governments were heavily involved in their financial systems. This gave rise to state appointment of directors and top bank management (on political grounds and rarely by merit), lack of autonomy by management to conduct efficient banking operations, directed lending to politically influential people and parastatals at preferential rates regardless of their profitability, corruption, poor credit appraisals and loan recovery strategies, as well as poor investment decisions.

Privately owned banks had the majority of their shares owned by one or few individuals, a family, or companies directed by the same family. This resulted in highly concentrated ownership structures. The consequent weaknesses of these practices were widespread lending irregularities. For instance, Brownbridge (1998) notes that where politicians were involved as bank shareholders, they used their influence on regulators and supervisors not to sanction banks even if clear violations were made. Furthermore insider lending was prevalent in family-owned banks. This all translated into unprecedented increase in non-performing loans and consequent bank failures in several countries under study.

Financial liberalisation

The economic and financial instability experienced in the late 1980s and early 1990s, changed the perception of most governments on the role of state interventions in the financial sector. The majority of SSA countries began to adopt financial sector reforms. These were largely drawn from the framework of Structural Adjustment Programmes (SAPs) supported by International Monetary Fund (IMF) and the World Bank.

The main objective of the SAPs was to replace former protectionist economic policies blamed for economic and financial instability, with more market oriented policies. However, the introduction of financial sector liberalisation was followed by a return to bank instability. A majority of SSA countries experienced banking problems, many of which were severe enough to be regarded as systemic, of similar or worse magnitudes as those prior to liberalisation.

However, in other countries, liberalisation reduced the risk of bank distress attributed to government's directed lending to economically unviable projects. For instance, financial

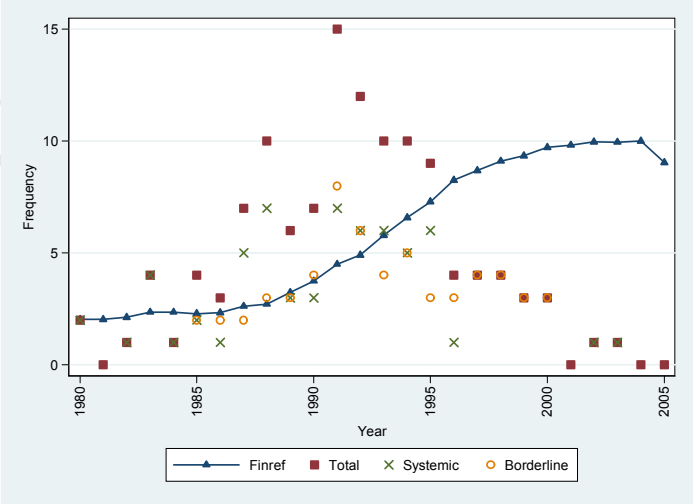
liberalisation in Uganda helped clean up small weak banks, and improved bank supervision and the privatization of state owned banks which historically made huge losses. This left the Ugandan banking system more stable than prior to liberalisation with non-performing loans dropping from 29% in 1998 to 12% in 1999 and subsequently to 3% by September 2004.

2.6 Financial Liberalisation and Scope of Banking Crises

Tables A.0.2, and A.0.3 in the appendix show the dates of initial liberalisation efforts, the crisis episodes, as well as the periods during which the banking crises experienced in these countries lasted. For instance, the crisis in Ghana stretched over most of the 1980s and 1990's. In other countries such as Kenya, Guinea, Nigeria, Zambia and Zimbabwe, the data shows how the episodes often recurred.

The crisis incidences experienced in SSA were largely systemic in nature. Non-performing loans in most cases exceeded 75% of total banking assets in Benin, Chad, Guinea and Nigeria at the peak of the crises. On the other hand, adverse loans ranged between 50%-75% of total banking system loans in Cameroon, Kenya, Ivory Coast, Senegal, Tanzania and Uganda. A striking feature about these events is that the period that recorded the greatest number of crisis episodes coincides with the period associated with increasing levels of financial liberalisation.

Figure 2.2: Total Liberalisation and Banking Crises



Source: Author's computations using data from Abiad et.al, (2008) and Laeven and Valencia (2010)

In Figure 2.2, $finref$ is the total financial liberalisation index for SSA countries between 1980 and 2006. The index is a weighted sum of seven liberalisation dimensions for each year

for all the countries in the sample. The figure further indicates that the process of overall financial liberalisation in SSA was gradual between 1980 and 1987, accelerated sharply between 1988 and 1998, before reaching its peak around 1999. It then slowed down and maintained steady levels thereafter. Individual country indices however display varying and less smooth progression with reforms, for instance, policy reversals were recorded in Kenya, Uganda and Zimbabwe.

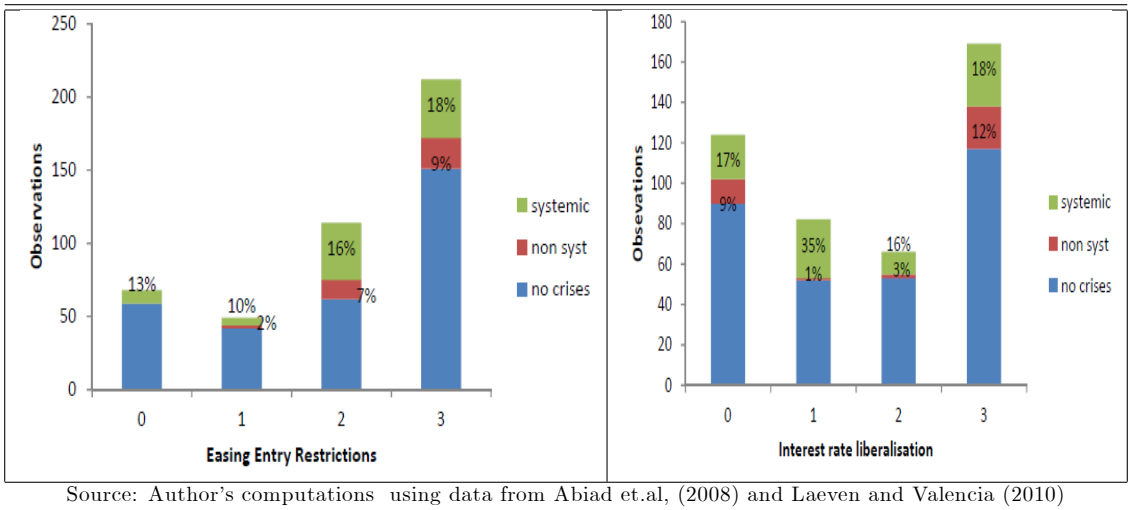
Figure 2.2 indicates that most crisis incidences were recorded between 1987 and 1995. During this period, the liberalisation index lies between 2.5 and 9.0, perhaps indicating a significant number of financial liberalisation policies implemented by a majority of countries. Therefore, this data seems to suggest that crisis periods were concentrated around the periods during which the financial liberalisation process was most intense. The next section gives a detailed analysis of the different liberalisation dimensions and incidences of both systemic and non-systemic banking crises in SSA.

2.6.1 Liberalisation policies and bank crisis frequency

This section discusses trends in crisis incidences and liberalisation policies in SSA. The study makes use of liberalisation data constructed in this thesis and from Abiad et al. (2008), as well as crisis incidences as dated by Laeven and Valencia (2010). Liberalisation along each dimension is normalised between 0 and 3 as follows: 0= fully repressed, 1= partially liberalised, 2= largely liberalised, and 3 = fully liberalised.

Figure 2.3 indicates that more countries eliminated entry restrictions completely (level 3) than those that either partially liberalised (levels 1 and 2) or maintained entry and activity restrictions. However, countries that fully eliminated such controls had higher incidences of systemic crises (18%) than those that were fully repressed (13%).

Figure 2.3: Entry and Interest Rate Reforms



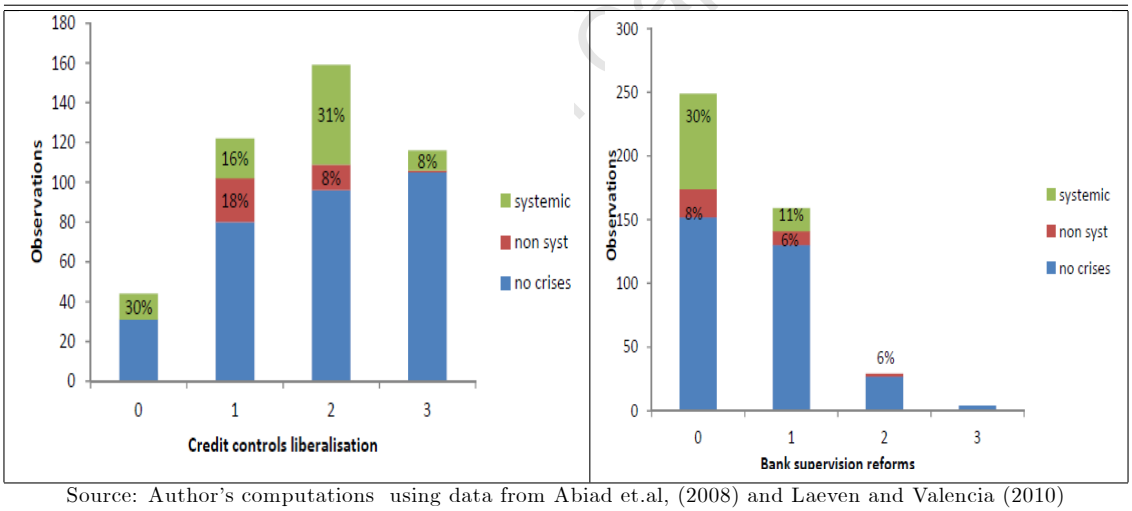
Source: Author's computations using data from Abiad et.al, (2008) and Laeven and Valencia (2010)

Figure 2.3 shows that more observations are recorded under full liberalisation than under full repression of interest rates. Similarly, systemic and non-systemic crisis incidences reported under full repression (17% and 9% respectively) are less than those reported under full liberalisation (18% and 12% respectively). That is, more crisis episodes are recorded during full liberalisation periods.

Regarding credit controls, Figure 2.4 shows that there are more incidences of crisis which coincided with largely liberalised systems (scale 2) than with either partially liberalised (scale 1) or fully liberalised financial systems (scale 3). Thus, there is an inverted u-shaped relationship between removal of credit controls and banking crises.

The right panel in Figure 2.4 indicates that less countries have taken steps towards implementing reforms in prudential regulation and bank supervision. However, there are less incidences of banking crises in those countries that have implemented these reforms than those that have not. This suggests that periods of lax supervision and weak prudential frameworks seem to be associated with high incidences of both systemic and non-systemic crises.

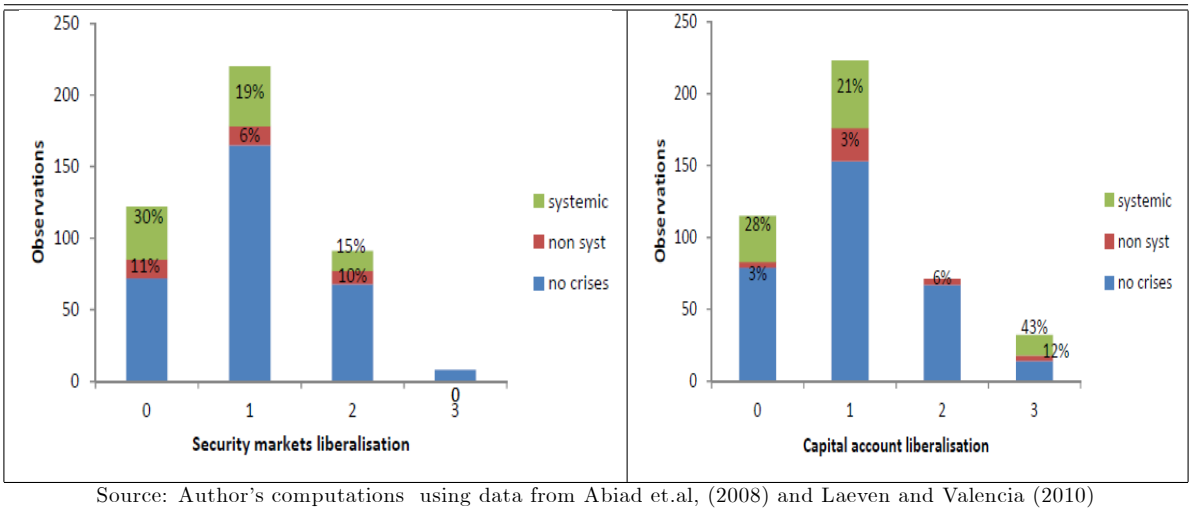
Figure 2.4: Credit Controls and Bank Supervision



Source: Author's computations using data from Abiad et.al, (2008) and Laeven and Valencia (2010)

Figure 2.5) confirm that few countries fully relaxed controls on security markets and capital accounts. Total crisis incidences (both systemic and non-systemic) reported under fully repressed markets are more than under fully repressed systems. However, fully liberalised markets record less incidences of either type of banking crises. This indicates that partially repressed markets seem to be linked with unstable banking systems.

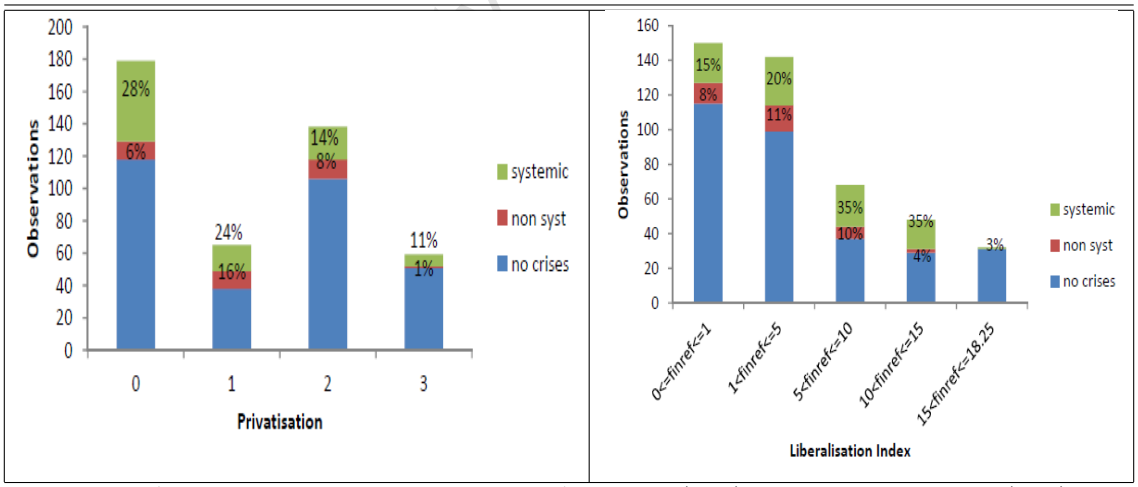
Figure 2.5: Security Markets and Capital Account



Source: Author's computations using data from Abiad et.al, (2008) and Laeven and Valencia (2010)

Regarding privatisation of previously state-owned banks, Figure 2.6 shows that incidences of systemic crisis in cases where a government's share in banking sector assets is more than 50% (level zero, fully repressed), are more than those recorded under fully liberalised conditions (government controls less than 10% of banking sector assets, level 3). This seems to suggest that reducing government dominance in bank ownership is linked with stable banking systems.

Figure 2.6: Privatisation and Total Liberalisation



Source: Author's computations using data from Abiad et.al, (2008) and Laeven and Valencia (2010)

Lastly, the overall index of financial liberalisation shown in Figure 2.6 is an aggregate sum of the seven liberalisation policies. Since the liberalisation scores range from 0 to 3, the liberalisation index for the seven policies has a range of 0 to 21, with higher values corresponding to higher magnitudes of financial liberalisation. The index shows that fewer observations reported high magnitudes of liberalisation in comparison with those characterised by low magnitudes. Initially, there is an increase in crisis frequency as liber-

alisation progresses from largely repressed (scale 0-1) up to the next level (scale between 1 and 5). However, fewer incidences of systemic and non-systemic crises are recorded for higher magnitudes of total financial liberalisation.

2.6.2 The cost of crises

Banking sector crises have been associated with huge costs imposed on the real economy. These are either fiscal costs, that is, how much it costs for the government to recapitalize the banks and reimburse depositors, or the loss in output relative to, for example, the trend growth rate. Table 2.6.1 presents statistics on output losses as a percentage of GDP during and after banking crises years in selected economies. Countries such as Cameroon suffered losses in output of 118% of GDP in 1987, while 45% % of GDP was lost in Burkina Faso between 1990 and 1992, and Swaziland recorded 31% loss in output in 1995[3]. Compared to other developing countries, emerging markets, as well as developed countries, the magnitude of output loss from crises has been more severe in SSA countries. For instance, in 1991 Finland recorded a loss in output of 39%, while Brazil lost 12% of output following the banking crisis of 1990.

Table 2.6.1: Output loss/GDP from Banking Crises

Africa	Output Loss (% of GDP)	Emerging Markets	Output Loss (% of GDP)	Advanced Economies	Output Loss (% of GDP)
Cameroon (1987)	118	Indonesia (1996)	68	Finland (1991)	39
Kenya (1992)	23	Malaysia (1997)	50	Japan (1997)	18
B. Faso (1990)	45	China (1998)	37	US (1988)	4
Senegal (1988)	33	Brazil (1990)	12	Sweden (1991)	0
Swaziland (1995)	31	Argentina (1988)	10	Norway (1991)	0

Source: World bank, 2000. Laeven and Valencia 2008. Initial year of banking crisis in parenthesis

[3]The cost of restructuring the banking system was equally high: 25% of GDP in Ivory Coast and 6% of Gross National Product (GNP) for Ghana in 1989.

Chapter 3

An Overview of the Theories of Banking Crises

3.1 Introduction

Banking sectors form an important part of financial systems. Banking theories assert that the basis for banks' existence is to ameliorate risks that are associated with market imperfections (Freixas and Rochet, 1997). Their existence is justified by the unique functions they perform as intermediaries involved in the deposit and lending business, offering access to payment systems and asset transformation, managing risk as well as information processing. Banks play an intermediary role to overcome information asymmetries and the associated problems of moral hazard and adverse selection. Unstable banks are unable to perform these crucial functions. As a result, substantial efforts are made to understand how banking crises manifest, and possible solutions to mitigate their occurrence.

This chapter gives an overview of banking crises theories. Although this review is not exhaustive, it attempts to highlight the relevant theories related to the study of banking sector crises. This chapter starts by introducing the panic-based theories of bank-runs. These theories are based on uncertainties in liquidity demands by consumers. Thereafter, modern day theories that attempt to explain occurrences of systemic and non-systemic crises are presented. Most of these theories are based on asymmetric information between banks and borrowers as well as depositors, and low returns in investments resulting from shocks to economic fundamentals. These theories have traditionally been classified into two broad categories, panic based and fundamental based (business cycle) models.

In addition, this chapter presents theories of banking crises that incorporate financial liberalisation. This review focuses on models relevant to developing countries that attempt to establish the link between financial liberalisation and banking crises.

The arguments from the models presented in this chapter form the basis of the theoretical framework for the empirical analysis presented in this thesis. In summary, this thesis borrows from the panic based and business cycle models to test how economic agents, economic fundamentals and government regulations affect the balance between banks' assets and liabilities that may result in insolvency. With regards to financial liberalisation, the empirical analysis draws on the framework presented in the models by Hellmann et al. (2000) and Daniel and Jones (2007). These models focus on the effects of competition and moral hazard on banking sector stability in liberalised economies.

3.2 Panic Based Models

This group of models views banking crises as random events that occur spontaneously as a result of mob psychology or panic and are unrelated to changes in the economy (Kindleberger, 1978). Bank runs are a rational response to consumer beliefs that a bank run will occur. A bank will face large-scale withdrawals as a result of co-ordination failure amongst depositors, that is, depositors withdraw for fear that all other depositors will withdraw their funds. However, banks operate under fractional reserve systems in which they collect deposits and invest a fraction of them in long term investments[1]. Bank balance sheets are therefore characterised by a maturity mismatch between liabilities (predominantly deposits) which are short term in nature, and assets (loans) which are long term and illiquid. Therefore, any sudden liquidity requirements may force banks to liquidate their assets at a loss and thus, the banking crisis becomes self-fulfilling. Conversely, the expectation of no crisis is also self-fulfilling, if no one expects a crisis, no crisis occurs. The seminal work of Bryant (1980) and Diamond and Dybvig (1983) demonstrate how bank runs arise from self-fulfilling expectations.

3.2.1 Diamond and Dybvig model of bank runs

In the Diamond and Dybvig (1983) model, there are 3 periods $T = 0, 1, 2$. Each consumer is endowed with one unit of homogenous consumption good during period 0 and nothing thereafter. During period 0, agents are identical, but they do not know which type they belong to. In period 1, they each have probability t of being type 1 (early consumers) and probability $1 - t$ of being type 2 (late consumers). The fact that the proportion of type 1 consumers is constant means that there is no uncertainty about the aggregate demand for liquidity.

There is a single production process that yields $R > 1$, for every good invested in period

[1] See Freixas and Rochet (1997) for an overview of fractional reserve banking and models of bank runs.

0, if held to maturity, that is in period 2 . For disinvestment in period 1, the yield is 1 for each good invested. Although early disinvestment is costly, units of the good may be stored at no cost, from period 1 to period 2.

Because of the continuum hypothesis, t and $1-t$ are also the proportions of consumers of types 1 and 2 respectively. Therefore, a fraction t of type 1 consumers has a utility function

$$U(c_1) \tag{3.1}$$

and consumes c_1. Similarly, type 2 consumers derive utility

$$\rho U\left(c_2\right) \tag{3.2}$$

and consumes c_2.

c_T is period T consumption by agents of type T , ρ is a positive constant less than unity. $u(c)$ is increasing, strictly concave, twice continuously differentiable and satisfies Inada conditions $U'(0)=\infty$ and $U'(\infty)=0$.

At date $t=0$, the consumer has a utility function that is state dependent and act so as to maximise the utility function's expected value

$$EU = tu(c_1) + 1 - t\rho u(c_2) \tag{3.3}$$

Maximising the expected utility (equation 3.3) derives the first order conditions

$$u\prime(c_1^*) = \rho R u\prime(c_2^*) \tag{3.4}$$

$$tc_1^* + (1-t)c_2^*/R = 1 \tag{3.5}$$

Given t, the optimal values $c_1^*(t)$ and $c_2^*(t)$ of c_1 and c_2 are found by solving the first order conditions, equations (3.4) and (3.5). Equation (3.4) implies that the sign of $c_1^*(t)$ equals that of $c_2^*(t)$, and equation (3.5) implies that $c_1^*(1)=1$ and $c_2^*(2)=R$. In other words, consumers will invest in period 0. In period 1, type 1 consumers will liquidate their investments and consume 1 unit, whereas type 2 consumers will consume R in period 2. This is an autarky situation where there is no trade in current and future consumption.

Further restrictions proposed in Diamond and Dybvig (1983) regarding relative risk aversion coefficient of the utility function and the discount rate are that:

$$\frac{-cU''(c)}{U'(c)} > 1 \; and \; 1/R < \rho \leq 1 \tag{3.6}$$

These restrictions guarantee that the solution to equations (3.4) and (3.5) also satisfies

$$1 < c_1^*(t) < c_2^*(t) < R \tag{3.7}$$

for $0 < t < 1$. As such, $\rho < 1/R$ implies that $c_2^*(t) < R$ and $c_1^*(t) > 1$. This outcome is better than the autarky condition, that is, the outcome that is attained if consumers are left without any intermediaries, $c_1^1 = 1$ and $c_2^2 = R$.

Bank deposit contract

Diamond and Dybvig (1983) suggest that the optimal solution in equation (3.7) can be achieved by a demand deposit contract. The banking sector is perfectly competitive such that the bank offers a deposit contract and supports optimal risk sharing, where the bank accepts a unit deposit in period 0, and offers depositors an option to withdraw their funds in either period 1 or 2. If the bank offers an average rate of return such that early consumers get $r_1 > 1$ in period 1 and late consumers get less than R in period 2 i.e. $r_2 < R$, then $r_2 > r_1$ means the consumers smooth their consumption and their welfare improves from that of autarky. Thus the contract enables the bank to insure depositors against the uncertainty pertaining to their demand for liquidity.

However, this good equilibrium is only achievable if certain conditions are met. Let n be the fraction of depositors who declare their intention to withdraw in period 1. The bank can offer a demand deposit contract that offers r_1 to n consumers who withdraw their funds in period 1. If $n < 1/r_1$ then the bank will be able to pay

$$r_2 = \frac{[1 - r_1 n]\, R}{1 - n} \tag{3.8}$$

per unit deposited to the remaining $1 - n$ depositors in period 2.

If the fraction of type 1 consumers (t) is known ex ante, then the bank can optimally set $r_1 = c_1^*(t)$. In addition, if t is known, and only t consumers withdraw at date 1 then $n = t$, and $r_2 = c_2^*(t)$. If every agent behaves rationally and the number of consumers who declare their intention to withdraw in period 1 equals the number of type 1 consumers, then type 2 consumers have no incentive to consume early. This is so because type 2 consumers are

guaranteed of consuming in period 2, and get a return higher than period 1 return, $r_2 > r_1$. This is a good equilibrium.

However, a bad equilibrium is attained if $n \geq 1/r_1$. This is so because deposit contracts promise payment on demand and yet funds are invested in long term assets, thus there arises a maturity mismatch in the banks' portfolio for $n \geq 1/r_1$. In this scenario only $1/r_1$ depositors can withdraw their funds before the bank runs out of funds and becomes insolvent. The rest of the depositors will not receive anything in either periods. This happens when type 2 consumers are not certain that $n = t$, and they fear that the other type 2 consumers may withdraw during period 1. The expectation that a bank run may arise forces even rational consumers to rush to withdraw their funds. The banks will serve them sequentially until they run out of funds and becomes insolvent. Therefore, the expectation of bank runs occurring becomes self-fulfilling, and the expectation does not necessarily have to be driven by economic fundamentals (Mitsuo, 2007).

Policy relevance

The Diamond and Dybvig (1983) framework describes the effect of co-ordination failure based on a shift in expectations. Solvent banks may be pushed into failure due to liquidity problems as a result of excessive withdrawals. However, this framework fails to explain the cause in the shift in expectations, but simply refers to the factors causing the shifts as "sunspots" (Lai, 2002). This problem of co-ordination failure calls for government intervention to help co-ordinate patient consumer's actions so as to ascertain a good equilibrium outcome.

Diamond and Dybvig (1983) demonstrate that with no aggregate uncertainty, a suspension of convertibility policy can hinder the bad equilibrium that characterises bank runs. The bank suspends any further withdrawals when a threshold level of early withdrawals is reached. Under suspension of convertibility, late consumers are always assured of consuming more in period 2 than in period 1 and therefore have no incentive to consume early. However, Diamond and Dybvig (1983) find that even a bank contract with suspension of convertibility does not achieve optimal risk sharing. This is because deposit contracts as well as investment decisions are taken prior to the realisation of t, the fraction of early consumers, whereas optimal risk sharing involves consumption levels that are contingent on t being realised.

Lender of last resort and deposit insurance schemes are also possible intervention measures for potential bank runs. Deposit insurance schemes were proposed to eliminate equilibrium bank runs as suggested in Diamond and Dybvig (1983). However, several researchers have criticised the desirability of such schemes arguing that deposit insurance may increase moral

hazard as well as bank risk-taking incentives (Demirguc-Kunt and Detragiache, 2002). If the bank can perfectly predict the number of early consumers, it would simply hold reserves sufficient to meet their demands. Some studies have however found evidence that if the premiums for the deposit insurance scheme are not fully reflective of the riskiness in bank portfolios, deposit insurance may increase bank instability by increasing moral hazard (Demirguc-Kunt and Detragiache, 2002). Similarly, lender of last resort schemes may create incentives for banks to take excessive risks.

The Diamond and Dybvig (1983) model has formed the basis of most empirical analysis in the banking crises literature. This model highlights that the bad equilibrium is a result of banks running out of reserves, and being forced to further liquidate their assets before maturity. As a result, bank assets fall short of liabilities, hence banks become insolvent. The bad equilibrium therefore captures banking instability in which bank runs nullify optimal risk sharing.

Although the model explains how bank runs occur, it fails to account for how either of the two equilibria is selected. Since depositors' beliefs are coordinated by "sunspots", and there is no real explanation of what triggers a crisis, the model as it is presents challenges for use in policy analysis (See Babus et al., 2009).

3.3 Business Cycle Models

The business cycle set of theories views banking crises as an intrinsic part and a natural outgrowth of the business cycle and a result of shocks to economic fundamentals (Babus et al., 2009; Allen and Gale, 1998; Kindleberger, 1978)[2].

One strand of the business cycle models, often referred to as information-based models, focuses on the role of information asymmetry in triggering banking crises. These models introduce some information uncertainty into the Diamond and Dybvig framework to co-ordinate agents' actions. Morris and Shin (2001) argue that assuming common knowledge regarding economic fundamentals in the Diamond and Dybvig (1983) model contributes to co-ordination failure and multiple equilibria in the model. As such, in the Morris and Shin model, agents are allowed to have some idiosyncratic uncertainty about economic fundamentals. The result is a unique equilibrium, where bank runs occur with a positive probability. Goldstein and Pauzner (2002) similarly introduce noisy observable information signals which serve to co-ordinate patient depositors' actions and lead to a selection of either the good or the bad equilibrium. There is a possibility that shifts in beliefs as modelled in the panic based theories are correlated to changes in fundamentals. Therefore,

[2]Allen and Gale (1998) review studies that focus on models in which bank runs are an intrinsic part of the business cycle.

these models imply that there is some correlation between the occurrence of panics and economic fundamentals (Lai, 2002). Bank runs are more likely to occur where there are poor economic fundamentals.

Chari and Jagannathan (1988) focus on a signal extraction problem where a part of the population receives information on the future asset payoffs. In this model the proportion of early consumers is uncertain, hence there is aggregate liquidity risk in the economy. The deposit contract is such that agents who deposit one unit of endowment in period 0 receive a return of 1 in period 1 or an equal share of bank profits in period 2. While each early consumer withdraws in period 1, late consumers have the option of withdrawing some or all of their deposits in period 1.

The uninformed agents co-ordinate on the number of observed early withdrawals. They try to deduce whether withdrawals are due to a bad signal observed or simply a result of high liquidity needs. Uninformed agents may fail to deduce whether depositors queuing up for withdrawals are early consumers or informed consumers who have received bad news. In this case, they all rush to withdraw their funds and a bank run ensues. Therefore, bank runs may occur not only because fundamentals have given a bad signal but also because liquidity needs turn out to be high.

Kindleberger (1978) posits that bank runs are endogenous to the business cycle, emerging at the peak of the expansionary phase of the cycle. This theory suggests that during an economic upturn, banks expect stronger economic growth in the future and therefore expand their allocation of credit to the real sector. As a result, banks become highly leveraged (exposed to large amounts of credit). However, in the event of a sudden economic downturn, firm performance declines and they fail to repay their loans. Despite the non-performing loans, depositors still seek to withdraw their funds. As a result, banks are caught between the illiquidity of their assets (loans) and the liquidity of their liabilities (deposits). Thus, they suffer huge losses. Consequent systemic bank failures become a result of exposure of many banks to such shocks.

On the other hand, if depositors receive information about an impending economic recession, they rush to withdraw their funds as they anticipate financial difficulties in the banking sector (Jacklin and Bhattacharya, 1988). In contrast to the Diamond and Dybvig (1983) model, crises are a result of agents receiving negative information about unfolding economic circumstances and not random events triggered by a sunspot signal. Gorton (1985) develops a model in which depositors receive a noisy signal on the value of bank assets. Where the signal suggests a low value for bank assets, a bank run ensues. This has repercussions even on solvent banks. Consistent with this line of argument, Gorton (1988) finds evidence from the US during the early twentieth century, which is consistent with the view that bank panics are intimately related to the state of the business cycle. These

bank panics could be predicted by a leading economic indicator based on the liabilities of failed businesses.

Allen and Gale (1998) model a bank which holds illiquid assets with risky returns. In contrast to the Diamond and Dybvig model, the Allen and Gale model stipulates that both early and late consumers are guaranteed equal level of consumption. Economic agents can observe a leading economic indicator that provides information on future bank asset returns. They further show that if depositors expect a sufficiently low return on the risky asset, depositors withdraw their funds in anticipation of poor bank performance. As a result, a bank run occurs. Although consumers are paid sequentially in this model, every consumer is paid equally in the event of a bank run. The Allen and Gale model therefore differs from the Diamond and Dybvig model in that in the former, bank runs are a result of low returns to assets and not due to expectations of bank runs by agents.

There are several other models in which bank runs are triggered by real shocks to the economy, for instance, models that link asset price bubbles and banking crises (Allen and Gale, 1999). These models incorporate a banking system that intermediates the payments that support the asset market. The expansion in credit that usually follows financial liberalisation pushes up asset prices. A sudden collapse of these prices either because of low returns or tightening of credit by monetary authorities, negatively impact on banks that hold stocks or real estate or that have made loans to the owners of these assets. Following the bubble burst, banks incur huge defaults and large loan losses, which spill over to the real economy.

Panic based models take the liquidation cost of long term assets to be exogenous. However, other models proposed consideration of other sources of liquidity, to which banks experiencing bank runs can resort. These sources include asset markets or interbank markets. This therefore endogenises the liquidity cost for banks that turn out to be illiquid. A bank that faces liquidity problems can liquidate its long term assets by issuing securities or claims on its long term assets. Alternatively, the bank can borrow from the interbank market. If the markets for liquidity are efficient, banks with liquidity problems are able to liquidate their assets at fair values and solve their liquidity problems. At the same time, those with excess liquidity have an incentive to lend to illiquid banks.

Asymmetric information and market power can lead to inefficiency in the liquidity markets (Lai, 2002). Banks with liquidity needs may be forced to dispose of their long term assets at prices below their fair market value or fail to borrow funds from the interbank market. Therefore, a bank that has liquidity problems may fail despite being solvent. Consequently, a systemic failure sets in if the problems faced by one bank spread to other banks in the banking sector through contagion.

3.4 Financial Liberalisation in Banking Crises Theories

A central theme of the fundamental-based models is that bank runs are more likely to occur where there are poor economic fundamentals, whether economic agents are fully informed or not. These models underline the effect of mass-withdrawals by depositors if they anticipate poor performance by banks or low returns to their investments. In this regard, financial liberalisation that removes ceilings on lending rates may result in unstable and less predictable rates of return. Furthermore, unstable interest and inflation rates resulting from financial liberalisation make forecasting difficult for banks and economic agents. Bell and Pain (2000) point out that if, for instance, banks fail to correctly forecast movements in the yield curve, the value of bank assets may become less than that of liabilities as the rate of return on assets falls below the rate of return on liabilities.

Central to the models in which bank runs are triggered by economic fundamentals, is the role played by asymmetric information in triggering banking crises. While credit booms during economic upturns may leave banks highly leveraged, banks tend to overlook problems of moral hazard and adverse selection during such booms (Bell and Pain, 2000). However, in liberalised economies, banks are limited in their use of appropriate pricing and screening of transactions. It is also difficult for them to use other methods of minimising risk such as taking collateral or asset portfolio diversification, because of moral hazard and adverse selection problems prevalent in free markets. As such, financial liberalisation aggravates the effects of shocks to fundamentals in triggering bank panics.

The theme of this thesis is drawn from the broad theoretical literature on the link between financial sector liberalisation, banking sector performance, and banking sector stability. The majority of studies that examine the impact of liberalisation and regulation on banking sector fragility are drawn from the work of Keeley (1990). Based on this work, different studies adopted different approaches regarding the overall link between deregulation and banking stability. Some of the theoretical models that attempt to incorporate financial liberalisation into banking crisis theories are discussed next.

3.4.1 Hellmann, Murdock and Stiglitz (HMS) model

Hellmann et al. (2000), developed a model in which controls on deposit rates act as a disincentive for banks to invest in risky portfolios. In this model banks in a competitive market choose to invest their assets in a gambling portfolio, that has a higher return than a safe portfolio. In the event that the gamble succeeds, the banks receive the benefits. However, because of limited liability, the banks pass on the losses to the depositors and

deposit insurers in the event that the gamble fails.

Financial liberalisation increases competition in the banking sector by reducing entry and activity barriers, as well as eliminating controls on interest rates. In a competitive environment, bank earnings from prudent investments are relatively low. As such, banks are inclined to invest in risky potential assets.

Banks can be forced to invest in safe assets because of high capital requirements which compel banks to internalise the adverse consequences of gambling (capital-at-risk effect). However, high capital requirements raise bank costs, and reduce bank profits, and hence lower bank franchise values. Low franchise values have the effect of eroding incentives for investments in safe assets (franchise value effect). This increases the moral hazard problem that capital requirements sought to eliminate in the first place. Hellmann et al. (2000) argue that the only incentive for banks to invest prudently is bank franchise value which is put at risk when banks invest in risky portfolios.

While capital requirements can offset the bank risk-taking incentives aggravated by liberalisation, the model establishes that banks have to be forced to hold inefficiently high amounts of capital. In a free market, banks compete for deposits by offering higher deposit rates, which increases their costs. Capital requirements will only reduce the incentive by banks to bid up deposit rates if they push up bank costs to sufficiently high levels to discourage banks to pay any higher deposit rates. As such, capital requirements act as an indirect mechanism for lowering deposit rates. Therefore, pareto-efficiency is unattainable without deposit controls. Instead, the risk of bank failure is reduced more effectively by a combination of deposit rate control and capital requirements policy.

In the HMS model, the bank offers an interest rate of r_i whereas competing banks offer r_{-i}[3]. Total deposits are given by $D(r_i,\ r_{-i})$ which is increasing in r_i and decreasing in r_{-i} . The bank faces a moral hazard problem in choosing its loan portfolio. It can invest in either a prudent asset which has a return of α, or in a risky asset.

The risky investment yields γ with probability θ, and β with probability $1-\theta$. The expected return of the risky asset is smaller than that of the prudent asset, $\alpha > \theta\gamma + (1-\theta)\beta$. The model assumes that although the regulator cannot monitor the investment portfolio exante, the regulator inspects the banks at the end of each period. If the bank invests in a risky portfolio, and the gamble fails, the yield for the risky investment is β. As a result, the bank becomes insolvent, and its franchise is revoked[4]. However, if the gamble succeeds, the bank earns a higher private return, that is $\gamma > \alpha$. The bank invests its capital k, with

[3]The bank operates in a competitive market and collects funds from depositors who have deposit insurance, such that the volume of deposits depends only on the interest rate offered.

[4]The bank becomes insolvent assuming the return on the risky investment when the gumble fails is insufficient to cover all depositor funds. This follows from the fact that $\alpha > \theta\gamma + (1-\theta)\beta$.

an opportunity cost of ρ, as well as the deposits that it mobilises. ρ is assumed to be larger than α to signify that capital is costly. The total investment is therefore $(1+k)D(r_i,\, r_{-i})$.

The bank profit margin on each unit of deposit less the cost of capital is $m_p(r_i,\, k) = \alpha(1+k) - \rho k - r_i$. Therefore, total bank profits from investing in the prudent asset is given as

$$\pi_p(r_i,r_{-i},k) = m_p(r_i,k)D(r_i, r_{-i}) \tag{3.9}$$

Similarly, the gambling margin, which depends on whether the gamble is successful or not, net of the cost of capital is given by $m_g(r_i,\, k) = \theta(\gamma(1+k) - r_i) - \rho k$. The total profit, in each period, of investing in the risky asset is given as

$$\pi_g(r_i,r_{-i},k) = m_g(r_i,k)D(r_i, r_{-i}) \tag{3.10}$$

If δ is the discount rate, banks maximise the expected discounted profits $V = \sum_{t=o}^{T} \delta^t \pi_t$, and the expected profits from investing in a prudent asset $V_p(r_i,\, r_{-i},k) = \frac{\pi_p(r_i,r_{-i},k)}{(1-\delta)}$, and $V_g(r_i,\, r_{-i},k) = \frac{\pi_g(r_i,r_{-i},k)}{(1-\delta\theta)}$ for investing in the risky asset. If the interest rate cost of deposits is denoted by r, then the banks will choose to invest in the prudent asset if $V_p(r,\, r_{-i},k) \geq V_g(r,\, r_{-i},k)$, otherwise they invest in the risky asset. The model develops a constraint:

$$\pi_g(r_i, r_{-i}, k) - \pi_p(r_i, r_{-i}, k) \leq (1-\theta)\delta V_p(r, r_{-i}, k) \tag{3.11}$$

in which the one period rent that the bank expects to earn from the risky investment must be less than the amount the bank loses in terms of the franchise value, if the gamble fails with probability $(1-\theta)$. From (3.11) the model derives a critical deposit rate $\hat{r}(k)$, below which the bank would rather invest in a prudent asset:

$$\hat{r}(k) = 1 - \delta\left(\frac{\alpha - \theta\gamma}{1-\theta}\right)(1+k) + \delta\left[\alpha(1+k) - \rho k\right] \tag{3.12}$$

Maximising expected profits, under the condition that the interest rate offered by competitors equals the rate the bank offers for prudent asset investment yields

$$m_p(r_p, k) = \frac{D(r_p, r_p)}{(\partial D(r_p,\, r_p)/\partial r_i)} \tag{3.13}$$

Equation (3.13) defines the deposit rate for investing in the prudent asset as

$$r_p(k) = \frac{[\alpha(1+k) - \rho k]\,\varepsilon}{\varepsilon + 1} \tag{3.14}$$

where ε is the interest rate elasticity of deposit. Since V_p is a decreasing function of capital, k, then increasing bank's capital only reduces the value of the expected profits. If the bank were to choose the prudent asset then $r_p(0) = \alpha\varepsilon/\varepsilon + 1$. Financial liberalisation has the effect of increasing competition in the markets. As competition increases and the elasticity increases infinitely ($\varepsilon \to \infty$), this raises $r_p(0)$ (approaches α), and franchise value becomes very small. However, if the deposit rate exceeds the critical threshold $\hat{r}(k)$, then the bank is better off investing in the risky asset because, above the critical threshold, expected returns from the risky asset exceed returns from the safe asset. In sum, in a financially liberalised market with sufficiently high interest rate elasticity of deposits, the bank will choose to: (1) invest in a risky asset, (2) hold no capital, and (3) pay $r_g(o) = \gamma\varepsilon/\varepsilon + 1$.

As argued above, imposing capital requirements as a regulatory measure may force banks to invest in the safe asset, as banks seek to avoid bearing the downside losses if the gamble fails. However, the HMS model shows that a pareto-efficient outcome is achieved by a combination of minimum capital requirements and deposit rate controls. The model establishes an equilibrium in which deposit rates are controlled and banks hold a lower level of capital, rather than the one imposed by a policy of capital requirements only. Furthermore, controls on deposit interest rates effectively reduce competition in the deposit market, increase per-period profits, and hence franchise values. As shown in equation (3.11), banks will choose to invest in safe assets as long as the franchise value at risk is more that the expected gain from investing in the risky asset.

The HMS provides the following important rationales for the empirical analysis.

- Financial liberalisation increases financial fragility by increasing competition in the banking sector.
- There is no competitive equilibrium in which a bank will choose to invest prudently, therefore gambling is more certain in periods following financial liberalisation.
- Besides capital requirements, restrictions on entry, scope of activity and enhancing direct supervision are some of the policies that can be implemented as tools to curtail risky bank behaviour.
- The only incentive for banks to invest prudently is bank franchise value, therefore, the probable negative effect of financial liberalisation on bank profitability reduces the incentive for prudent bank behaviour.

3.4.2 Daniel and Jones (2007) model

Daniel and Jones (2007) develop a model that captures the dynamic effects of liberalisation and their contributions to banking crises. An important assertion in this model is that existing literature points to institutional flaws in newly liberalised economies such as (1) implicit and explicit bail-out schemes that increase moral hazard problems, and (2) increased competition. However, Daniel and Jones argue that these mechanisms, besides being static in nature, are not unique to financial liberalisation. The model illustrates that financial liberalisation affects the evolution of banks' franchise value, the returns to gambling, the banks net worth, and aggregate capital stock.

The first period, which comes immediately after financial repression, is characterised by low bank capital stock, with high marginal productivity. Foreign finance is assumed to be expensive and bank net-worth is limited. As a result, banks charge high loan rates. High returns to capital also imply that firms are not likely to default. Therefore, during this period, bank margins are high and incentives to take risk are minimal.

The next period, shortly after (but not necessarily immediately after) financial liberalisation, is characterised by growth in capital stock, decline in marginal productivity of capital, and availability of cheap foreign debt. As a result, loan interest rates begin to fall, current bank profit margins decline, and future profits are expected to fall. It is at this point, when banks' cost of bankruptcy (the foregone future profit) falls, but the returns on risky assets are high, that bank risk-taking behaviour as well as chances of having banking crises are high. However, in the periods that follow, banks become conservative and prefer to be less leveraged. Therefore, the model establishes that increased bank risk-taking behaviour is inherent in emerging markets, during the transition from financial repression to liberalisation.

In their model, Daniel and Jones (2007) further argue that the series of events leading to banking crises occur even if the banking system is well designed or competition is stiff in the long run. The simulations from the model illustrate that, in the long run, even though franchise values are minimal, the returns to gambling are even lower due to low interest rate spreads. The spreads are, however, high enough to yield some positive franchise value, hence the banks become risk averse. In the high risk period, future interest rate spreads are expected to be low relative to the current interest rate spreads. As a result, the expected gains from gambling outweigh the expected costs. Therefore, the model concludes that, while institutional flaws and stiff competition increase the vulnerability of economies to banking crises, financial liberalisation, in and of itself, contributes to banking crises in developing countries.

3.5 Summary and conclusion

This chapter reviews banking crisis theories, either under panic based models or business cycle-based models. Theories that incorporate financial liberalisation in explaining banking crises have also been discussed. The first group of theories of bank runs discussed are based on bank panics resulting from co-ordination failure. In these models, excessive withdrawals may push solvent banks into failure as a result of liquidity problems. In the fundamentals based models, bank runs are correlated to the state of the business cycle. The cause of the shifts in expectations that trigger excessive withdrawals are labelled "sunspots" in the panic based models. Changes in information or signals received by economic agents trigger the shifts in expectations in the fundamental-based models.

Allen and Gale (2001) reconcile these two basic theories of banking crises. They show that sunspots are a limiting case of real exogenous shocks that fuel a crisis. They argue that sunspot theory actually depends on fundamentals. Whereas weak fundamentals are not sufficient to trigger banking crises, the presence of weak fundamentals may be sufficient to cause self-fulfilling expectations that trigger crises. The sunspot theory does not predict a crisis, but allows for the possibility of a crisis, whereas business cycle-based theories are able to predict crises.

Financial liberalisation, adopted in many developing countries in order to increase efficiency in financial intermediaries, can have adverse effects on banking stability. Some of the models discussed in this chapter establish that the link between liberalisation and crises in banking is through increase in competition that undermines prudent bank behaviour. Hellmann et al. (2000) show that deposit rate controls stabilise banks by reducing competition in the deposit market, thereby increasing bank profits and hence franchise values. Banks with high franchise value behave more prudently. Daniel and Jones (2007) argue that banking crises are inherent in developing market economies during the transition from financial repression to financial liberalisation. As such banking crises occur shortly after financial liberalisation. However, beyond this period, the returns to gambling become less than the costs of gambling, and thus, banks become risk averse and less leveraged.

Although the theory of banking crises has traditionally assigned depositor bank runs a central role in the occurrence of crises, sudden depositor runs have featured in only a minority of cases in recent years. In fact, recent episodes of banking crises have often been a result of adverse shocks arising elsewhere in the economy (Demirguc-Kunt et al., 2006). Banking crises in SSA countries have largely been systemic in nature but seldom characterised by bank-runs. As such, the emperical estimation in this thesis draws more from the business cycle models than from the models of bank runs.

Chapter 4

Liberalisation Policies and Banking Crises in Sub Saharan Africa

4.1 Introduction

By the late 1980's several countries in SSA had moved towards liberalising their financial markets after decades of financial repression. Most countries abolished credit controls and reduced or removed compulsory reserve requirements. They also privatized state owned banks, removed interest rate ceilings, relaxed capital account restrictions, eased bank entry requirements, and eliminated restrictions on scope of banking activities. Nowadays, countries are strengthening prudential regulations and supervision. Based on the work of McKinnon (1973) and Shaw (1973), liberalisation of financial markets (also referred to as deregulation or financial reform), provides a remedy to problems associated with repressive policies in developing countries. However, the scope and frequency of bank failures in SSA over the last two decades have clouded the benefits of financial liberalisation [1].

So far, there has been a lot of research on the link between liberalisation and bank stability (Angkinand et al., 2009; Shehzad and De Haan, 2009; Daniel and Jones, 2007; Giannetti, 2007; Demirguc-Kunt and Detragiache, 2005; Noy, 2005; Bayraktar and Wang, 2004; Kaminsky and Reinhart, 1999; Demirguc-Kunt and Detragiache, 1998a). However, researchers have not agreed on a precise conclusion. Research that finds a positive relationship between systemic banking crisis and banking liberalisation have so far provided three rationales for this relationship: (i) banking liberalisation erodes monopoly profits and reduces the opportunity cost of bankruptcy, therefore enhancing incentives for exces-

[1] Laeven and Valencia (2008) identified 103 countries that experienced systemic banking crises. Of these, 36 (35%) are in Africa, accounting for 45% of total crisis episodes. Between 1976 and 2005, 65% of SSA countries experienced systemic banking crises and this figure increases to about 83% with borderline crises. This compares to only 28% recorded in emerging market economies for the same period.

sive risk-taking (Zhao and Murinde, 2009; Hellmann et al., 2000; Keeley, 1990; Rhoades and Rutz, 1982); (ii) competitive pressure on banks resulting from liberalisation can drive banks to broaden their lending commitments to include the real estate and securities markets. This may result in rapid credit growth which can drive an asset price bubble. When the bubble bursts, it suppresses the ability of borrowers to repay loans. An upsurge in loan defaults causes banks to incur huge non-performing loans. The US mortgage crises of 2007 is a classic example of this "boom and bust" behaviour in asset prices. Allen and Carletti (2011) argue that the US crises was mainly caused by a bubble in real estate. When the bubble burst, there was a collapse in the securitized mortgage markets, which caused problems in the financial institutions that were eventually transmitted to the real economy; (iii) weak supervisory capacity and under-developed prudential regulatory frameworks drive banking crises in developing countries (Noy, 2004; Rossi, 1999; Williamson and Mahar, 1998; Lindgren et al., 1996). An increase in the number of intermediaries and widening of scope of bank activities after financial liberalisation stretches existing monitoring capacity. Several researchers have used the Miniskyian theory to argue that hedging, speculation and Ponzi schemes are nurtured in liberalised economies, unless authorities take concurrent steps to enhance bank supervision. However, such a simultaneous process of liberalisation and improving bank supervision (re-regulation) imposes heavy regulatory costs on banks (Zhao and Murinde, 2009). Such regulatory costs have an effect of reducing the cost of bankruptcy and consequently increase risk-taking incentives by banks.

On the other hand, a different strand of literature suggests a negative relationship between liberalisation and banking crises (Boyd et al., 2006; Boyd and De Nicolo, 2005). Following financial liberalisation, the competitive culture amongst banks promotes stability of banking systems. This is achieved through facilitating diversification of bank portfolios, widening of the depositor base and adoption of advanced risk-management standards from new foreign players in the market (Carlson and Mitchener, 2006; *World Development Report*, 2002; Demirguc-Kunt et al., 1998). Under this view, overall stability of banking systems improves through consolidation, as weaker banks are forced out of the system, either through voluntary liquidation or mergers. In addition, other studies argue that by increasing competition, financial liberalisation increases efficiency in banking sectors. At the same time, efficient banks engage in rigorous screening and monitoring of borrowers, hence incur fewer non performing loans (Schaeck and Cihak, 2010).

Given the analysis above, it follows that previous research provides mixed evidence that makes it difficult to draw conclusions on the relationship between financial liberalisation and banking stability. A key contributor to such mixed evidence is the use of different measures of financial liberalisation as well as diverse measures of banking crises.

The goal of this chapter is to provide a comprehensive empirical analysis of the impact of financial liberalisation on banking industry stability in SSA during the past few decades.

To achieve this goal, an empirical strategy which takes into account all the methodological shortfalls so far encountered in the literature is used. These shortfalls include varying banking liberalisation indicators, banking crises indicators, and simultaneous bias.

The indicators of banking liberalisation which have been identified in literature include: (i) a dummy variable for the presence of controls on interest rate (Noy, 2004; Weller, 2001; Demirguc-Kunt and Detragiache, 1998b), (ii) a measure of capital account liberalisation (Eichengreen and Arteta, 2002), and (iii) intermediation measures such as ratio of liquid assets to GDP (Aziakpono, 2004; Allen and Ndikumana, 2000). These studies restrict financial liberalisation to one or few items in a range of liberalisation policies. However, in the case of SSA countries, liberalisation episodes entailed reform along distinct but interrelated dimensions, at different implementation rates and levels. While some countries opted for liberalising all previously controlled activities of their banking sectors, others partially liberalised their banking sectors, leaving some dimensions under government control. Others moved first from fully controlled to partially liberalised, and then to fully liberalised banking sectors. There have also been cases of withdrawal and policy reversals as well as re-implementations. The indicators used in previous studies are therefore not appropriate for the empirical analysis in this chapter.

Regarding indicators of banking instability, those most often used in the literature are: (i) a dummy variable to capture the occurrence of banking crises (Noy, 2004; Weller, 2001; Demirguc-Kunt and Detragiache, 1998b), or (ii) measures of bank risk-taking (Shehzad and De Haan, 2009; Gonzalez, 2005; Demsetz et al., 1996; Keeley, 1990)[2]. These two indicators have some inadequacies in the SSA context. The dummy variable indicators do not take into account the non-systemic banking crises. Since non-systemic episodes are sometimes a result of government corrective policies which weaken the severity of systemic crises, such exclusion can induce several types of bias in the results. Unavailability of bank-level data from most SSA counties has limited the use of other measures of bank risk-taking in the literature.

The empirical strategy adopted in this chapter attempts to solve all the shortfalls mentioned above. The study focuses mainly on SSA which is a specific group of countries that have experienced major banking crises, and have implemented several types of financial liberalisation policies over the last few decades. To account for banking liberalisation indicators, this study uses the Abiad et al. (2008) database on financial liberalisation. This database was further extended by constructing seven liberalisation indices using the data collected from 12 SSA countries not covered in the Abiad 2008 study. Together, the liberalisation data tracks the presence of restrictions in seven aspects of the financial system in 26 SSA countries.

[2]See Tchana Tchana (2008a) for a discussion on the weaknesses of dating crisis based on market events.

The liberalisation components used in this study capture and reflect the extent and level of liberalisation, and the actual types of restrictions that existed or have been abolished. Furthermore, this data captures policy reversals, as well as the implementation rate. It is unlikely that the dichotomous variables used in previous studies could have been able to capture such characteristics of liberalisation.

To account for banking crises indicators, the study constructs a banking crisis index that incorporates both systemic and non-systemic banking crises in SSA. This crisis indicator allows for more than two (ordered) response categories. The variable takes the value of 0 if there is no crisis, 1 for non-systemic crises and 2 for systemic crises. This is the most comprehensive crises index for SSA countries to be used in the analysis of banking instability and financial liberalisation.

Given that the dependent variable is an ordered variable, the relevant discrete method in this panel data context is an ordered probit or logit model in panel data setting. To compute the marginal effects of this model the study uses the two-step method developed by Hove, Tchana-Tchana and Touna-Mama (2011). Using this method, the study investigates how different liberalisation policies affect the occurrence of both systemic and non-systemic banking crises in SSA. In fact, banking industries in these countries provide a unique sample of developing economies which have witnessed a large number of bank failures during the past two decades.

The empirical results suggest that total liberalisation reduces the probability of occurrence of both systemic and non-systemic banking crises. However, different liberalisation policies have different effects. For instance, while removal of entry and activity restrictions significantly increases the probability of occurrence of banking crises, privatization of mainly state-owned banks as well as bank supervision have negative effects. Thus, the results support deregulation policies implemented alongside prudential regulation, as well as improving the institutional environment, to offset the positive impact of these policies on banking sector stability. The results are robust to various discrete econometric model specifications as well as banking liberalisation, and banking crisis indicators.

The rest of the the chapter is structured as follows. Section 4.2 presents a theoretical as well as empirical literature review on the link between financial liberalisation and banking crises. Data and empirical methodology is presented in section 4.3, while section 4.4 presents the results and analysis of the empirical model. Section 4.5 presents the sensitivity analysis. Finally, section 6 presents a summary of the results and the conclusion.

4.2 Literature Review

A wide range of theoretical and empirical studies exist on the link between banking liberalisation and banking crises. The theoretical studies often focus on the channels through which banking liberalisation affects banking crises, while empirical studies aim at verifying if theoretical links are supported by statistical evidence. This section aims at reviewing the existing literature around this subject, as well as identifying the gaps in knowledge, with a focus on SSA countries.

A large proportion of literature supports the premise that there is increased bank fragility in more competitive markets such as in liberalised financial markets (See for example Angkinand et al., 2009; Shehzad and De Haan, 2009; Noy, 2005; Noy, 2004; Hellmann et al., 2000)[3]. These studies suggest that liberalising financial markets can lead to financial instability through two main ways: (i) the erosion of previously granted monopolies of existing banks (monopoly power hypothesis- See Noy, 2004), and (ii) the increase in general risks that banks face in their otherwise usual operations.

The monopoly power hypothesis stems from the argument that financial liberalisation breaks down the monopolistic structures of most banking systems by allowing more players to enter the banking system as well as removing price floors and ceilings. In fact, Hellmann et al. (1999) argue that deposit rate controls enable banks to earn both current and future profits where the capitalized value of these profits contribute to the bank's franchise value. Given that liberalisation increases competition, thereby shrinking bank profit margins, it therefore reduces franchise values. This implies that the costs of bankruptcy are reduced. As a result, liberalisation increases the incentives to hold riskier loan portfolios. As such, the monopoly power hypothesis suggests that banks with low franchise value are prone to gambling, and have less incentives for investing in safe portfolios (Gonzalez, 2005; Hellmann et al., 2000; Hellmann et al., 1999; Keeley, 1990).

Financial liberalisation increases the exposure of banks to three basic sources of risk: credit risk, liquidity risk, and interest and foreign exchange rate risk. Financial liberalisation contributes to credit expansion, but during such expansion, excessive credit risk is undertaken. Such heightened levels of risk often turn into banking crises (See for example Wilmarth Jr, 2003; Kaminsky and Reinhart, 1999; Allen and Gale, 1998; Mishkin, 1996). In fact, any real shock to the economy can turn an asset boom to a bust resulting in the collapse of stock and real markets (Allen and Gale, 1999). This sequence of events implies losses for many economic agents. In order to reduce their losses, agents will rush to liquidate their investments. Eventually, investment and overall economic activity declines causing loan-defaults by debtors. This gives rise to a surge in non-performing loans and

[3]This is referred to as the competition-fragility view (Beck, 2008; Berger et al., 2009).

banking crises may follow this wave of defaults. Financial liberalisation therefore leaves banks exposed to higher risks.

The removal of ceilings and floors during financial liberalisation results in unpredictible and more volatile interest rates. As a result, uncertainty increases in the banking system. Banks are inclined to finance high risk projects and charge high risk premiums. Thus, in free markets, banks are more likely to hold high risk portfolios than in controlled markets (Demirguc-Kunt and Detragiache, 1998b).

Several studies have tested the theoretical claims on the positive link between financial liberalisation and banking crises using empirical data for both developed and developing countries. Diaz-Alejandro (1985) refers to the financial crises of the early 1980s as unintended consequences of financial liberalisation in Latin America. Several other studies have found empirical evidence that confirms that a banking crisis is more likely to occur after financial liberalisation (Noy, 2004; Weller, 2001; Kaminsky and Reinhart, 1999; Demirguc-Kunt and Detragiache, 1998b). Demirguc-Kunt and Detragiache (2005,1998a) find that liberalisation of interest rates is strongly and positively correlated with the occurrence of banking crises. Kaminsky and Reinhart (1999) proxy financial liberalisation with a two-year lagged domestic credit growth and find evidence that in 18 out of 26 banking crises, the financial sectors had been liberalised in the preceding five years.

Another strand of literature argues that financial liberalisation is positively correlated with banking crises because of insufficient supervision of financial sectors (lax supervision hypothesis) (Noy, 2004). Financial liberalisation entails the withdrawal of government's involvement in the banking sector, and in most cases government monitoring mechanisms are turned into regulatory forbearance. Financial reform then implies a change in the rules and regulations under which banks operate, and bank managers have to manage risk in an unfamiliar environment. This new environment stretches available monitoring capacity, if no simultaneous adjustments to supervisory resources are implemented. Yet, regulatory authorities in developing countries often face challenges that include lack of autonomy and insufficiently trained supervisors. Furthermore, lifting activity restrictions may create new institutions and at the same time increase the volume and complexity of financial transactions, which may fall out of the old regulatory frameworks. As such, if the regulatory framework does not keep pace with the new instruments and institutions, enforcement is weakened, and bank risk-taking behaviour may increase.

Various studies have empirically tested the effects of supervision and prudential regulation on banking crises (Barth et al., 2004; Demirguc-Kunt and Detragiache, 2005; Demirguc-Kunt and Detragiache, 1998a; Lindgren et al., 1996). Barth et al. (2006) test the impact of all possible regulations on bank stability and their results vary with different regulations. Angkinand et al. (2009) emphasize the importance of capital regulation and supervision,

arguing that the probability of crises increases with liberalisation especially where supervision is weak. However, Noy (2004) finds weak evidence that prudential supervision helps stabilize the banking sector after financial liberalisation.

Another strand of literature finds evidence that liberalisation reduces chances of banking crises. As acknowledged above, the main argument presented in this literature is that banking competition has a negative impact on bank risk-taking behavior. Some empirical studies have provided evidence to this view. For instance, Shehzad and De Haan (2009) use a database of 33 developed and developing countries, and establishes that conditional on effective banking supervision, most financial reform policies reduce the likelihood of systemic crises. Angkinand et al. (2009) find that crises are likely to occur after some degree of liberalisation and not necessarily full liberalisation. They find an inverted U-shaped relationship between liberalisation and the likelihood of crises.

Other studies have found no evidence of any positive link between financial liberalisation and banking crisis. Bordo et al. (2001) examine the effects of capital controls on banking crises and found no significant correlation. Eichengreen and Arteta (2002) use the presence (or absence) of capital account controls as a proxy for external liberalisation. The study finds that capital account liberalisation had no influence on the occurrence of banking crises.

4.3 Methodology

This section presents the empirical strategy of this chapter.

4.3.1 Model specification

This study employs the ordered logit model to analyse the response of both systemic and non-systemic crises to financial liberalisation. It is the relevant model given the discrete and ordered nature of the dependent variable.

This study tests the hypothesis that various financial liberalisation policies increase the probability of the occurrence of banking crises. The study assumes that the underlying variable behind the occurrence of banking crises is a linear function of banking liberalisation and some control variables. This underlying variable is referred to as banking instability, $Bkinst$ (hereafter).

$$Bkinst_{it} = \mu_i + Lib_{it}\delta + Z_{it}\gamma + \varepsilon_{it}, i = 1, ...N \text{ and } t = 1, ..., T_i \tag{4.1}$$

$$\varepsilon_{it} \sim D(0,1)$$

where Lib is a matrix of liberalisation policies, Z is a matrix of control variables that are capable of explaining crisis, δ and γ are slope coefficients, μ_i is a vector of individual country effects while ε_{it} is a vector of error terms, i and t are country and time indices respectively, N is the total number of countries and T_i is the total number of time observations for country i. $D(0,1)$ is a probability distribution with mean 0 and standard deviation 1.

Lib is a matrix of seven different liberalisation policies which include: (i) credit controls and reserve requirements (cr), (ii) interest rate controls (ir), (iii) entry and activity restrictions (ent), (iv) state ownership in the banking sector (pvt), (v) capital account restrictions ($intk$), (vi) prudential regulation and supervision (sup), and (vii) securities market policy ($secmkt$).

Z is a matrix of control variables which include: (i) macroeconomic variables (real gdp growth ($rgdpg$), inflation ($infn$), real interest rate (rir) as well as change in terms of trade (Δtot)), (ii) banking system characteristics variables (liquidity (liq), share of private sector loans to GDP (cr/gdp), lagged real credit growth ($crgr_{t-2}$), as well as ratio of broad money to foreign reserves ($m2res$)), (iii) institutional and regulatory quality variables (GDP per capita ($gdppc$), rule of law ($rlaw$), governance (gov), required reserves ($reqres$), as well as presence of explicit deposit insurance ($depins$)). Each cross section unit is observed for a period t, and $t = 1, 2...T$ and it varies across i countries, $i = 1, 2...N$ depending on data availability.

$Bkinst$ is an unobserved variable. In fact the study observes the occurrence of only three states of nature, non-crisis, non-systemic crisis, and systemic banking crisis states. These states of nature can be labelled as ordered variables that are referred to as banking crises, hereafter $crisis$. The study assumes that

$$crisis_{it} = \begin{cases} 0 & if \quad Bkinst_{it} \leq L_{it} \\ 1 & if \quad L_{it} \leq Bkinst_{it} \leq U_{it} \\ 2 & if \quad Bkinst_{it} \geq U_{it}. \end{cases} \tag{4.2}$$

L and U are threshold parameters reflecting the change from no crisis to non-systemic crisis, as well as from no crisis to systemic crisis states repectively. To reduce the length of the equations, the following notations are set:

$$Y_{it} = crisis_{it} \text{ and } X_{it}\beta = \mu_i + Lib_{it}\delta + Z_{it}\gamma.$$

Therefore, Y_{it} is the new dependent variable, X_{it} is the new set of exogenous variables and β is the new vector of parameters. The structural fixed effects logit model for the unbalanced panel data is written as:

$$\begin{cases} Bkinst_{it} = X_{it}\beta + \epsilon_i + \upsilon_{it}, i = 1, ..., N \text{ and } t = 1, ..., T_i \\ Y_{it} = 2 \text{ if } Bkinst_{it} > U_{it};\ 1 \text{ if } L_{it} \leq Bkinst_{it} \leq U_{it}, \text{ and 0 otherwise.} \end{cases} \tag{4.3}$$

Where ϵ_i is the unobserved country specific heterogeneity and $\upsilon_{it} \sim logistic$ distribution.

The response probabilities of the occurrence of banking instability outcome are:

$$P(Y_{it} = 0) = P(Bkinst_{it} \leq L_{it}) = F(L_{it} - X_{it}\beta), \tag{4.4}$$

$$P(Y_{it} = 1) = P(L_{it} \leq Bkinst_{it} \leq U_{it}) = F(U_{it} - X_{it}\beta) - F(L_{it} - X_{it}\beta), \tag{4.5}$$

$$P(Y_{it} = 2) = P(Bkinst_{it} > U_{it}) = 1 - F(U_{it} - X_{it}\beta). \tag{4.6}$$

The parameters are estimated by maximum likelihood and the log likelihood function of the logistic function is:

$$\ln(L) = \sum_{i=1}^{N}\sum_{t=1}^{T} \left\{ \begin{array}{c} 1_{[Y_{it}=0]} \ln[F(L_{it} - X_{it}\beta)] + 1_{[Y_{it}=1]} \ln[F(U_{it} - X_{it}\beta) - F(L_{it} - X_{it}\beta)] \\ +1_{[Y_{it}=2]} \ln[1 - F(U_{it} - X_{it}\beta)] \end{array} \right\} \tag{4.7}$$

where $F(.)$ is the cumulative probability distribution function of υ and $1_{[Y_{it}=j]}, j = 0, 1, 2$ is the indicator function of the set $[Y_{it} = j]$.

4.3.2 Marginal effects of the discrete choice panel model

In discrete choice models, the parameters that are generally provided are the marginal effects because they have reasonable asymptotic properties and can be interpreted easily (Wooldridge, 2001). The study uses a three-step procedure developed by Hove et al. (2011), to estimate marginal effects. The first step consists of estimating the discrete choice panel model and then obtaining the estimated parameter $\widehat{\beta}$. The second consists of computing the predicted probabilities for each outcome using $\widehat{\beta}$, that is:

$$\widehat{p}_{jit} = prob(Y_{it} = j),\ j = 0, 1, 2.$$

These probabilities are given by:

$$\begin{aligned}
\widehat{p}_{0it} &= F(L_{it} - X_{it}\widehat{\beta}), \\
\widehat{p}_{1it} &= F(U_{it} - X_{it}\widehat{\beta}) - F(L_{it} - X_{it}\widehat{\beta}), \\
\widehat{p}_{2it} &= 1 - F(U_{it} - X_{it}\widehat{\beta}).
\end{aligned}$$

The third step consists of computing the marginal effects of each outcome by regressing $\Delta\widehat{p}_{jit}$, the first difference of $\widehat{p}_{jit}$ on ΔX_{it}, the first difference of X_{it} as follows :

$$\begin{aligned}
\Delta\widehat{p}_{jit} &= \Delta X_{it}\theta_j + \eta_{jit}, \text{ for } j = 0, 1, 2. \\
\eta_{jit/\Delta X_{it}} &\sim N(0, \sigma^2)
\end{aligned} \tag{4.8}$$

Where θ_j is the vector of parameter values in regression j and η_{jit} the panel error term for regression j. The marginal effect is then given by

$$\widehat{\theta}_j = \left[(\Delta X)'(\Delta X)\right]^{-1}(\Delta X)'(\Delta\widehat{p}_j), \tag{4.9}$$

which is the estimated value θ_j using the fixed effect standard panel regression. It is a fair approximation of the marginal effects given that logarithms of most key exogenous variables are used.

Angkinand et al. (2009) suggest using lagged explanatory variables and dropping years following the onset of banking crisis to deal with simultaneity bias which may be caused by reverse causality between crises and liberalisation. In addition, Demirguc-Kunt and Detragiache (2005) point out that the behaviour of some explanatory variables may be affected by the crisis itself. To deal with such feedback effects, they suggest excluding from the sample, years in which the crisis is unfolding. This study adopts a similar approach, all independent variables are lagged by one period. In the robustness checks, the study excludes from the sample crisis years following the onset of a banking crisis. For the years where the crisis duration is not known, three years following the onset of the crisis are droped from the sample (See Demirguc-Kunt and Detragiache (2005)).

Another methodological concern is the use of fixed effects model, considering that using fixed effects imply that countries that had not any banking crises would be dropped from the regression (See Demirguc-Kunt and Detragiache 1998b). In this thesis, there are only two countries from the study sample which recorded no crises at all. However, in unreported results, the study estimates random effects models, with robust and clustering standard errors by country, and the results are not significantly different from the baseline estimation results.

4.4 Data and Variable Description

This section presents the database and provides a detailed description of variables.

4.4.1 Database

This study is carried out on an unbalanced panel data. Observations on different groups do not cover the same time periods. Macroeconomic data is drawn from World Bank's World Development Indicators (WDI), while microeconomic data is drawn from IMF's International Financial Statistics (IFS). Although all SSA countries from WDI database are initially considered, others are eliminated due to unavailability of macroeconomic data.

Systemic crisis data is obtained from the dated episodes of banking sector crises by Laeven and Valencia (2008, 2010) Non-systemic or borderline crisis data is drawn from Kane and Rice (2001) and Caprio and Klingebiel (2003). In order to minimise bias and to avoid reducing the sample size, this study does not exclude countries which implemented financial liberalisation but do not experience banking crises.

Data on financial liberalisation variables is taken from Abiad et al. (2008). While Abiad et,al provide data on 7 liberalisation policies for 14 SSA countries for the period 1973 to 2005, this study extends this dataset in two ways. First, data is compiled on the 14 SSA countries for the year 2006. Second, information on liberalisation policies for 12 other SSA countries from 1986 to 2006 is collected. This brings the study sample to 26 SSA countries, and the study period is extended from 1986 to 2006. Countries that liberalised only a few facets of their financial sectors but experienced crises during the study period are included in the sample as controls.

The majority of countries in the sample adopted liberalisation policies in the late 1980s, hence the study stretches over periods before, during and after major financial liberalisation episodes. The period was also characterised by macroeconomic turbulence across the African continent. These economic dynamics are expected to have affected bank performance in a significant way, and therefore should be reflected in the level of bank stability.

The details on the construction of the liberalisation data are discussed in the data appendix. Table B.0.1 in the appendix presents the variables used in the empirical analysis. However, the descriptive statistics of these variables are detailed in Table 4.4.1 and all the variables are discussed in detail in the next section.

Table 4.4.1: Descriptive Statistics

Variable	Obs	Mean	Std Dev	Min	Max
Crisis	546	0.49	0.81	0	2
Liberalisation Policies					
finreform	546	9.06	5.81	0	20
ent	447	2.15	1.09	0	3
ir	483	2.13	1.16	0	3
cr	462	1.69	1.03	0	3
sup	483	0.84	0.78	0	3
pvt	462	1.62	1.04	0	3
intk	462	1.19	0.91	0	3
secmkt	462	1.02	0.91	0	3
finlib	546	0.82	0.39	0	1
Institutional Variables					
gov	546	-0.02	1.27	-2.5	2.5
lgdppc	544	6.22	1.12	4.63	8.93
pressf	546	0.69	0.71	0	2
depins	546	0.13	0.33	0	1
Macroeconomic and Banking Characteristics					
crgdp	544	29.62	192.54	1.58	42.35
m2res	546	0.982	0.215	0.0091	148.3
liq	546	17.37	16.01	0.18	118.7
crgr_2	542	9.58	20.58	-10.99	34.55
rgdpg	546	3.68	4.99	-19.01	33.63
rir	534	5.63	14.33	-110.06	48.39
ctot	443	1.46	8.02	-54	71.75
infn	543	17.86	40.03	-30.16	49.53

Table 4.4.1 shows that in terms of degree of liberalisation, entry restrictions and interest rate liberalisation are the most advanced dimensions in the sample. On the other hand, regulatory and supervisory reform is the least advanced dimension with an average scale of 0.84, on a scale of 0 (no reform) to 3 (fully liberalised). The total liberalisation index has an average score of 9 out of a maximum score of 20. The standard deviations for liberalisation policies give evidence of significant variations across the different dimensions and countries. There is also evidence of differences among countries, as shown by large standard deviations for variables such as ratio of private sector credit to GDP and lagged credit growth.

4.4.2 Variable description

This section provides a description of the variables used in the empirical analysis.

Banking crises variable

The literature provides many definitions of what constitutes a banking crisis. This is because banking crises have several dimensions[4]. This study adopts the definitions of systemic crises and non-systemic banking crises used by Caprio Jr and Klingebiel (1996) and Caprio and Klingebiel (2003), and have been similarly adopted in Laeven and Valencia (2008).

A crisis is classified as systemic if at least one of the following conditions apply: (i) the ratio of non-performing loans to total loans in the banking sector is at least 10%, (ii) the cost of any rescue operation is at least 2% of GDP, (iii) banking problems have resulted in large scale nationalization of banks, (iv) occurrence of extensive bank runs, (iii) the adoption of emergency measures such as deposit freezes, prolonged bank holidays or deposit guarantees by the government in response to the crisis.

A crisis is classified as non-systemic if some of the country's major banks suffer little erosion of their ownership capital. This includes banking system distress events that affect isolated banks but are not systemic in nature. Non-systemic episodes are usually either contained by some regulatory measures, or affect a small section of the banking system. Using these definitions, 95 systemic and 35 non-systemic crises in 24 SSA countries over 21 years were identified.

Liberalisation variables

This study uses liberalisation data for seven facets of the financial sector. These include (i) credit controls and reserve requirements, (ii) interest rate controls, (iii) entry and activity barriers, (iv) state ownership in the banking sector, (v) capital account restrictions, (vi) prudential regulation and supervision of the banking sector, and (vii) securities market policy. Data for 14 countries in the study sample is drawn from Abiad et al. (2008). These countries include Burkina Faso, Cameroon, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Madagasca, Mozambique, Nigeria, Senegal, South Africa, Tanzania, Uganda, and Zimbabwe.

This study extends the above dataset by constructing a new database for similar liberalisation policies as in Abiad 2008, for 12 other SSA countries. The countries include

[4]Tchana Tchana (2008b) reviews the following four definitions of what is considered a banking crisis by different authors. i) liquidity crisis in the banking system ii) credit crunch crises iii) solvency crisis and iv) combination of insolvency and liquidity crisis that leads to bank runs and bank closures.

Botswana, Chad, Gabon, Gambia, Lesotho, Mali, Malawi, Mauritius, Seychelles, Siera leone, Swaziland, and Zambia. This study adopts the methodology used in Abiad et al. (2008), including using the questions to guide the coding for the 7 liberalisation dimensions. The details are provided in the appendix.

In brief, total financial liberalisation progressed slowly between 1986 and 1992. The pace increased between 1993 and 2000, before slowing down again after 2001, across all countries. The variables are less smooth for individual financial liberalisation policies. The variables also exhibit some positive corelation (Table B.0.3 and Figure E.3 in the appendix). However, the computed annual changes for each liberalisation policy presented in Table B.0.4 are less correlated and hence are used in the analysis.

Macroeconomic variables

The literature on business cycle models of bank runs posits that banking fragility increases during downturns of business cycles. As such, the study includes the following macroeconomic variables to capture economic fluctuations. The r*eal GDP growth (rgdpg)* is used as a control for cyclical output effects. During recessions, credit quality is likely to deteriorate, thereby negatively affecting loan repayments and resulting in increase in loan defaults.

The GDP deflator is used to proxy inflation ($infn$). It is included to control for macroeconomic volatility. The *real interest rate (rir)* is used to capture the potential adverse effects of high interest rates on bank balance sheets.

The variable *change in terms of trade* (Δtot) is included to control for external macroeconomic volatility, for instance sudden adverse movements in terms of trade, real exchange rates or sharp fluctuations in world interest rates. This variable also makes it possible to test if crises are not due to excessive foreign exchange risk exposure.

Banking system variables

Liquidity (liq) is measured by the ratio of bank cash plus reserves to bank assets. If the banking system is liquid, adverse macroeconomic shocks are less likely to increase the chances of a crisis. The ratio of *private sector credit to GDP (cr/gdp)* controls for bank exposure to the private sector. Research has shown that most banking crises are preceded by a boom in private credit (Kaminsky and Reinhart, 1999). Therefore, *lagged real credit growth* ($crgr_{t-2}$) is included in this study to control for asset market booms that may trigger a crisis when the booms burst. Demirguc-Kunt and Detragiache (1998b) argue that systemic banking crises may be associated with sudden capital outflows in countries

with exchange rate pegs. As such, the *ratio of broad money to foreign exchange reserves (M2/gdp)* is included to control for this effect.

Institutional and regulatory quality variables

Banking sector problems may be increased by fraud, weak enforcement of loan contracts and prudential regulations, especially where the legal system is not very efficient. *Governance* (*gov*) and *press freedom* (*pressf*) are included to measure the quality of the legal and political systems in a country. Since these variables capture the administrative capacity of governments which determines the effectiveness of prudential supervision, low values may mean more opportunities for moral hazard and hence increase the possibility of banking crises.

GDP per capita (*gdppc*) is included to control for the level of economic development in the country and hence general institutional quality. The presence of explicit *deposit insurance* (*depins*) is also included as a regressor. Deposit insurance is expected to reduce the occurrence of banking crises after liberalisation by eliminating the possibility of self-fulfilling panics analyzed in the model by Diamond and Dybvig (1983). However, high deposit insurance cover can increase moral hazard and bank risk-taking behaviour. Therefore, apriori, the effect of deposit insurance is ambiguous.

4.5 Model Estimation and Result Analysis

Tables **4.5.1, 4.5.2,** and 4.5.3 present the results of the ordered logit regressions estimating the relationship between financial liberalisation and banking crisis, controlling for relevant variables. The results are explained in terms of marginal probability effects. Column (1) corresponds to the aggregate financial liberalisation index while columns (2) to (7) correspond to different financial liberalisation policies.

4.5.1 Banking stability and financial liberalisation

The baseline model in Table **4.5.1** column (1), presents strong evidence that total financial liberalisation has a negative marginal probability efffects on the occurrence of both systemic and non-systemic banking crises, contrary to widely held perceptions. This relationship between the occurrence of banking crisis and liberalisation is significantly negative at 1% level.

Data presented in Table 2.2 shows that about 50% of countries that took some major moves towards liberalisation had experienced banking crises prior to liberalisation, whilst the other half experienced banking crises after implementing financial reforms. This seems to suggest that financial liberalisation improved stability by enabling banks to better diversify their asset portfolios as well as widening their depositor base. Diversification insulates banks from shocks that are specific to certain economic sectors, regions or type of bank activity. In addition, stability might also have been achieved through improved efficiency as a result of heightened post liberalisation competition.

These results are consistent with findings in previous research. For example, Carlson and Mitchener (2006) find that states in the US that deregulated bank branching laws had fewer bank failures in the 1920s. Similarly, Gonzalez (2005) reports that banks in 36 developed and developing countries outside Africa (except South Africa) with stricter regulations take higher risk, and hence face more chances of failure than those in countries with less restrictive laws.

Table 4.5.1: Financial liberalisation Policies and Banking Crises: Ordered logit Estimation Results

	(1)			(2)			(3)		
Variables	crisis=0	crisis=1	crisis=2	crisis=0	crisis=1	crisis=2	crisis=0	crisis=1	crisis=2
rgdpg	0.08***	-0.01***	-0.07***	0.013***	-0.002***	-0.011***	0.012***	-0.002***	-0.019***
	(0.003)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.004)	(0.002)	(0.004)
lgdppc	0.13***	-0.03***	-0.10***	0.01***	-0.03***	-0.07***	0.12***	-0.035***	-0.09***
	(0.013)	(0.003)	(0.014)	(0.02)	(0.005)	(0.02)	(0.013)	(0.004)	(0.014)
ctot	-0.061***	0.004**	0.06***	-0.04***	0.004***	0.041***	-0.005	0.005	0.003
	(0.006)	(0.004)	(0.007)	(0.01)	(0.003)	(0.01)	(0.008)	(0.004)	(0.007)
infn	-0.001***	0.0001***	0.002***	-0.002*	0.001*	0.001*	-0.0002*	0.0001*	0.0002*
	(0.0001)	(0.0002)	(0.0001)	(0.001)	(0.003)	(0.001)	(0.01)	(0.004)	(0.001)
rir	-0.001*	0.021*	0.031*	-0.001***	0.002***	0.001***	-0.004***	0.009***	0.005***
	(0.001)	(0.002)	(0.001)	(0.0002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
m2res	-0.013***	0.015***	0.02***	-0.024***	0.032***	0.004***	-0.041***	0.052**	0.064***
	(0.003)	(0.001)	(0.004)	(0.005)	(0.002)	(0.001)	(0.001)	(0.003)	(0.002)
crgdp	-0.002***	0.004***	0.009***	-0.008**	0.002**	0.001**	-0.001***	0.006***	0.009***
	(0.001)	(0.001)	(0.004)	(0.003)	(0.001)	(0.003)	(0.001)	(0.004)	(0.0002)
liq	0.0001	-0.0003	-0.0001	0.001***	-0.001**	-0.001***	0.001***	-0.0002*	-0.001***
	(0.0003)	(0.001)	(0.003)	(0.0003)	(0.0001)	(0.0003)	(0.0002)	(0.001)	(0.002)
crgr_2	-0.03***	0.01***	0.021***	-0.028**	0.01***	0.022**	-0.061***	0.014***	0.05***
	(0.01)	(0.002)	(0.01)	(0.012)	(0.002)	(0.01)	(0.01)	(0.003)	(0.01)
depins	-0.11***	0.02***	0.09***	-0.05	0.01***	0.04**	-0.08***	0.02***	0.056**
	(0.027)	(0.002)	(0.03)	(0.03)	(0.002)	(0.03)	(0.02)	(0.003)	(0.022)
finreform	0.025***	-0.003***	-0.022***						
	(0.003)	(0.004)	(0.003)						
ir				-0.06	0.01	0.05			
				(0.17)	(0.51)	(0.11)			
ent							-0.081***	0.011***	0.07***
							(0.01)	(0.002)	(0.01)
Obs	488	488	488	508	508	508	488	488	488
R^2	0.85	0.67	0.81	0.84	0.69	0.83	0.92	0.71	0.89

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Marginal effects reported.

All regressions included a constant

Table 4.5.2: Financial liberalisation Policies and Banking Crises continued

	(4)			(5)		
Variables	crisis=0	crisis=1	crisis=2	crisis=0	crisis=1	crisis=2
rgdpg	0.011***	-0.002***	-0.01***	0.013***	-0.02***	-0.011***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
lgdppc	0.08***	-0.02***	-0.05***	0.12***	-0.03***	-0.09***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)
ctot	0.04***	-0.01***	-0.03***	0.02*	-0.003*	-0.02*
	(0.01)	(0.003)	(0.01)	(0.011)	(0.003)	(0.01)
infn	-0.001**	0.001**	0.003**	-0.001***	0.001***	0.001***
	(0.001)	(0.002	(0.001)	(0.001)	(0.002)	(0.001)
rir	-0.011***	0.028***	0.022***	-0.051***	0.044***	0.041***
	(0.002)	(0.02)	(0.001)	(0.006)	(0.002)	(0.002)
m2res	-0.003***	0.001***	0.003***	-0.004***	0.003***	0.003***
	(0.0001)	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)
crgdp	-0.004	0.002	0.003	-0.002***	0.006***	0.002***
	(0.003)	(0.003)	(0.003)	(0.001)	(0.004)	(0.001)
liq	-0.0004	0.0001	0.0004	-0.001***	0.001**	0.001**
	(0.003)	(0.001)	(0.0003)	(0.0003)	(0.001)	(0.0003)
crgr_2	-0.024**	0.01***	0.02**	-0.07***	0.02***	0.05***
	(0.01)	(0.002)	(0.01)	(0.016)	(0.003)	(0.013)
depins	-0.07**	0.02***	0.06*	-0.003	0.01***	0.01***
	(0.03)	(0.003)	(0.03)	(0.03)	(0.002)	(0.024)
cr	0.13***	-0.02***	-0.114***			
	(0.01)	(0.001)	(0.01)			
intk				-0.06***	0.01***	0.05***
				(0.01)	(0.002)	(0.01)
Obs	390	390	390	388	388	388
R^2	0.866	0.635	0.841	0.901	0.770	0.871

Robust standard errors in parentheses;*** p<0.01, ** p<0.05, * p<0.1; Marginal effects reported

Table 4.5.3: Financial liberalisation Policies and Banking Crises continued

	(6)			(7)		
Variables	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
rgdpg	0.01***	-0.001***	-0.06***	0.012***	-0.005***	-0.02***
	(0.001)	(0.003)	(0.001)	(0.001)	(0.0002)	(0.001)
lgdppc	0.05***	-0.02***	-0.04**	0.11***	-0.03***	-0.08***
	(0.014)	(0.004)	(0.015)	(0.014)	(0.01)	(0.015)
ctot	-0.05***	-0.01**	0.06**	0.011	-0.01	-0.01
	(0.008)	(0.01)	(0.011)	(0.01)	(0.002)	(0.01)
infn	-0.003**	0.001***	0.002**	-0.001*	0.003*	0.001*
	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)
rir	-0.002	0.001	0.003	-0.004***	0.001***	0.003***
	(0.0002)	(0.0002)	(0.0002)	(0.001	(0.0002)	(0.001)
m2res	-0.004***	0.0002***	0.004***	-0.004***	0.0001***	0.003***
	(0.0003)	(0.0004)	(0.0002)	(0.0001)	(0.0001)	(0.0002)
crgdp	-0.01***	0.03**	0.06***	-0.02***	0.04***	0.07***
	(0.009)	(0.01)	(0.02)	(0.001)	(0.004)	(0.006)
liq	0.0001	-0.0003	-0.0002	0.001***	-0.0003***	-0.001***
	(0.0003)	(0.001)	(0.0003)	(0.0003)	(0.0001)	(0.0004)
crgr_2	-0.021**	0.01***	0.02***	-0.068***	0.013***	0.055***
	(0.01)	(0.002)	(0.006)	(0.02)	(0.002)	(0.016)
depins	-0.08***	0.001***	0.09***	-0.07***	0.017***	0.06***
	(0.027)	(0.01)	(0.02)	(0.028)	(0.003)	(0.027)
pvt	0.17***	-0.03***	-0.14***			
	(0.08)	(0.002)	(0.06)			
secmkt				0.10**	-0.02**	-0.08**
				(0.018)	(0.003)	(0.016)
Obs	508	508	508	488	488	488
R^2	0.776	0.567	0.737	0.702	0.737	0.777

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; Marginal effects reported.

All regressions included a constant.

As mentioned earlier, this study focuses on the relationship between specific components of banking liberalisation and the occurrence of banking crises.

Liberalisation of interest rate controls is considered first. Results presented in column (2) suggest that interest rate liberalisation has a positive, though insignificant marginal probability effect on the occurrence of systemic banking crisis in SSA countries. The marginal probability effects are stronger for systemic crises than non-sytemic crises. This contradicts results reported in previous studies. In fact, Demirguc-Kunt and Detragiache (1998b) find a positive and significant relationship between these two variables. Similarly, Angkinand et al. (2009) report a positive relationship between behavioral liberalisation (interest rate and credit controls) and banking crisis incidences.

The results suggests that in SSA banking crises seem not to be related to higher levels of interest rates. In addition, the interest rate variable used in this study capture financial liberalisation which was implemented in stages as well as instances where policy reversals were encountered. In fact, the interest rate variable is captured on an ordinal scale, taking the value of 1, if government sets ceilings or floors for both interest and deposit rates, and 2, if government allows interest rates to fluctuate within a band, and 3 if ceilings, floors or bands on interest rates are all eliminated. From the study sample, countries such as Nigeria moved from total interest rate controls to complete removal of lending rate ceilings as well as removal of deposit rate floors over time. Other countries, such as Ghana and Kenya, moved from full repression to full liberalisation. On the other hand, other countries like Zimbabwe, moved from complete government control to largely liberalised banking sectors. Zimbabwe's financial sector moved back to a partially controlled system when the government re-introduced lending rate controls. Therefore, given that the interest rate variable used in the current study captures all such developments, the result is not totally surprising.

Regarding controls on entry and activity restrictions, the results suggests that relaxing such restrictions increases the marginal probability effects of bank failure. This result seems to suggest that increasing the number of players in the market causes an increase in bank failures as lower profits from a competitive banking environment distort risk-taking incentives of banks. The results also suggest that fewer restrictions on bank activity may lead to banks diversifying into high risk areas. This is consistent with findings by Lepetit et al. (2008), that expanding into non-interest income activities increases insolvency risk. The probability of occurrence of systemic crises induced by removal of entry and activity restrictions is higher than that of non-systemic crises. This may reflect the weaknesses of domestic banks that sprouted after easing of entry requirements in the majority of SSA countries. This increase put pressure on implicit government deposit insurance schemes and resulted in central banks failing to contain the spreading of bank failures to the rest of the banking sector through the contagion effect.

Removing controls on credit allocation reduces the marginal probability effects of both systemic and non-systemic banking crises. Brownbridge and Harvey (1998) report that prior to financial liberalisation, several state owned banks accumulated non performing loans as a result of non-repayment of loans by poorly performing parastatals as well as institutions from "priority sectors" to which banks were obliged to offer credit at below market rates. As such, removal of compulsory credit quarters, ceilings and preferential interest rates on credit lines improved the banks' financial positions, and as a result contributed to bank stability. Thus, the negative result on removal of credit controls may be justified on these grounds.

Results presented in column (5) show a positive and significant relationship between banking crises and removal of restrictions on flow of international capital. As expected, greater capital outflows increase the likelihood of banking crises, especially for less developed countries. Capital flows are subject to asymetric information, agency problems, adverse selection, and moral hazard problems. At the same time, inadequate institutional and prudential arrangements that characterise developing economies may fail to deal with the risks associated with diverse types of capital flows.

Reducing the share of government assets in the banking sector through increased privatisation has a negative effect on both systemic and non-systemic banking crises (column 6). The study observes that state owned banks were characterised by poor loan procedures and had loan recovery rates less than 50% in a majority of the study countries. This result is intuitive, it suggests that reducing state participation in banking systems reduces bank failure rates significantly.

Lastly, there is a negative and significant relationship between liberalisation of security market policies and banking crises. This supports the claim that stock market development improves bank stability through easing liquidity constraints. Allen et al. (2011) and Allen et al. (2012) surveys on stock market development in SSA report a positive performance of stock markets in liberalised markets. As such, liberalisation of security market policies promotes competition and hence bank stability through financial deepening and improved efficiency.

4.5.2 Bank supervision and prudential regulation

Several studies observe that well developed regulatory institutions that enhance effective supervision mitigate the positive impact of financial liberalisation on banking crises. In this section this link is revised for SSA countries using results reported in Tables B.0.5, B.0.6, B.0.7 and B.0.8 in the appendix. In these tables, column (1) presents the results of the baseline specification, and column (2) presents the results of the specification with an

interacting dummy variable between the index of financial liberalisation and bank supervision. Columns (3) to (8) present results for the relationship between banking crises and various liberalisation policies, conditional on prudential supervision. The results show a negative and significant marginal probability effect of liberalisation on banking crises.

To understand these results more clearly, the following observations are made. Firstly, for the prudential regulations and supervision variable, a greater degree of government intervention is coded as a reform, thus a higher ranking shows the presence and effectiveness of government supervision and prudential regulation. Secondly, the lax-supervision hypothesis discussed earlier suggests that an efficient supervisory structure reduces the destabilising impact of liberalisation on banking sector. The empirical results seem to substantiate these observations. Specifically, strengthening the supervisory and regulatory framework helps to contain the impact of other liberalisation policies on banking crises. To investigate this further, the previous regressions were re-run, but in these regressions the variable for bank regulation and supervision is considered as one of the control variables. The objective here is to observe the impact of other liberalisation policies on banking crises, given the different levels of bank supervision in each country.

In Table B.0.5, the financial reform index and an interactive term $finrefsup$, (finreform $\times$ sup), are included as explanatory variables in columns (1) and (2) respectively. The coefficient of the index for total liberalisation, $finreform$ changes to positive, though it is not significant (column 2). However, the interactive term is negative and strongly significant. This result strongly supports the stabilising effect of efficient supervision and prudential regulatory structures.

Interest rate liberalisation and easing entry requirements have positive and significant effects on banking crises (columns 3 and 4, Table B.0.6). However, the statistical significance of the coefficient on *ent* is weak. This suggests that strong institutional environments mitigate the destabilising effects of increased entry into the banking sector (column 4).

Results in Tables B.0.7 and B.0.8 report that liberalisation of credit controls, bank privatisation, and security markets reduce the probability of banking crises as established in the first set of results. The effect on capital account liberalisation is positive but insignificant (column 6). This confirms the importance of effective prudential and regulatory strucures to contain the risks associated with complex capital flows.

Removal of controls on credit allocation has a stabilising effect as banks are able to extend loans only to credit-worthy debtors and at market determined rates. The present result suggests that this impact remains in force in the presence of efficient bank supervision. This result is consistent with the argument presented in Brownbridge and Harvey (1998), that forcing banks to give credit to selected sectors without paying due regard to the credit worthiness of the borrowers compromises the quality of bank loans. Evidently, removal of

such controls alongside strengthening of prudential supervision enhances bank stability.

Overall, the results presented in this section are consistent with the view that, if financial liberalisation is not concurrently implemented alongside efforts to improve prudential regulation, it is more likely to increase bank risk-taking behaviour and lead to subsequent crisis. However, information provided in Table E.1.1, in the appendix, suggests that in SSA countries, measures to improve bank regulation and supervision lagged behind other liberalisation dimensions between 1986 and 2006. As emphasised in Mishkin (1999), it is imperative to have proper bank regulatory and supervisory structures in place before or alongside financial liberalisation. This helps to reinforce the positive effects of financial liberalisation, while containing the negative impact of liberalisation on banking sector.

4.5.3 Institutional and regulatory quality

The results presented in Tables B.0.9 and B.0.10 establish that explicit deposit insurance has a positive and significant marginal effect on banking crises. Diamond and Dybvig (1983) suggest that deposit insurance schemes may mitigate the incentives by agents to run on illiquid but solvent banks. However, these results are consistent with findings by Demirguc-Kunt and Detragiache (2002) that explicit deposit insurance is associated with a higher probability of banking crisis. Whilst some countries in SSA were encouraged to set deposit insurance schemes over the years, the empirical results suggest that such schemes have a negative impact on prudent bank behaviour.

The variable GDP per capita is a proxy for institutional development. The negative relationship suggests that developing economies with poor institutional structures are more vulnerable to crises. This is further supported by the negative relationship exhibited by the coefficient on $pressf$ (Table B.0.10, column 3). However, the effect is only significant at 13% level. Another proxy for institutional development, the quality of governance in the country, is not significant.

Reserve requirements are included to proxy bank regulations in an economy. Results presented in column (2) of Tables B.0.9 indicate a negative relationship between reserve requirements and banking crisis occurrence. This may suggest that such banking regulations work to reduce risk-taking incentives. Tchana Tchana (2008a) similarly finds that an increase in the level of reserve requirements reduce the probability of occurrence of a banking crisis.

4.5.4 Other control variables

Macroeconomic variables

Several macroeconomic variables in the empirical tests presented in this chapter significantly affect the probability of banking crises. GDP growth has a negative and significant effect in all specifications. Similarly, high interest rates have positive effects on bank crises. Thus supports the assertion that high and volatile interest rates reduce the quality of loan portfolios and compromise loan repayment by borrowers. Such loan defaults contribute to high ratios of non-performing assets to total assets and consequently, to higher incidences of banking crises.

The coefficient on inflation is generally positive and significant. High levels of inflation increase the probability of banking crises, due to its impact on nominal interest rates and hence bank balance sheets. These results suggest that banking crises increase during periods of low GDP growth, high interest and inflation rates, and are consistent with results in reported by (Demirguc-Kunt and Detragiache, 2005; Gonzalez, 2005; Noy, 2004; Demirguc-Kunt and Detragiache, 1998b). Change in terms of trade is generally not significant.

Banking system characteristics

The ratio of broad money to foreign exchange reserves, $m2res$, has a positive and significant marginal effect on the probability of having either type of crises. This suggests that vulnerability of banks to speculative attacks which may result in sudden capital outflows increases the probability of a banking crisis. This result is consistent with that of Angkinand et al. (2009) and Demirguc-Kunt and Detragiache (1998b).

The ratio of private sector credit to GDP, cr/gdp, has positive and significant marginal probability effects on occurrence of either type of banking crisis as expected. Lagged credit growth, $crgr\_2$ is generally not significant. Finally, the results also suggest that more liquid banking systems reduce the likelihood of a banking crisis.

4.6 Robustness and Sensitivity Analysis

This section conducts various robustness and sensitivity tests of the results.

4.6.1 Logit estimation

In the first robustness check, the study assumes a crisis dummy variable that takes the value of 0 for non-crisis periods, and 1 in the first year of each crisis episode (whether systemic or non-systemic crisis)[5]. Therefore, the study specifies a multivariate logit regression model to estimate the probability of occurrence of a crisis in liberalised financial sectors. Table B.0.11 in the appendix shows the results from this estimation.

Column (1) reports the results of the relationship between total liberalisation and banking crises while Columns (2) to (7) report results for different liberalisation policies. The results in column (1) indicate that total financial liberalisation reduces the probability of banking crises (albeit only significant at 10% level). A similar relationship is reported in the results from ordered logit estimation.

The other liberalisation policies generally bear the same relationship as in the baseline model. Privatisation, relaxing credit controls and security market policy have negative marginal probability effects, while removal of entry restrictions and capital account liberalisation have positive effects. The other explanatory variables generally have the same signs and are of similar significance as in the main model already presented. These findings confirm that the results in of this study are neither driven by endogeneity, neither are they sensitive to model specification.

4.6.2 Liberalisation dummy variable

In the second robustness test, the study employs a dummy variable for financial liberalisation ($finlib$) instead of the index for total liberalisation $finref$. This dummy variable takes the value of 1 starting from the year in which reforms on interest rate controls were initiated, and 0 for all the years prior to the interest rate liberalisation, to proxy total liberalisation.

Table B.0.12 reports a positive and significant relationship between liberalisation and the occurrence of both systemic and non-systemic crises. While this result is not consistent with the one established using total financial liberalisation index, the result concurs with the one pertaining to interest rate liberalisation in Table 4.5.1, except that the coefficient is now significant. This result concurs with those reported in studies that used a similar dummy variable to proxy total liberalisation, and concluded that financial liberalisation increases bank fragility. The coefficients on the other variables are not significantly different from the baseline results.

[5]Years following the onset of banking crisis are excluded.

In other unreported results, the crises variable is replaced with non-performing loans and bank z-score. The sample period is reduced due to limited data on non-performing loans and bank z-score. The results are however not significantly different from the ones presented earlier.

Banking sector fragility index

The crises identification based on events in the baseline specification has been criticised in some research circles[6]. The basis for the criticism has been that it presents a selection bias by focusing on some strict set of events. This implies that this method only captures crises episodes that are so severe that they trigger the occurrence of these market events, otherwise episodes that are contained by corrective policies are not captured by this method (Tchana Tchana, 2008a).

In this section, the study constructs an index similar to the one used by Tchana Tchana (2008a). The Banking System Fragility Index (BSFI) is a weighted index of the three major types of risks that banks are exposed to: credit risk, proxied by domestic credit to the private sector; liquidity risk which is captured by bank deposit growth; and exchange risk proxied by foreign liabilities growth. The index is given as;

$$\begin{aligned} BSFI_{it} &= \frac{NDepg_{it} + NPvtcr_{it} + NFL_{it}}{3} \\ NDepg_{it} &= \frac{Depg_{it} - \mu_{depg}}{\delta_{depg}} \; where \; Depg_{it} = \frac{LDepg_{it} - LDepg_{i,t-1}}{LDepg_{i,t-1}} \\ NPvtcr_{it} &= \frac{Pvtcr_{it} - \mu_{pvtcr}}{\delta_{pvtcr}} \; where \; Pvtcr_{it} = \frac{LPvtcr_{it} - LPvtcr_{i,t-1}}{LPvtcr_{i,t-1}} \\ NFL_{it} &= \frac{FL_{it} - \mu_{fl}}{\delta_{fl}} \; where \; FL_{it} = \frac{LFL_{it} - LFL_{i,t-1}}{LFL_{i,t-1}} \end{aligned} \tag{4.10}$$

$Depg$ is the real growth rate of bank deposits, $Pvtcr$ is real credit to the private sector whilst FL is total real foreign liabilities. μ and δ are the mean and standard deviation for the three variables respectively. This index captures the distinctions in banking crises that may have arisen due to problems within the banking sector or deepened by underlying fragilities in the banking system from those resulting from macroeconomic events, outside the banking sector. Using this index as the dependant variable, the study runs similar regressions as in the baseline model. However, the results are not significantly different from the ones already established.

[6]See for instance Boyd et al. (2009).

4.7 Summary and Conclusion

This chapter examines the relationship between financial liberalisation policies and the probability of occurrence of banking sector crises in a sample of SSA countries. The study employs seven different liberalisation components that capture the extent and the progress made with reforms as well as regulatory and supervisory contributions made during financial liberalisation. In addition, a composite index for total financial liberalisation used in this analysis is constructed from these policies. The study also makes use of a banking crisis variable that encompasses both systemic and non-systemic banking crises. As such, the crises variable allows for 3 response categories. The study therefore specifies an ordered logit model to analyse the response of both systemic and non-systemic crises to the implementation of financial liberalisation policies.

The results of the empirical estimations show that total financial liberalisation has significant negative marginal probability effects on sytemic and non-sytemic banking crises. This relationship is reinforced in well developed institutional environments that enable efficient bank supervision as well as prudential regulation. Thus, conditional on prudent supervision, the results report evidence that overall liberalisation does not necessarily increase the chances of banking crises occurrence.

Regarding specific policies, the results show that different financial liberalisation policies have the following marginal probability effects on bank stability.

- On the one hand the removal of entry and activity restrictions has a positive and significant impact on the occurrence of banking crises. This result seems to confirm the notion that as more banks enter the market, bank failures are likely to increase as lower profits resulting from competition encourage banks to take on more risk. This result, therefore, does not support the stabilising effects likely to arise from diversification opportunities as a result of removal of activity restrictions. Similarly, relaxing controls on international capital flows has positive marinal probability effects on systemic and non-systemic banking crises
- On the other hand, financial liberalisation reduces the likelihood of banking crisis when the following variables of liberalisation are used:
  - Removal of controls on credit allocation reduces the likelihood of banking crisis. This confirms the view that removal of compulsory credit quarters, ceilings and preferential interest rates on credit lines to poorly performing institutions may improve bank's financial positions, and as a result contribute to bank stability.
  - Bank privatisation has a negative and significant effect on banking crisis. This

implies that reduction of the share of government assets in the banking system has the effect of stabilising banking sectors in the SSA region.

  - Reforms that entail strengthening supervision and prudential regulation have a negative impact on banking crises. This negative relationship is strongly significant in all the model specifications presented in this study. Furthermore, interacting the prudential supervision variable with liberalisation policies confirms that prudential regulation policies help contain the destabilising effects of some financial liberalisation policies.
  - The study finds a negative and significant relationship between removal of controls on security markets and the probability of banking crisis occurrence, although weakly significant in some specifications.

- Finally, this study does not find convincing evidence that removal of controls on interest rates has positive marginal probability effects on systemic banking crises, a result that is common in previous studies. This result is intuitive given the manner in which most SSA countries implemented interest rate liberalisation. There are several cases of partial implementation and policy reversals, which were not captured in previous research. The empirical results concur with those of previous research regarding a positive link between interest rate liberalisation and banking crises when a dummy variable for the presence or absence of interest rate controls is used.

Overall, empirical results from this study provide clear and robust evidence that different liberalisation policies have varying marginal probability effects on banking crises incidences in SSA countries. While several previous studies agree on a positive and significant relationship between liberalisation and banking crises, this study shows that this assertion is true when removal of controls on entry and activity restrictions, and removal of restrictions on flow of international capital are considered as the liberalisation variables. Indeed, other liberalisation policies, for instance, removal of credit controls, privatisation of previous state-owned banks, and strengthening prudential regulations have stabilising effects on banking crises. As such conclusions drawn from analysing similar relationships should be made with regard to specific liberalisation policies.

Chapter 5

The Effects of Financial Liberalisation and Competition on Bank Profitability

5.1 Introduction

The debate on the link between financial liberalisation and banking crises prompted researchers to investigate possible conduits through which the effects of liberalisation are transmitted to banking sector fragility/stability. Two main channels have been suggested in the literature. The first conduit, the franchise value channel, set forth in Keeley (1990), focuses on the effects of financial liberalisation on bank franchise value. In his model, Keeley (1990) argues that reforms in the US laws governing state branching, multibank holding company, and interstate expansion led to increased competition and erosion of bank monopoly profits.

The Hellmann et al. (2000) model reviewed in chapter three of this thesis, presents an argument similar to that propounded by Keeley (1990). In addition, the literature on bank regulation points out the importance of entry barriers in enhancing profitability through protecting banks from competition, unsafe and unsound banking practices and bank failures (Athanasoglou et al., 2006). Banks protected from competition gain monopoly power and acquire high profit margins. However, when laws that restrict inter-bank competition, as well as competition from non-bank firms are relaxed, competition increases and there is a general decline in bank profits (see for instance Claessens et al., 2001; Berger, 1995)

Conversely, some sections in the lierature suggest that financial liberalisation positively affects bank profitability. For instance, proponents of financial liberalisation argue for the removal of operating obstacles in the banking sector in order to foster competition and

efficiency. In accordance with this theory, more (cost) efficient firms earn more profits. This is supported by the Industrial Organisation (IO) theories on banking which posit that efficiency drives profitability. Therefore, financial liberalisation through enhancing efficiency in the banking sector, fosters bank profitability. This leaves the debate on the link between financial liberalisation and bank profitability open for empirical verification.

Despite established theoretical effects of liberalisation on bank profitability, little indepth empirical research has been undertaken on this link. The literature that focuses on SSA is scant. While countries in SSA are characterised by the dorminant role of the banking sectors, financial reforms aimed at liberalising these sectors have witnessed development of stock markets and non-financial intermediaries such as life insurance companies and pensions funds. Implementation of these reforms has brought about changes in the legal, institutional, structural, regulatory, and supervisory frameworks of the financial systems, with consequent effects on banking activities and perfomance. As a result, investigating bank profitability in SSA has become more relevant.

The goal of this chapter is to test how financial liberalisation policies, implemented across SSA countries, influenced market structure and bank profitability, while accounting for macroeconomic, institutional, and bank-specific determinants of bank profitability. Several studies have examined determinants of bank profits in several countries and geographic regions, focus on SSA region has been limited. Furthermore, the current study specifically accounts for the effects of financial liberalisation policies implemented in countries in SSA since the late 1980s. This study argues that changes in regulatory conditions- for instance, regulatory reforms relating to entry and activity restrictions, international capital flows and security market policy- increase bank competition and affect bank performance. The hypothesis for this chapter is that financial liberalisation, by increasing competition in the banking sector, erodes market power and previously earned abnormal bank profits. This hypothesis draws on both theoretical and empirical literature that examines the impact of financial liberalisation on competition, which is then linked to literature on bank profitability.

The study hypothesis focuses on changes in market structures induced by financial liberalisation. Therefore, it is necessary to test this model using data that covers the period when liberalisation policies were expanding in both scope and intensity. In this regard this chapter uses annual country and bank level data from an unbalanced panel of 144 banks from 25 SSA countries over the period 1996 to 2006. A list of the countries and the details of the banks from each country is in Table C.0.1 in the appendix. In specifying the model, the study accounts for profit persistence by employing a dynamic panel framework using the Arellano-Bond (1991) two-step General Method of Moments (GMM) approach.

This study finds mixed results regarding the relationship between financial liberalisation

policies and bank profitability. While competitive liberalisation significantly reduces bank returns, total liberalisation does not seem to have any explanatory power for bank profitability. Furthermore, the results show a negative and significant relationship between specific liberalisation policies including relaxing entry and activity restrictions, scrapping of controls on interest rates, and relaxing controls on security market policies. On the contrary, reforms on prudential regulation and bank supervision, as well as bank privatisation significantly increases bank profit levels.

The empirical results also highlight that bank specific, macroeconomic and institutional variables are important determinats of bank profitability in SSA. The results show evidence of moderate profit persistence, implying significant competitive conditions in SSA financial markets. Bank capital, credit risk and bank size have positive effects on bank profitability, while bank costs have the opposite effect. Economic growth, GDP per capita, and inflation significantly increase bank profits while the other measures of institutional and regulatory environment have no siginificant effects on bank profits.

The rest of this chapter is organised as follows: The next section outlines the stylised facts on financial liberalisation and bank profit trends in SSA. Section 5.2 provides an overview of established theoretical and empirical research relevant to this study. Section 5.3 outlines the empirical strategy, presents the data and describes the variables used in the emperical analysis. Section 5.4 presents the model estimation and analysis of results. Finally, section 5.5 presents the sensitivity analysis, summarises and concludes.

5.2 Financial Liberalisation and Bank Profitability Trends

Commercial banks in countries in SSA perform better, in terms of return on assets and net interest margin, than banks in other developing countries (Flamini et al., 2009). As presented in Table 5.2.1, return on assets averaged 3% in the last decade for the African continent. However, different countries and regional groups reported varying profitability during the period 1990 to 2005. For instance, countries in west and southern Africa reported average profit rates of about 5%. This compares to an average rate of about 1% recorded in North African countries. Net interest margins, a measure of bank efficiency, provides a similar picture.

Table 5.2.1: Bank Perfomance Measures in Selected African Countries

Regional block	Country	Return on Assets				Net Interest Margin			
		1990	1995	2000	2005	1990	1995	2000	2005
	Cameroon		-0.001	-0.003	0.005		0.043	0.049	0.046
	Gabon		0.029	0.03	0.02		0.134	0.57	0.33
	Ethiopia	0.01	0.012	0.012	0.026		0.244	0.107	0.264
East and Central Africa	Kenya	0.010	0.019	0.003	0.016	0.149	0.069	0.073	0.067
	Madagasca		0.04	0.04	0.04		0.01	0.08	0.09
	Malawi	0.02	0.037	0.005	0.028		0.016	0.121	0.123
	Mozambique		0.01	-0.09	0.005		0.1	0.08	0.08
	Uganda	-0.052	0.014	0.038	0.033		0.083	0.112	0.117
	Average		0.02	0.004	0.022		0.09	0.14	0.14
	Burkina Faso		0.02	0.006	0.004		0.066	0.053	0.058
	Ivory Coast	0.002	0.028	0.005	-0.048	0.038	0.067	0.058	0.064
West Africa	Ghana		0.045	0.023	0.02		0.104	0.107	0.095
	Nigeria	0.025	0.001	0.04	0.023	0.058	0.079	0.085	0.064
	Senegal		0.026	0.016	-0.01		0.053	0.058	0.049
	Average		0.06	0.05	-0.009		0.074	0.072	0.066
	Botswana	0.024	0.014	0.035	0.041		0.063	0.084	0.05
	Rep of South Africa	0.01	0.014	0.01	0.023	0.043	0.051	0.048	0.067
Southern Africa	Zambia	0.057	0.043	0.058	0.044		0.147	0.120	0.103
	Zimbabwe	0.027	0.019	0.045	0.134		0.064	0.184	0.317
	Average	0.03	0.023	0.037	0.061		0.081	0.109	0.134
	Algeria		0.004	0.01	0.016	0.036	0.061	0.037	0.05
North Africa	Egypt	0.015	0.015	0.011	0.001	0.023	0.021	0.022	0.019
	Morocco	0.007	0.01	0.011	-0.002	0.067	0.065	0.041	0.034
	Tunisia	0.01	0.013	0.013	-0.001	0.02	0.031	0.032	0.028
	Average		0.011	0.011	0.004	0.037	0.045	0.036	0.036

Source: Beck et al (2010), Author's calculations.

One of the reasons cited for high profitability of commercial banks in Africa is the risky financial environments (Flamini et al., 2009). This claim is based on weak legal institutions that fail to enforce contractual agreements and hence suppress creditor rights. This characteristic is common across many countries in SSA. Similarly, economic under-development in the region exposes banks to risk as low growth promotes deterioration of credit quality, and hence increased loan defaults. In addition, poorly developed prudential and supervisory frameworks also expose banks to high risk. Poor monitoring may give rise to banks earning high returns, though from high risky projects. In such a high risk environment,

arbitrage ensures that the riskier assets get high rates of return.

Bank regulations and market power also have significant effects on bank returns. Whilst financial liberalisation is expected to promote competitive markets, oligopolistic structures in some banking sectors in Africa are a possible cause of supernormal returns. Alternatively, high loan rates in liberalised and less concentrated markets may result in higher returns than those in controlled markets.

Table 5.2.2 does not give a distinct positive correlation between concentration

Table 5.2.2: Bank Concentration and Profitability in Selected Countries

	CR			ROA				ROE			
Country	1996	2000	2006	1996	2000	2006	Trend‡	1996	2000	2006	Trend‡
Botswana	0.97	0.93	0.80	0.02	0.04	0.03	↑	0.25	0.35	0.49	↑
Burkina Faso		0.87	0.67	0.02	0.006	-0.008	↓	0.16	0.07	-0.08	↓
Cameroon	1	0.82	0.65	-0.01	-0.03	0.01	↑	-0.39	0.7	0.13	↑
Ethiopia	0.9	0.85	0.88	0.02	0.01	0.03	↑	0.35	0.11	0.33	↓
Gabon	1	1	0.96	0.03	0.03	0.03	→	0.13	0.25	0.26	↑
Ghana	0.99	0.93	0.79	0.02	0.02	0.003	↓	0.17	0.32	0.11	↓
Kenya	0.7	0.55	0.59	0.01	0.003	0.02	↑	0.13	0.04	0.15	↑
Ivory Coast	0.96	0.83	0.75	0.02	0.01	-0.01	↓	0.29	0.2	-0.31	↓
Madagasca	1	0.83	0.74	0.04	0.04	0.03	↓	0.9	0.30	0.28	↑
Mali	0.91	0.84	0.76	0.01	0.002	0.01	→	0.18	-0.06	0.15	↓
Malawi		0.92	0.86	0.04	0.05	0.04	→	0.28	0.47	0.35	↑
Mauritius	0.98	0.89	0.72	0.01	0.02	0.01	→	0.12	0.13	0.12	→
Mozambique		0.8	0.82	0.01	-0.09	0.03	↑	0.09	1.18	0.26	↑
Nigeria	0.82	0.42	0.39	0.02	0.04	0.03	↑	0.29	0.32	0.19	↓
Senegal	0.94	0.72	0.64	0.01	0.02	0.01	→	0.13	0.19	0.16	↑
Sierra leone	1	0.97	0.89	0.06	0.12	0.02	↓	0.45	0.65	0.19	↓
South Africa	0.92	0.81	0.90	0.03	0.01	0.03	→	0.16	0.06	0.19	↑
Uganda	0.84	0.57	0.65	-0.02	0.04	0.03	↑	-0.18	0.47	0.28	↑
Zambia	0.86	0.69	0.58	0.06	0.06	0.05	↓	0.42	0.36	0.32	↓
Zimbabwe	0.98	0.97	0.83	0.03	0.05	0.15	↑	0.35	0.48	0.82	↑
Algeria	0.91	0.87	0.87	0.004	0.01	0.01	↑	0.04	0.08	0.12	↑
Egypt	0.71	0.57	0.57	0.02	0.01	0.01	↓	0.19	0.11	0.21	↑
Tunisia	0.54	0.46	0.45	0.01	0.01	0.002	↓	0.12	0.12	-0.04	↓

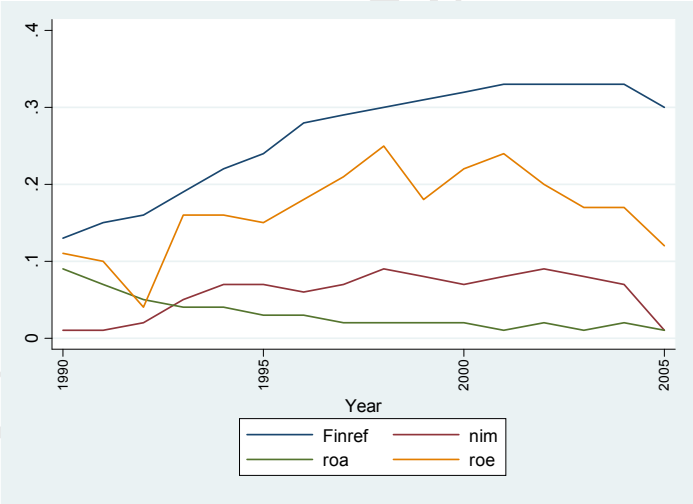
Source: Beck et al. (2010) and Author's calculations. CR is bank concentration ratio measured as assets of three largest banks in total commercial bank assets. ROA and ROE is return on average assets and return on average equity respectively.‡change between 1996 and 2006 rates

levels and return on assets. In fact, while concentration levels have decreased between 1996 and 2006 in SSA countries, statistics in Table 5.2.2 indicates that more countries reported marginal increases in rates of return on assets than those that reported declines in the same profit measure. However, an equal number of countries did not record any significant changes in return on assets. North African countries (Algeria, Egypt and Tunisia) report lower concentration ratios than SSA countries, and generally declining rates of return on assets. A similar trend is also observed with regard to rates of return on equity.

Concerning the influence of bank regulation on bank profit measures, statistical evidence shows that there is a correlation between liberalisation policies implemented over time, and bank profit measures, which are proxies for franchise value. As discussed in detail later, there seems to be negative and significant correlations between some profit measures and different liberalisation components such as relaxing entry restrictions and removal of interest rates and credit controls.

Figure 5.1 shows the trends in three measures of bank profitability as well as total financial liberalisation in SSA between 1990 and 2005. The scales are normalised between 0 and 1.

Figure 5.1: Financial Liberalisation and Bank Profit Measures in SSA (1990-2005)



Source: Beck et.al (2010) and authors calculations using Bankscope data.

Finref is the financial liberalisation index

Return on equity shows a general upward trend and reaches a peak in 1998, and thereafter takes a gradual decline. A similar trend is observed for net interest margins, though this measure is not as volatile as return on equity. Return on assets shows a gradual decline throughout the 1990 to 2006 period. On the other hand, financial liberalisation shows an upward trend from 1990 and reaches a peak in 2000, before taking a slight decline in 2004.

5.3 Literature Review

This section presents an overview of previous research relavant to the current study. Since the present chapter's hypothesis hinges on the effects of financial liberalisation on bank profits through its effects on competition, a brief review of bank competition models is presented first. The monopoly model of banking is presented to highlight the market conditions that may exist prior to financial liberalisation, while the monopolistic model represents liberalised markets.

5.3.1 Financial liberalisation, bank competition and profitability

The pioneering work of Bain (1951) provides a basic framework for firm behaviour in a competitive environment, under the neoclassical theory of competition. This theory views competition as a state that would prevail if there were no entry and exit controls in the market. Firms take prices as given. The larger the number of firms the more effective their competitive behaviour and the less concentrated the market structure. Conversely, the fewer the number of buyers and sellers, the more oligopolistic and monopolistic their behavior, and consequently the more the profits realised. The basic model used to account for differences in profits is thus given by:

$$\pi = f(Cr, M) \tag{5.1}$$

where Cr is firm concentration ratio and M captures imports and other external costs to the firm. As such, financial liberalisation impacts on bank profits indirectly through its effects on Cr.

While most early theories of bank competition were drawn from the neoclassical assertions, the IO approach to the economics of banking considers banks as firms that react optimally to the environment in which they operate. This approach deals with market size, firm growth, market perfomance, and market structure in the banking industry. The Klein-Monti model (Klein, 1971; Monti, 1972), forms the basis of the IO models of banking competition.

The monopoly model of banking

The Klein-Monti (hereafter KM) model assumes a single bank in the economy. An individual bank is not able to influence market price and/or output. The bank chooses among three assets: cash reserves, loans, and treasury bills. There are three types of liabilities,

demand deposits, time deposits, and equity capital that is exogenously set. The bank faces a cost function denoted by $C = C(D, L)$, where D and L represents the production costs of bank deposits and loans respectively.

The central bank reserve coefficient is α. The aggregate compulsory reserve is expressed as $R = \alpha D$. As such, the net interbank position of each individual bank is $R = (1-\alpha)D - L$.

The bank faces a downward sloping demand for loans $L(r_L)$ and upward sloping deposit function $D(r_D)$. Therefore, the inverse demand and supply functions are $r_L(L)$ and $r_D(D)$. The bank decides on the amount of loans L and deposits D which affect the corresponding interest rates (r_L, and r_D). The money market rate is denoted by r.

The profit function for the bank is thus given by the sum of interest margins on loans and deposits, net of production costs.

$$\pi(L, D) = r_L(L)L - r(D(1-\alpha) - L) - r_D(D)D - C(L, D) \tag{5.2}$$

Profit maximisation, assuming that the profit function is concave and twice differentiable, yields the following first order conditions:

$$\begin{aligned} \frac{\partial \pi}{\partial L} &= r'_L(L) + r_L - r - \frac{\partial C}{\partial L}(L, D) = 0 \\ \frac{\partial \pi}{\partial D} &= -r'_D(D)D + r(1-\alpha) - r_D - \frac{\partial C}{\partial D}(L, D) = 0 \end{aligned} \tag{5.3}$$

Thus, a monopolist bank stipulates the optimal stocks of loans (L^*) and deposits (D^*),which are independently determined. The optimal solutions for the loan and deposit rates, r_L^* and r_D^* are similarly determined. As such, the lending decision for the bank $L(r_L)$ is independent of the deposit supply function $D(r_D)$.

The elasticities of demand for loans, and supply of deposits are defined as $\varepsilon_L = -\frac{r_L L'(r_L)}{L(r_L)} > 0$, and $\varepsilon_D = \frac{r_D D'(r_D)}{D(r_D)} > 0$ respectively. Substituting these expressions in equation (5.3) yields:

$$\begin{aligned} \frac{r_L^* - r - C'_L}{r_L^*} &= \frac{1}{\varepsilon_L(r_L^*)} \\ \frac{r(1-\alpha) - r_D^* - C'_D}{r_D^*} &= \frac{1}{\varepsilon_D(r_D^*)} \end{aligned} \tag{5.4}$$

The left hand side of both lines in equation (5.4) are the Lerner indices (price minus

marginal cost divided by price) for loans and deposits respectively. The Lerner index describes the relationship between elasticity and price margins for a profit maximising firm. Equation (5.4) states that in equilibrium, a monopolist firm sets the quantity of loans and deposits in order to equate the Lerner indices to inverse elasticities. In the banking literature, the Lerner indices reflect market power in the loan and deposit markets. The greater the market power, the smaller the elasticities, the higher the Lerner index, and hence, the higher the intermediation margins (lower deposit rates and high lending rates). In monopoly markets, price is always greater than marginal cost, hence the Lerner index is closer to unit. However, for competitive markets, price equals marginal cost and the Lerner index becomes zero.

An important implication of the monopoly model is that intermediation margins can only be reduced if more substitutes for banking products (competition) are introduced in the market. Regulatory structures in an economy, for instance, barriers to entry, interest rate contols, and other structural regulations, shield existing banks from any potential competitors. As such, the intermediation margins are wide, and monopolist banks earn high profits.

Equilibrium solutions under perfect competition can be derived analogously. The competitive equilibrium solutions however yield the equation for the interest rate spread.

$$r_L - r_D = \alpha r + \frac{\partial C}{\partial L}(L, D) + \frac{\partial C}{\partial D}(L, D) \tag{5.5}$$

Equation 5.5 states that the intermediation margin in a perfectly competitive market is a function of the reserve ratio and sum of the marginal costs of servicing loans and deposits. As such, the competitive pressure in a perfectly competitive market is capable of inducing a fall in prices of financial goods and services. This will erode monopoly profits that otherwise would be enjoyed by banks in non-competitive markets (Besanko and Thakor, 1992).

The imperfect competition model of banking

The imperfect or oligopolist competition model of banking addresses some of the shortcomings of the monopolist model. This model approximates practical banking behavior. Banks operate in monopolistically competitive markets, with a finite number of other banks, N. As such, the imperfect models assume an imperfect Cournot competitive framework.

For simplicity, the study maintains the assumptions of the basic KM monopoly model of banking. Banks in the oligopolistic model have a linear cost function $C_n(L, D) = \gamma_L L + \gamma_D D$ where $n = 1, ..., N$. Each bank takes the amount of loans and deposits chosen by other banks as given. A bank chooses its own amount of loans and deposits and

maximises the following profit function[1].

$$\pi = \left\{ \left(r_L \left(L_n + \sum_{m \neq n} L_m \right) - r \right) L_n + \left(r\left(1-\alpha\right) - r_D \left(D_n + \sum_{m \neq n} D_m \right) D_n \right) - C(L_n,\, D_n) \right\} \tag{5.6}$$

Freixas and Rochet (1997) show that by solving the objective function, the Cournot equilibrium gives a vector for N firms, of the stock of loans and deposits, $(L_n^*,D_n^*)_{n=1...,N}$, such that for every n, the stock of loans and deposits (L_n^*,D_n^*) maximises profits for each bank. The solution derived gives a unique equilibrium. In equilibrium, each bank's stock of loans and deposits are $L_n^* = \frac{L}{n}$ and $D_n^* = \frac{D}{n}$.

Maximising the profit function yields:

$$\begin{aligned} \frac{\partial \pi_n}{\partial L_n} &= r_L'(L^*)\frac{L^*}{N} + r_L(L^*) - r - \gamma_L = 0 \\ \frac{\partial \pi_n}{\partial D_n} &= -r_D'(D^*)\frac{D^*}{N} + r(1-\alpha) - r_D - \gamma_D = 0 \end{aligned} \tag{5.7}$$

The results in equation 5.7 show that the optimal amounts of loans and deposits are determined solely by the two separate first order conditions. An important deduction is that the bank lending decisions are independent of the deposits' supply function.

Rearranging equation 5.7 and making use of the equilibrium solutions of r_L^* and r_D^* , the equations can be re-written in terms of elasticities as follows:

$$\begin{aligned} \frac{r_L^* - (r+\gamma_L)}{r_L^*} &= \frac{1}{N\varepsilon_L(r_L^*)} \\ \frac{r(1-\alpha) - r_D^* - \gamma_D}{r_D^*} &= \frac{1}{N\varepsilon_D(r_D^*)} \end{aligned} \tag{5.8}$$

The equilibrium solutions are similar to the ones obtained under the bipolar case of monopoly except that the elasticities in equation (5.8) are multiplied by the number of banks in the market, N. The monopolist equilibrium solution is therefore a case where $N = 1$. The implication of this analysis is that the larger the number of entrants (N large), the less the market power, the greater the elasticities. As a result, intermediation margins are lower than the ones obtained by the monopolist bank.

[1]Unlike in the perfect competition model, the oligopolistic model takes into account the influence of the stocks of loans and deposits on both the loan and deposit interest rates, $r_L(L)$ and $r_D(D)$, respectively.

In liberalised financial sectors, the regulations that limited competition are removed, and more financial intermediaries enter the market. As $N \rightarrow +\infty$, then the market structure becomes very competitive. Conversely, when competition is weak (N small), the Lerner index is large and banks have more market power. When $N = 1$, and price is higher than marginal cost, the bank earns more profits. Intuitively, if $N > 1$, and a firm decides to leave the industry, quantity falls, and price rises, and hence profits for the remaining firms increase.

Summary The theories of bank competition described in the preceding section reveal the following points that are pertinent to the formulation of the model in the empirical methods section.

- More market power (controlled markets) implies smaller elasticities, higher Lerner indices, and hence higher intermediation margins (bank profits)
- A firm in a monopolistically competitive firm maximises profits by setting the quantity of loans and deposits to equate the Lerner indices to the product of inverse elasticities and the number of banks in the market. With financial liberalisation, $N \rightarrow +\infty$, market power is reduced, the elasticities become large, the Lerner index is lower and intermediation margins are lower than those derived by monopolist banks, and hence bank profits are lowered.
- In the extreme case of perfect competition, monopoly profits are dampened by the effects of intense competition on prices of financial goods and services (price falls, and quantities increase).

5.3.2 Financial liberalisation and market structure

Financial sector reforms that encompass scrapping of bank entry and activity restrictions should ideally promote competition in the banking sector. The resultant degree of competition in turn determines market structure (degree of concentration) and therefore profit margins that banks realise. Early research on the structural effects of liberalisation on bank profitability started with the application of two competing hypotheses; (a) the market power hypothesis, which comprise the Structure-Conduct -Performance (SCP) paradigm and Relative Market Power hypothesis (RMP); and (b) the Efficient Market hypothesis (EM) (Bikker and Haaf, 2002; Molyneux and Forbes, 1995; Lloyd-Williams et al., 1994; Hannan, 1991).

Both theories underscore the importance of competition as a determinant of profitability. The studies based on this hypothesis have used market structure indicators such as con-

centration ratios and market share, to measure the degree of competition and efficiency respectively within the market.

The SCP hypothesis asserts that increased market power yields monopoly profits and hence predicts a positive relationship between profitability and degree of market concentration. Similarly, the RMP hypothesis asserts that firms with large market shares use their market power to extract higher profits. As such, there is a positive relationship between profits and market share. Contrary to these two market power theories, the EM theory argues that market concentration may simply be reflecting firm-specific efficiencies (Peltzman, 1977; Demsetz, 1973). Firms earn higher profits because they are more efficient, hence they obtain larger market shares and consequently the market becomes concentrated. Therefore, firms do not necessarily earn higher profits because they are exploiting market power associated with high concentration.

In fact, the efficient market hypothesis argues that firms earn higher profits because they have lower costs. This may be due to either superior management and production technologies (X-efficiency), or because they produce at more efficient scales than others (Scale efficiency). Market share and profits will be correlated but without any causal relationship between profits and concentration (Berger, 1995; Smirlock, 1985). The positive profit-concentration relationship thus reflects a positive correlation between size (market share) and efficiency.

The competing interpretations of the theoretical predictions of both the market power and efficient structure hypotheses in banking, prompted researchers to seek empirical consensus. Bourke (1989) and Molyneux and Thornton (1992) argue that increased deviations from competitive market structures are reflected in increased concentration and subsequent monopoly profits. In other studies, Gibson (2000) and Athanasoglou et al. (2006) confirm a positive relationship between measures of bank profitability and concentration in Greece and South-Eastern Europe respectively. Using data from 80 developed and developing countries, Demirguc-Kunt and Huizinga (1999) report that bank concentration ratio has a positive and significant impact on bank profitability. Chirwa (2001) similarly reports a significant relationship between monopoly power and bank profitability in Malawi. In contrast, Smirlock (1985), Berger (1995) and Athanasoglou et al. (2008) find no evidence in support of the SCP hypothesis, with results showing a negative relationship between concentration and profitability. To some extent, Smirlock (1985) confirms the RMP hypothesis as they find evidence of a positive (though weak) relationship between profit and market share, suggesting that increased market power raises profits.

Regarding the efficient market hypothesis, Berger (1995) reports a positive relationship between profits and market share as well as between profits and X-efficiency. Smirlock (1985) also finds a positive relationship between profit and market share. Findings by

Berger (1995) suggest that efficiency may both raise profits and lead to market share gains that in turn may increase concentration. Contrary to these findings, Chirwa (2001) finds no evidence to support the EM hypothesis in the Malawian banking sector.

5.3.3 Bank profit persistence

The importance of competition in determining profit levels has been emphasized in the literature on profit persistence first developed by Mueller (1977). The key argument in this body of literature is that profits that are earned in one period may persist in the following periods due to stringent entry restrictions that protect monopoly profits. Convergence of profits to their average levels is slow to non-existent in heavily controlled markets and high in liberalised and competitive markets. Ideally, the rate of return for firms in liberalised markets should tend towards the competitive rate over time thus effectively eliminating abnormal profits. Following this pioneering work of Mueller (1977), there is a well established body of literature on the persistence of profits in the manufacturing and service industries[2] (Glen et al., 2003; Glen et al., 2001; Goddard and Wilson, 1999; Roberts, 1999; Waring, 1996). Research that focuses on similar effects of competition on the rate at which above or below average bank profits subsequently dissipate is scant.

Levonian (1993) reports high levels of profit persistence for banks with supernormal profits in the US which is attributed to regulations that dampen forces of competition. Goddard et al. (2004) find evidence of significant profit persistence in European banking sectors despite growth in competition. The degree of persistence is higher in countries with more regulated banking sectors. Gibson (2000) and Athanasoglou et al. (2008) report the presence of moderate profit persistence in Greece. In another recent contribution, Goddard et al. (2011) find that persistence of profits is positively related to the size of entry barriers and negatively related to GDP per capita growth rate. Similarly Berger et al. (2000) confirm that barriers to competition have a significant influence on the degree of profit persistence. However, Bektas (2007) reports an absence of long run bank profit persistence in Turkey using data for the period 1989 to 2003. In a cross country study for SSA countries Flamini et al. (2009) find moderate persistence of bank profits suggesting a marginal departure from perfectly competitive conditions. Similarly, Biekpe (2011) and Mwega (2011) find positive profit persistence in Ghana and Kenya respectively.

[2]Goddard and Wilson (1999) review evidence on the persistence of profits in non bank firms.

5.3.4 Bank regulation and profitability

Of interest in the profit persistence literature as well as to the current study is how financial regulation policies and different government interventions in general affect bank profitability. Demirguc-Kunt and Huizinga (1999) find a negative relationship between variables of required reserve regulation and bank profitability, which may reflect banks' opportunity cost to holding reserves. The study also reports a negative relationship between deposit insurance and net interest margins. Arguably, net interest margins may be significantly depressed as banks are more likely to lend money at cheaper rates in the presence of deposit insurance than they would otherwise.

Zarruk and Madura (1992) similarly find that an increase in bank capital requirements or deposit insurance premiums has the effect of reducing bank net interest margins. Contrary to that, Gonzalez (2005) finds that the presence of deposit insurance in a country has a positive influence on bank charter value, while regulatory restrictions on bank activities have a negative influence.

Hellmann et al. (1999) argue that use of prudential regulatory measures such as stringent capital requirements, which often accompany deregulation processes, have the side effect of depressing bank profit levels and hence franchise values. This partly undermines the bank risk-taking incentives that the prudential regulatory measures sought to curb in the first place.

Athanasoglou et al. (2006) argue that there is lack of a formal verification of the effects of deregulation on bank profitability in the literature. On the one hand, deregulation opens up financial sectors to new institutions, and at the same time increase the size of existing ones. However, the effects of size on bank performance is ambigous. However, Athanasoglou et al. (2006) report a negative relationship between financial reform and bank profitability. In a seperate study, Kirkpatrick et al. (2008) acknowledges that financial liberalisation has important implications for bank performance in SSA, however, it has not improved profit and cost X-inefficiency in the banking sectors.

In line with the current study, Demirguc-Kunt and Detragiache (1998b) use correlation analysis between measures of bank profitability and a dummy variable for financial market liberalisation to assess the relationship between liberalisation and bank profitability. Whilst they give interesting results, this study argues that correlation may not necessarily imply causation. This thesis estimates the causal relationship between financial liberalisation and bank profitability.

5.3.5 Summary

The implication of this review is that while theory on bank competition predicts a negative relationship between concentration and bank profits, the empirical literature suggests different performance (profit) outcomes for both high and low concentrated market structures. However, evidence from the SSA region is very scant. The few exceptions, however, do not adequately account for the effects of financial liberalisation policies. Notwithstanding this, both theoretical and empirical studies agree that financial liberalisation has a significant impact on competition, market structure, and subsequently bank profitability. Regarding bank profitability, high positive profit persistence has been identified with less competitive markets. Finally, some bank regulations are reported to have a negative impact on bank profitability.

5.4 Estimation strategy

This section presents the model used for the empirical analysis. In addition, this section discusses the data employed, and gives a description of the variables used in the econometric analysis.

5.4.1 Model Specification

Research on determinants of bank profitability faces three main challenges. The first challenge pertains to potential endogenous bias that may arise from some of the profitability determinants. For instance, more profitable banks are capable of increasing their equity and therefore enhance profitability. Similarly, more profitable banks hire more employees and incur higher operating expenses and may become less efficient compared to less profitable banks. The second problem is the unobserved heterogeneity which likely arises from omitted variables and may cause correlations between some explanatory variables and the error term. Lastly, high persitance in profitability implies the inclusion of past profit levels as regressors in current profitability regressions. To address these potential problems, this study uses a two-step Generalised Method of Moments (GMM) estimator developed for dynamic panel models by Arellano and Bond (1991). The GMM estimator is designed for datasets with many panels and few periods, therefore, it suits this study's dataset perfectly.

To start with, the general dynamic panel data model is specified as follows:

$$Y_{ict} = \alpha + \lambda Y_{ic,t-1} + \beta Z_{ic,t} + u_i + e_{it} \tag{5.9}$$

where Y_{ict} captures profitability for bank i in country c for period t. $Y_{ic,t-1}$ is the one period lagged profitability. λ measures the speed of mean-reversion, with values between zero and one indicating the persistence of profits over time. λ close to zero signifies competitve markets, while λ close to 1, reflects markets with less competition. $Z_{ic,t}$ is a vector of explanatory variables. u_i is the unobserved panel effect, and e_{it} is the idiosyncratic error.

In this case $Y_{ic,t-1}$ is not strictly exogenous, it is correlated with the panel effects u_i, hence the Ordinary Least Squares (OLS) estimator becomes biased and inconsistent. The random effects estimator (RE) is biased and inconsistent, while the fixed effects estimator (FE) only becomes consistent as $T \rightarrow \infty$. As such, the model is no longer robust to estimate the determinants of bank profitability in this chapter.

The two step GMM is adopted to correct for the errors and bias arising from the unobserved panel level effects and the lagged dependent variable. The estimator removes the panel specific heterogeneity effect by first differencing equation (5.9). However, whereas first differencing equation 5.9 eliminates the individual effects u_i, it introduces another problem. The transformed error term, $e_{it} - e_{it-1}$, is correlated with the transformed lagged dependent variable, $y_{ic,t-1} - y_{ic,t-2}$, which is one of the explanatory variables. Thus OLS estimates in the first differenced model are inconsistent. Arellano-Bond (1991) propose using lagged values of the endogenous variables, as well as first differences of the exogenous variables as instruments.

The consistency of the two-step GMM estimator depends on the validity of the instruments as well as on the assumption that the error term does not exhibit any serial correlation. This study uses two tests proposed by Arellano and Bond (1991) to test these assumptions. The first test, the Sargan test for over-identifying restrictions, evaluates both the specification of the model and the validity of the instruments, by analysing the sample analog of the moment conditions used in the estimation preocedure. The other test is the Arrelano-Bond test for second order serial correlation. In addition, Bond (2002) notes that asymptotic standard errors of the two step estimators tend to be too small while t-ratios are too big compared to equivalent tests for similar sample sizes based on one step estimators. As a result, this study uses a finite-sample correction for the two step GMM estimator asymptotic variance provided by Windmeijer (2005).

The empirical model to be estimated is thus:

$$BP_{ict} = \alpha + \lambda BP_{ic,t-1} + \beta X_{ic,t} + \gamma RIM_{ct} + u_i + e_{it} \tag{5.10}$$

BP_{ict} represents profits for bank i in country c at time t and $BP_{ic,t-1}$ is the one period lagged profitability captured by either $ROAA$ (return on average asset), $ROAE$ (return on average equity), or NIM (net interest margin). $X_{ic,t}$ is a vector of bank specific variables,

while RIM_{ct} is a vector of regulatory, institutional and macroeconomic control variables. u_i is the unobserved panel effect, and e_{it} is the idiosyncratic error. β and γ are slope coefficients. A detailed discussion of the variables is presented in the next section.

5.4.2 Data and variable description

Data and data sources

The study is based on data from an unbalanced panel of 144 banks from 25 SSA countries over the 1996 to 2006 period. Table 5.4.1 presents the variables and data sources that are used in this chapter. All the annual bank balance sheets and income statement data are obtained from the Bankscope database. Macroeconomic data is from the World Bank's World Development Indicators and International Financial Statistics from the IMF. Data on liberalisation variables is drawn from the database by Abiad et al. (2008), and extended in this study. The database by Beck.et.al (2010) provides microeconomic annual banking data as well as data on bank concentration levels.

Model variables

The dependant variable

The dependent variable in the econometric model is bank profitability. This study considers banks return on average assets ($ROAA$), calculated as net profits of average total assets, as the main measure of bank profitability. The second and alternative profitability measure that is employed in this study is return on average equity ($ROAE$), which captures the return to shareholders on their equity. Several studies in the literature on bank profitability have used these profit measures and derived econometrically plausible results (See for instance Flamini et al., 2009; Athanasoglou et al., 2008; Goddard et al., 2004; Demirguc-Kunt and Huizinga, 1999). In robustness checks, this study employs net interest margin (NIM), as a proxy for bank performance. Although NIM does not directly measure bank profitability, it is a rough index for bank efficiency, and as such, it can be used as a performance measure.

Table 5.4.1: Variables and Data Sources

Variable symbol	Variable Discription	Source
Profitability measures		
ROA	Return on average assets	Bankscope, FSDD*
ROE	Return on average equity	Bankscope, FSDD
NIM	Net interest margin, (interest received -interest paid)/ total earning assets	Bankscope, FSDD
Bank specific measures		
Size	Logarithm of total assets	Bankscope, FSDD
$Size^2$	$(\text{Logarithm of total assets})^2$	Bankscope, FSDD
Capital	Equity/total assets	Bankscope, FSDD
Cr_risk	Credit risk. Net loans/total assets	Bankscope
Risk	non-performing loans/ total loans	Bankscope, FSDD
fown	Share of assets of foreign banks in total bank asets	Claessens et.al (2008)**, authors' computations
Conc	Concentration ratio, assets of three largest banks/total bank assets	FSDD
CIR	Cost to income ratio	Bankscope
Costs	log (Bank overhead costs)	Bankscope,FSDD
Regulatory, institutional and macroeconomic measures		
finref, cr, ent, ir, intk sup,pvt,secmkt	Financial reform index, reform of controls on credit, entry, interest rate, capital account, supervision,privatisation and security markets	Abiad et.al, Author's compilation
complib	Competitive liberalisation index	
gdppc	logarithm of GDP per capita	WDI
Gov	Governance, index ranging from -2.5 to 2.5 with higher values corresponding to better outcomes	Kaufmann et.al. 2007
Press freedom	Freedom of media ranging from 0 to 2 with higher values corresponding to more freedom.	Freedom House
rgdpg	Rate of growth of real GDP	WDI
infn	Rate of change of GDP deflator	WDI

*FSDD refers to the Financial Structure and Development Database, Beck.et.al (2010)

** Foreign bank has at least 50% foreign ownership, see Claessens et al. (2008).

Bank-specific variables

The logarithm of total assets is included to control for bank *size*. Banks operating in financial sectors with few large banks may earn high profits resulting from efficiency gains due to economies of scale. As a result, low costs for larger banks allow them to earn higher

profits as long as competition remains low. A banking system with a few large banks may also earn high profits by charging high lending rates while maintaining low deposit rates. However, there is a possibility that size may have a negative impact on profits especially when banks become too large and bureaucracy cause inefficiency. To capture this nonlinear relationship, this study uses the logarithm of banks' total assets ($size$) and their square ($size^2$) (See for example Berger et al., 2010; Flamini et al., 2009).

This study uses the ratio of bank equity to total assets to proxy for bank capitalisation ($capital$). Well capitalised banks are less prone to bankruptcy costs and lower costs of capital. Therefore, higher bank equity ratios have a positive impact on bank profitability (see for example Naceur and Omran, 2011; Athanasoglou et al., 2008). However, capital levels may affect bank profitability as a regulatory measure. Higher capital adequacy, as a regulatory cost, is expected to reduce the amount that banks can invest to earn profits. In addition, while banks with more capital make more profits, profitable banks also invest in more capital. As such, capital is treated as endogenous in the empirical estimations.

The ratio of net loans to total assets is used to measure bank credit risk (cr_risk). High credit risk may be associated with high profit levels since riskier loans earn the highest yields. An alternative measure is the ratio of non-performing loans to total loans.

Concentration and ownership

The effect of competition on market structure and hence profitability is approximated by bank concentration ratio ($conc$). Admittedly, the recent literature on SCP hypothesis criticises the use of such structural indicators of competition arguing that they have a weak correlation with competition, for instance, competition can still be present in highly concentrated markets. Furthermore, concentration seem to have a weak correlation with profitability when measures of market share are included in the regressions. The proposed non-structural measures such as the Learner and Rose-Panzer indices. However, the computations of these indices requires data that is beyond the scope of this study. Therefore, despite the cited limitations, this study uses the 3-firm concentration ratio as an indicator of bank competition.

An increase in competition resulting from financial liberalisation is expected to reduce concentration levels. Thus, the measure of concentration reflects to a greater extend, regulatory restrictions, or alternatively, liberalisation of such restrictions on competition. This study uses the share of assets of the 3 largest banks in total bank assets to capture concentration levels in each country. The SCP hypothesis predicts that banks in concentrated markets may earn above normal profits compared to the profits that their counterparts in competitive markets may earn. On the other hand the efficient-structure hypothesis predicts that more efficient firms earn higher profits, obtain larger market shares, and consequently the market becomes concentrated, as such a measure of efficiency, cost to income

ratio (cir), is included in some of the regressions.

Overhead costs ($costs$) are considered to capture the effects of operating expenses. This variable captures managerial inefficiencies and operating expenses that may erode profits unless they are passed on to consumers. As such, a negative effect is forecast on the coeffient for bank costs.

Foreign ownership ($fown$), measured as a proportion of foreign bank assets in total assets is considered to be an indicator of foreign penetration and hence measures how open the banking sector is to competition. An alternative measure of this variable is the total number of foreign banks as a ratio of total banks in the banking system ($fown1$). Athanasoglou et al. (2006) argue that presence of foreign banks renders domestic banks more efficient due to (1) increase in competition which drives domestic banks to cut costs, (ii) the technological expertise in risk management and co-orperate governance (ii) the technological spillovers, brought about by the foreign banks.

Macroeconomic indicators

Real GDP growth ($rgdpg$) is used as a proxy for economic fluctuations. Adverse economic growth exposes banks to risk. For instance, periods of low economic growth, such as recessions, adversely affect asset quality, and increase loan defaults and thereby reducing bank returns. Demirguc-Kunt and Huizinga (1999) find a positive relationship between bank profitability and business cycle.

Inflation ($infn$) is included to control for macroeconomic volatility as measured by the change in the GDP deflator. High inflation rates are usually associated with high loan rates and hence high bank returns. However, Naceur and Omran (2011) and Flamini et al. (2009) argue that if agents do not correctly forecast inflation, then unexpected changes in inflation could raise costs as banks fail to appropriately adjust interest rates, potentially decreasing bank profits.

Regulatory and institutional variables

To capture the effects of regulatory reforms on bank profitability, the study considers financial liberalisation indices $finref$, a composite index of seven liberalisation policies, and $Complib$, an index of competitive liberalisation variables comprising 3 liberalisation dimensions. These include elimination of restrictions on entry and scope of bank activity, capital account, and security market policy. Angkinand et al. (2009) and Omori (2006) argue that restrictions on equity markets, international capital transactions and restrictions on entry and activity- all have the same effect on the competitive environment in which banks operate. Athanasoglou et al. (2006) use an index that captures the progress for liberalisation and institutional reforms of banking sectors in countries in South Eastern Europe. The study also considers the effects of the seven liberalisation policies and indices

constructed from these policies. $Crgdp$, a measure of financial structure and development, is also used as an alternative measure for the level of financial liberalisation.

The logarithm of GDP per capita ($lgdppc$) controls for the level of economic development in the country and hence general institutional quality. Press freedom ($pressf$) as well as an index for governance (gov) control for the quality of the regulatory environment in which banks operate. Better institutions are likely to boost competition, as such a good institutional environment is likely to have a negative impact on bank profitability. The summary statistics of the model variables are presented in table C.0.2 in the appendix.

5.5 Model Estimation and Result Analysis

5.5.1 Correlation analysis

Table 5.5.1 provides a summary of results for correlations between different profit measures and financial liberalisation policies. The first column outlines the composite liberalisation index, while the second column reports results pertaining to the competitive liberalisation index. Columns (3) to (9) present results for the rest of the liberalisation components. Although these results are from simple correlation analysis, they give a preliminary indication of the relationship between liberalisation and measures of bank profitability.

The results show a positive correlation between total liberalisation and return on assets, although the correlation is not statistically significant. However, competitive liberalisation leads to lower bank profits. Similarly, return on equity has a negative relationship with competitive liberalisation. In fact, all the liberalisation policies except bank supervision are negatively related to two of the profitability measures: return on assets and return on equity. Conversely, $finref$, ent, ir and cr all have a positive relationship with net interest margins. However, the statistical significance levels are generally weak.

There is a positive and significant correlation between bank capitalisation and the overall liberalisation index, removal of stringent entry requirements as well as privatisation. Intuitively, financial liberalisation leads to increased bank capitalisation, which has the effect of reducing bank profits. This relationship holds when restrictions on entry are removed, where a greater share of banks in a country are privately-owned, as well as when restrictions on foreign participation in security markets are minimised.

Table 5.5.1: Correlation Coefficients: Financial Liberalisation and Franchise Value Indicators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Finref	complib	ent	ir	cr	sup	pvt	intk	secmkt
ROAA	0.04	-0.08**	-0.155*	-0.191***	-0.097*	0.06	-0.04	-0.077	0.13***
	(0.33)	(0.05)	(0.014)	(0.002)	(0.06)	(0.16)	(0.50)	(0.21)	(0.00)
ROAE	-0.05	-0.03*	-0.06	-0.04*	-0.04	0.04	0.17***	-0.11**	0.10*
	(0.2)	(0.01)	(0.18)	(0.08)	(0.29)	(0.40)	(0.00)	(0.01)	(0.02)
NIM	0.13*	0.09	0.15*	0.29**	-0.17**	0.17**	0.23*	-0.12**	0.04
	(0.02)	(0.04)	(0.01)	(0.05)	(0.02)	(0.00)	(0.00)	(0.01)	(0.35)
Capital	0.34***	0.14*	0.07	0.16**	-0.10	0.05	0.09	0.10	0.05*
	(0.000)	(0.06)	(0.12)	(0.00)	(0.02)	(0.20)	(0.16)	(0.02)	(0.02)
Size	-0.16***	-0.24***	-0.41**	0.13***	-0.12**	0.17***	-0.25**	-0.63***	0.35
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.02)	(0.00)	(0.37)
Conc	-0.183***	-0.50***	-0.45***	-0.36***	0.01	-0.29***	-0.38***	-0.04	-0.27***
	(0.002)	(0.00)	(0.00)	(0.00)	(0.74)	(0.00)	(0.00)	(0.37)	(0.00)
f.own	0.27***	-0.03	0.34***	0.13***	0.44***	0.27***	0.21***	0.02	-0.44***
	(0.00)	(0.47)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.62)	(0.00)
cr_risk	0.18**	0.06**	-0.04	-0.34***	0.04	-0.31***	-0.22***	0.31***	-0.26
	(0.02)	(0.01)	0.36	(0.00)	(0.30)	(0.00)	(0.00)	(0.00)	(0.00)

Pearson correlation coefficients are reported. P-Values in parentheses

* ,** and ***means sig at 10%,5% &1% respectively

The results suggest that total liberalisation and bank privatisation are associated with lower bank concentration ratios though with greater foreign participation. Increasing entry by foreign players alters market structures from being monopolistic to competitive. Consequently, franchise values are reduced as a result of a decline in monopoly profits. The positive coefficient on the size variable, though weakly significant on the liberalisation index, seem to suggest that deregulation may promote mergers or conglomerates that make high profit margins from scale efficiency. The other correlations are not significant.

Overall, these results are consistent with Demirguc-Kunt and Detragiache (1998b) findings, although their focus is on interest rate liberalisation only.

5.5.2 Dynamic panel model estimation results

Table **5.5.2** presents results from estimating the model in equation (5.10)[3]. The Wald tests for the different regressions report statistics that reject the null hypothesis of joint insignificance of parameters. This confirms that the estimated models fit the data well. Tests for first and second order serial correlation are conducted to check the reliability of the model estimates. Arellano and Bond (1991) note that if the e_{it} are serially un-correlated in equation (5.9) then the first differenced residuals show first order serial correlation but not second order serial correlation. This is confirmed by the Arellano-Bond test that rejects the null hypothesis of no first order autocorrelation in first differenced errors. The results show no second order serial correlation which confirms that the moment conditions used to identify parameters are valid. Thus, there is no evidence of model mis-specifications. The Sargan tests reports insignificant chi-square for all the 8 regressions reported in Table 5.5.2, indicating that the overidentifying restrictions are valid.

Financial liberalisation, competition and bank profitability

Table 5.5.2 reports mixed results on the relationship between measures of financial liberalisation ($finref$, *complib*, and $crgdp$), and bank profitability. Columns (2) and (5) show a negative and significant relationship between *complib* and bank return on assets and return on equity respectively. This seems to suggest that as competition intensifies, banks face declining returns. This result concurs with that presented by Athanasoglou et al. (2006), who note that banks in highly competitive environments may lend to riskier portfolios characterised by low returns. Furthermore, this result is consistent with findings by Koeva (2003) that increase in competition following financial liberalisation lowers spreads and profitability in Indian banks. The current result is further substantiated by results presented in columns (2) and (6), which show a negative relationship between $crgdp$ and bank $ROAA$ and $ROAE$ respectively. The ratio of domestic credit to GDP is used as an alternative proxy for financial liberalisation.

By contrast, the coefficient on total financial liberalisation bears a positive sign, albeit not statistically significant for both measures of bank profitability (columns 1 and 4). This seems to suggest that financial liberalisation in total may increase bank returns. A possible explanation for this result may be that as financial systems adopt liberalisation policies, initial competition may force them to take on risky portfolios that yield high returns. However, the risky portfolios may yield less return later on as competition intensifies. In addition, high levels of competition may increase efficiency which in turn increase profit levels

[3]Year dummy variables included to account for potential unobservable time effects were generally not statistically significant, hence were dropped from the final estimations.

Table 5.5.2: Financial Liberalisation and Bank Profitability:Two-step GMM Estimation Results

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ROAA_1	0.25***	0.24**	0.27***				0.28***	
	(0.09)	(0.10)	(0.04)				0.08	
ROAE_1				0.19***	0.22***	0.23***		0.30**
				(0.07)	(0.06)	(0.07)		0.07
Capital	0.08*	0.16**	0.08**	-0.85**	-0.72*	0.14**	0.13*	-0.41*
	(0.07)	(0.08)	(0.16)	(0.43)	0.40	(0.09)	0.08	0.16
Cr_risk	0.15***	0.19**	0.14**	0.16	0.14*	0.55	0.09*	0.14**
	(0.05)	(0.07)	(0.05)	(0.19)	(0.09)	(0.56)	0.04	0.07
Costs	-2.8**	-2.74***	-2.9***	-2.2***	-1.9**	-2.0*	-2.20***	-1.60**
	(0.8)	(0.89)	(0.9)	(0.71)	(0.60)	(0.70)	0.88	0.60
Size	2.3***	4.21*	5.02**	-1.3*	-0.45*	-0.40	-1.39***	2.1*
	(1.5)	(2.21)	(2.5)	(0.37)	(0.36)	(0.30)	0.30	0.30
Size2	-0.28*	-0.34*	-0.29*	0.10*	0.40*	0.22*	-0.35**	0.69**
	(0.2)	(0.2)	(0.2)	(0.04)	(0.2)	(0.07)	0.17	0.21
gdpg	0.13***	0.07**	0.11***	1.17**	1.21**	0.08**	0.10***	0.26***
	(0.04)	(0.03)	(0.03)	(0.57)	(0.53)	(0.04)	0.04	0.10
Infn	0.03**	0.01**	0.03**	0.23**	0.21**	0.18**	0.03**	0.17*
	(0.01)	(0.01)	(0.01)	(0.09)	(0.10)	(0.08)	0.01	0.09
Conc	-0.85	-1.6	-5.6	-0.40	-0.49	-0.6	-1.11	-0.36
	(0.58)	(0.57)	(2.8)	(0.35)	(0.38)	(0.4)	0.56	0.30
Finref	0.46			0.18				
	(0.22)			(1.8)				
Complib		-0.24**			-0.31*		-0.42**	-0.17***
		(0.08)			(0.10)		0.13	0.05
Crgdp			-0.14***			-0.34*		
			(0.05)			(0.09)		
fown	-0.07	-0.05	-0.08	0.16*	0.08	0.09	0.07	0.08
	(0.04)	0.04	(0.04)	(0.46)	(0.61)	(0.07)	0.04*	0.07
gdppc	0.63**	0.71**	0.68**	0.56*	0.70*	0.40*	0.38**	0.53**
	(0.15)	0.21	(0.19)	(0.21)	(0.23)	(0.20)	0.17	0.32
pressf	-0.22	-0.34	-0.72	-0.18	0.15	-0.20	-0.45	-0.23
	(1.4)	(1.33)	(1.3)	(0.11)	(0.38)	(0.30)	1.06	0.14
gov	-0.16	-0.41	0.18	-0.11	-0.20	0.10	-0.11	-0.01
	(1.06)	(1.40)	(1.35)	(1.55)	(0.39)	(0.31)	0.86	0.18
cir							-0.04**	-0.14**
							0.01	0.08
Wald Chi2()[1]	124.01***	101.18***	100.12***	134.45***	104.25***	145.11***	169.14***	180.11***
AR(1)[2]	-3.06***	-2.62**	-2.6***	-2.4**	-3.2***	-3.0***	-2.65**	-3.7**
AR(2)[3]	0.40	0.18	0.31	0.3	1.10	0.21	-0.35	-0.9
Sargan Test[4]	112	107	112	114	111	107	101	99

Windmeijer-Corrected robust standard errors in parentheses;*** p<0.01, ** p<0.05, * p<0.1

1 Wald statistic: H_0 All coefficients are zero.

2,3 AR(1) and AR(2) tests for 1^{st} and 2^{nd}-order autocorrelation, H_0 No autocorrelation of residuals

4 Sargan Test of overidentifying restrictions: H_0 Overidentifying restrictions are valid

Effects of individual liberalisation policies

Table C.0.3 in the appendix presents results pertaining to the effects of individual liberalisation policies on bank profitability[4]. Contrary to theoretical predictions, the result in column (1), though not statistically significant, suggest that removal of controls on credit allocation has a negative effect on bank profitability. Directed credit policies are expected to reduce bank profitability given that banks are forced to charge below-market clearing interest rates for loans to priority sectors. As such, removal of such controls is expected to have a positive effect on bank profitability. A possible explanation for this unexpected result may be that removal of directed lending requires new standards of credit and risk management for banks which imposes some cost on banks. Together with other operating expenses, such costs negatively affect bank profits.

Columns (2) and (3) show a negative and statistically significant relationship between removal of entry and interest rate controls and bank profitability. This suggests that as more players enter the market, the competitive pressure increases, and this forces banks to offer increasingly competitive margins on loans and deposits, thereby lowering bank profitability. This result is comparable to findings by Keeley (1990) that removal of entry barriers has a negative influence on bank performance ratios. In addition, Goddard et al. (2011) suggest that bank profits are low in banking sectors with less strict entry requirements. Similarly, Koeva (2003) finds that entry deregulation is associated with decline in bank profitability in India.

Reforms in prudential regulation and bank supervision significantly increase bank profitability. This result supports observations that most banks in SSA economies with weak regulatory structures face large numbers of irrecoverable loans as they have little or no recourse against delinquent borrowers (Brownbridge and Harvey, 1998). Therefore, improving regulatory institutions effectively reduces non-performing loans and strengthens bank balance sheets.

Table C.0.3 column (5) presents positive and significant results on the relationship between privatisation of former state-banks and bank profitability. This result is in line with observations made by Brownbridge and Harvey (1998) that state owned banks in a majority if liberalising African countries perform dismally compared to privately owned banks. This result therefore suggests that privatisation of previous loss-making state-owned banks improves their performance. This concurs with findings in Boubakri et al. (2005) that profitability increases in post-liberalisation periods for privatised banks in 22 developing countries across the world. Furthermore, Beck et al. (2005) find evidence of improved perfomance in nine privatised banks in Nigeria.

[4]For results presented in Table C.0.3, profitability is measured by ROAA. Results obtained from using bank return on equity are not significantly different and hence are not reported.

With regard to capital account liberalisation and reforms in securities markets (columns 6 and 7), these policies have the effect of reducing bank profits. While the effect of removal of controls on international capital movement is insignificant, liberalisation of security market policies has a significant effect. Stock market development and lowering barriers to international investment are expected to enhance bank perfomance through their positive effect on economic development and hence firm perfomance. However, the negative results seem to support the argument provided by Angkinand et al. (2009) that relaxing restrictions on these two policies has the same impact on the competitive environment in the banking sector. The stock market offers an alternative financing option for firms. Thus, increased competition has the effect of reducing bank margins and profitability.

Effects of market concentration

Regarding, the effect of concentration, the empirical results presented in Table 5.5.2 suggest a negative but insignificant effect of market concentration on both measures of bank profitability. Perhaps this suggests that high concentration levels in SSA banking systems do not necessarily indicate low competition. Instead, presence of competition in concentrated markets lowers bank profitability through reduction in loan rates or increase in deposit rates.

If the measure of concentration in this study reflects the level of regulatory restrictions on competition, then controlling for financial liberalisation policies that had effects on competition and hence concentration levels justifies the negative coefficient on *conc*. In addition, Demirguc-Kunt et al. (2003) argue that any positive relationship between bank concentration and bank margins is expected to vanish once regulations pertaining to entry and actitvity restrictions are controlled for. This outcome is consistent with Berger (1995) who posits that once institutional and regulatory variables are controlled for, concentration is negatively related with profitability. However, Flamini et al. (2009) find no significant relationship between market concentration measures and bank profitability in SSA banking sectors.

Studies that report a negative relationship between concentration and bank profitability justify their results based on bank efficiency. Higher operational efficiency may induce efficient banks (facing lower costs) to charge low loan rates and offer high deposit rates, and as a result incur low net interest margins. As such, higher efficiency can be associated with low profitability. To verify this explanation, a measure of bank efficiency, cost to income ratio (*cir*) is included in the regression. The results are presented in columns (7) and (8) of Table 5.5.2[5]. The coefficient on *cir* is negative and significant when using either measure

[5]Using either $finref$ or $crgdp$ as measures of financial liberalisation does not produce significantly different results.

of bank profitability. This seems to suggest that improvements in efficiency are translated into improvements in profitability. Therefore, the outcome on *cir* does not render support for the "high efficiency-low profit" theory in SSA banking systems. However, Naceur and Omran (2011) reports a negative and significant relationship between bank concentration, efficiency, and profitability in MENA countries.

Bank specific variables and profitability

The coefficient on lagged profitability is positive and significant in all the regressions presented in Table 5.5.2 ranging from 0.19 to 0.30. This confirms the dynamic character of the model specified in this chapter. Furthermore, the size of the coefficients suggests moderate persistence in bank profits, and hence marginal departure from perfectly competitive system.

The value of the coefficient on lagged profits measured by return on assets is higher in regressions for individual liberalisation policies compared to regressions on total liberalisation ($finref$) and competitive liberalisation (*complib*). For instance, when considering removal of credit controls only, the coefficient is 0.27 as shown in Table C.0.3 compared to 0.25 and 0.24 shown in columns (1) and (2) of Table 5.5.2, where the measure of financial reform is the total liberalisation and competitive liberalisation indices respectively. This suggests that persistence levels are negatively related to comprehensive levels of financial liberalisation.

Overall, the results on the lagged dependent variables in all regressions are consistent with findings by Goddard et al. (2011) that profit persistence is positively related to the size of entry barriers. Goddard et al. (2004) similarly find high persistence in profits for countries where high levels of government regulation seem to have insulated banks from competition. Similar results were also found by Biekpe (2011), Mwega (2011) and Flamini et al. (2009) for banks in Ghana, Kenya and SSA countries respectively.

The effect of the capital variable depends on whether profitability is measured in terms of return on assets or on equity. In the first scenario, columns (1) to (3) in Table 5.5.2 report a positive and significant relationship between return on assets and the ratio of equity to total assets, the variable for bank capital. This result suggests that banks that hold more capital have more opportunities to increase investment in earning assets, hence profitable returns. Furthermore, this agrees with the assertion that banks with a higher equity to total asset ratio have fewer external funding needs, and hence fewer costs related to external debt. In addition, the literature posits that highly capitalised banks are safer (more solvent), and remain profitable even during economic downturns. This is consistent with findings by Trujillo-Ponce (2011), Athanasoglou et al. (2006), Goddard et al. (2004),

and Bourke (1989). Demsetz et al. (1996) also report that banks with high charters hold more capital. On the other hand, bank capital has a negative effect on profitability of bank equity. This result implies that banks with more equity have less return on equity. This may be explained by the fact that returns for banks holding more capital are spread over a wider capital base. Furthermore, Trujillo-Ponce (2011) notes that the inverse relationship between the equity to asset ratio (capital) and return on equity reflects a decrease in bank leverage levels since ROE can be decomposed as $ROA * 1/(Equity/Total\ assets)$. Therefore, the inverse relationship does not reflect a decrease in wealth arising from the capital invested. This result is consistent with findings by Dietrich and Wanzenried (2011).

The coefficient of credit risk is generally positive and significant. This is consistent with assertions that banks ask for high premiums for investments in perceived high risk assets. Naceur and Omran (2011) similarly find a positive relationship between credit risk and net interest margins for banks in the Middle East and North African (MENA) region.

On the other hand, overhead costs present a negative and significant impact on profitability of either bank assets or equity. This result suggests that high costs in SSA banks have the effect of eroding bank profits.

The empirical results pertaining to the effect of bank size show a positive and significant effect of bank size on bank return on assets. The implication is that big banks benefit from efficiency gains as well as the relative degree of market power that they have. Furthermore, big banks are able to engage in a wider scope of income generating activities. This result is consistent with findings reported by Athanasoglou et al. (2006). The negative, though weakly significant coefficients on $size2$ (columns (1) to 3) suggest that the impact of size on bank return on assets is non-linear. The results in columns (4) to (6) suggest that large banks are less profitable when considering return on equity. However this effect is statistically not significant.

Macroeconomic and institutional variables and bank profitability

Most of the macroeconomic variables have expected signs and are generally significant. Real GDP growth shows a positive impact on bank profits. Inflation has a positive and significant effect on bank profitability as expected.

GDP per capita, a proxy for institutional development, has a positive and significant effect on bank profitability. This relationship suggests that banks in developed economies earn more profits compared to their counterparts in developing economies with poor institutional structures. Banks in poor economies maybe susceptible to loan defaults and hence low profits. This may be aggravated by weak contract enforcements which are typical in such countries. The other institutional measures, press freedom and quality of governance, are

insignificant in determining bank profits in SSA. Flamini et al. (2009) use a Corruption Perception Index and Ease-of-doing Business Index to proxy the legal environment in SSA and find that they both have no significant impact on bank profitability. Lastly, foreign ownership of banks in SSA does not have any significant effect on profitability.

5.5.3 Robustness checks

This study performs several tests to confirm the main empirical results of this chapter. Firstly, the study employs NIM as the dependent variable. The results presented in Table C.0.4 in the appendix do not differ much from the ones reported previously. One notable exception is the positive coefficient on the variable for market concentration, *conc* in column (2). Although the coefficient is statistically not significant at the 5% level, the result suggests that concentrated markets earn higher margins as suggested by the SCP theory. In addition, together with the negative and significant coefficient on *cir*, the result suggest that the increase in profitability in concentrated markets maybe a result of improved efficiency. Higher efficiency (low *cir*) translates to high profitability, resultantly, efficient and profitable banks may gain market share and hence the market becomes concentrated. Otherwise the coefficient on *cir* remains negative and insignificant in the other 3 specifications, confirming our earlier results.

Another exception is the positive coefficient on the cost variable. This result suggests that bank net interest margins increase with overhead expenses. As such, banks in SSA pass on most of their overhead costs to customers through higher spreads. On the other hand, wider margins are usually associated with riskier loans which entail high monitoring costs.

The size of the coefficients on lagged values of net interest margins are larger (as high as 0.53) than those on lagged return on assets as well as equity. This suggests that profit persistence is higher for net interest margins than for return on assets and equity. The implication of this result is that there is less competition using interest rates, probably suggesting that interest rates are not completely liberalised in SSA banking systems.

The financial liberalisation variables have negative and significant coefficients. This confirms the results reported previously, that financial liberalisation causes banks to offer increasingly competitive margins on loans and deposits, which in turn reduces bank profitability.

Secondly, the study estimates a linear regression model in the spirit of Bourke (1989) and Athanasoglou et al. (2006). Results presented in Table C.0.5 confirm that the Hausman test rejects the null hypothesis that the coefficients between fixed effects and random effects are not systematic, weighing in support for the fixed effects model. In addition the Breusch-Pagan LM test confirms the presence of fixed effects in the data, as such this

study estimates a fixed effects model in place of the dynamic panel model to check if the results are sensitive to the estimation technique.

Table C.0.5 in the appendix present the results from estimating the linear model applying the least squares methods of fixed effects. The reported results agree to a greater extend with those presented earlier. Regarding bank specific characteristics, the results still mantain that bank size, capital, and credit risk positively affect bank profitability while overhead costs and inefficiency have negative effects. Macroeconomic growth and stabilty similarly have positive effects while measures of institutional environment do not have significant effects. Of interest, the index for total liberalisation exerts no influence, while competitive libelisation index as well as ratio of private sector credit to GDP both reduce bank profitability. Finally, foreign ownership, as well as market concentration do not have any influence on bank profitability.

5.6 Summary and Conclusion

This chapter investigated the determinants of bank profitability in SSA, accounting for the effects of financial liberalisation policies. A majority of SSA countries implemented financial liberalisation policies in varying degrees over the past few decades, which significantly affected the market structures banks operated in. A survey of the literatute highlights that research on the impact of these reforms on bank performance has focused mostly on developed countries, emerging markets, and developing countries outside SSA. This has left a knowledge gap regarding the profitability of SSA banks following implementation of a wide array of liberalisation policies.

This chapter uses annual bank and country level data in 25 SSA countries to assess the extent to which seven liberalisation policies, (and indices constructed from these seven policies) and market structure determine bank profitability. The main profitability measure employed in the econometric analysis is return on average assets, while return on average equity is employed as an alternative profitability measure. The analysis covers the 1996 to 2006 period and controls for bank specific, macroeconomic as well as institutional factors.

The study tests the hypothesis that liberalisation policies have a negative impact on the levels of bank profitability. The results from correlation analysis among different liberalisation components and measures of bank profitability, generally show a negative and significant relationship. Specifically, competitive liberalisation, removal of entry barriers, interest rate and credit controls are negatively correlated with bank profitability measures.

The results from the correlation analysis are substantiated by regression results from a dynamic panel model in a two step GMM framework. The results affirm that the extent

of financial liberalisation in different financial markets provides one of the most important explanations for bank returns in the region. While the variable for total liberalisation does not seem to have any explanatory power for bank profitability per se, the one for competitive liberalisation policies suggests a negative impact on bank profitability. Pertaining to individual liberalisation dimensions- removal of controls on entry, interest rates, and security market policies significantly decrease bank returns. On the other hand reforms directed at prudential regulation and bank supervision, and bank privatisation significantly increase bank returns.

Regarding bank specific variables, the results confirm that higher inefficiency has a negative influence on bank profitability in SSA. As such, countries that liberalised their financial sectors targetting to improve efficiency would expect improvements in bank profitability as well. The results also confirm low profit persistence which suggests significant levels of competition in the banking sectors in SSA. Bank capitalisation significantly increases bank return on assets. In addition, credit risk significantly increases bank returns, while bank overhead costs have an effect of eroding bank profits. The effect of bank size on profitability is non-linear.

Finally, real GDP growth, GDP per capita, and inflation all have positive effects on bank profits. Bank concentration, foreign ownership and the legal and institutional environment, do not appear to have any explanatory power for bank profitability.

The results obtained when using return on equity as well as net interest margin as the dependent variables confirm the key results from using return on assets as the measure of bank profitability. Finally, the results from the main model are not sensitive to the estimation techniques employed. Estimating a fixed effects model gives similar results.

Chapter 6

Financial Liberalisation, Franchise Value and Banking Crises in Sub Saharan Africa

6.1 Introduction

One of the key findings of the theoretical literature on bank regulation is that financial sector reforms lead to more stable banking systems. Financial liberalisation brings stability to the banking sectors by promoting competition which enables diversification of bank portfolios and adoption of advanced risk-management standards (*World Development Report*, 2002; Demirguc-Kunt et al., 1998). Some researchers have found empirical evidence in support of this liberalisation-stability hypothesis (Boyd et al., 2006; Boyd and De Nicolo, 2005).

However, another body of research supports the liberalisation-fragility hypothesis that links high incidences of banking crises to financial liberalisation through increased competition and reduction of bank profits (Berger et al., 2009; Hellmann et al., 2000; Keeley, 1990). The previous chapter of this thesis suggests that financial liberalisation has a negative effect on bank profit, which transmits to lowering capitalised values of expected future profits (franchise or charter value). Franchise value serves as a self regulatory device by discouraging banks from engaging in high risk bahaviour. Therefore, banks with low charter values may branch into riskier lines of business, since what they stand to lose, in the event of bank failure, is lower compared to banks with a high charter value.

A bank franchise can originate either externally from the market within which the banks operate (market-related) or from within the banking system (bank related) (Demsetz et al., 1996). Market-related bank franchise is made valuable by: (i) regulations that limit the

supply of bank charters through restricting the number of bank licences and (ii) various regulations that limit inter-bank competition as well as competition by non-bank firms. As such, anti-competitive laws that exist in controlled financial markets allow banks to earn supernormal profits and hence acquire high franchise values. However, with financial liberalisation, franchise values decrease while opportunities for risky investment increase. Banks with low franchise values have higher expected rate of return from taking risk than those with high franchise values. The latter would therefore only have an incentive to hold a more risky portfolio if the value of their franchise decreases relative to the rate of return on the risky portfolio.

Bank-related franchise values arise from efficiency differences amongst banks and variations in the value of lending relationships established by banks. In this case the value of the franchise is increased by banks serving their clients efficiently and establishing long-term relationships with them. As a result banks gain informational advantage over other banks and hence generate informational rents (Demsetz et al., 1996). As long as banks appropriate at least part of these rents, they have an incentive to limit their risk exposure and continue to enjoy the value of the relationship. However, as competition increases, banks are inclined to reduce expenditure on establishing client relations in a bid to sustain their profits (Besanko and Thakor, 1995). As a result, they face reduction in the rents, and in incentives to hold safe portfolios .

Notably, both market and bank-related sources of bank franchise are more valuable in heavily regulated financial sectors. The goal of this chapter is to empirically test if the link between financial liberalisation and banking crises is accounted for by changes in bank franchise value. The hypothesis for this chapter is that liberalisation of financial markets in SSA countries severed the importance of bank franchise values, discouraged bank prudent behaviour, and increased the probability of banking crises occurring. To test this hypothesis, this chapter first considers an indicator for the effect of financial liberalisation on bank profitability (which is the coefficient of the financial liberalisation variable, from regressing liberalisation on bank profits). This indicator expresses the extent of reduction in franchise value due to financial liberalisation policies. The predicted values of this indicator are then included as one of the regressors in an ordered logit model for the likelihood of having a banking crisis. The ordered logit model is ideal given that the dependent variable, banking crises, can be categorised into one of the three states; no crisis, non-systemic crisis, and systemic crisis.

The empirical results confirm that some liberalisation policies significantly increase the probability of banking crises through reduction in franchise values. In robustness checks, a negative and significant relationship between banking crises and both observed and forecasted franchise value further confirms the effects of franchise value on bank stability. This effect is however minimal in countries with effective prudential supervisory structures and

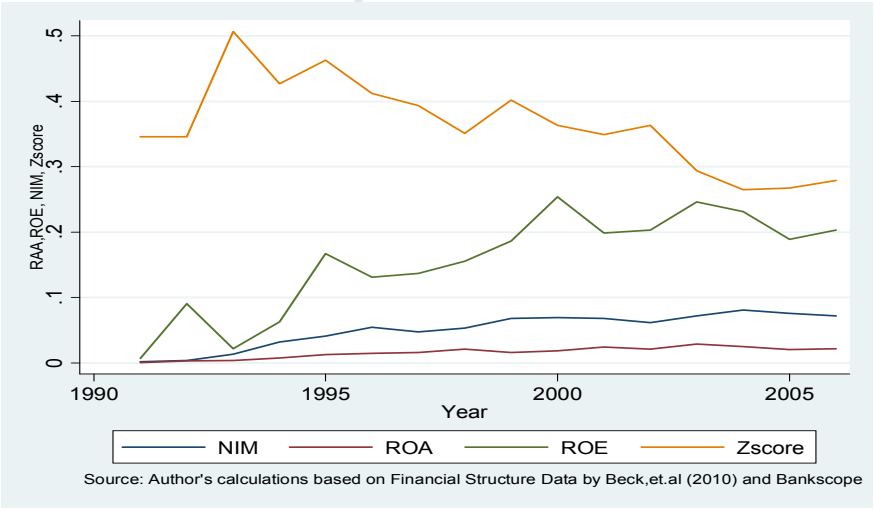
well developed legal institutions.

The rest of this chapter is organised as follows. Section 6.2 outlines the stylised facts on liberalisation, bank profitability and banking sector fragility. An overview of previous reserch is outlined in section 6.3, while 6.4 presents the data and model specification. Section 6.5 discusses the empirical results, while section 6.6 presents robustness checks. Section 6.7 presents a summary of findings and conclusions drawn from this chapter.

6.2 Financial Liberalisation, Bank Profits and Fragility Patterns

Figure 6.1 depicts the relationship between bank fragility and profitability measures for countries in the study sample. Bank z-score is the ratio of the sum of return on assets and capital to asset ratio, to the standard deviation of return on assets. As such it gives the number of standard deviations by which bank return on assets have to fall to wipe out bank equity and cause the bank to become insolvent (Beck et al., 2009). By assuming that profits follow a normal distribution, it can be shown that z-score is the inverse of the probability of insolvency. Therefore, higher values of the z-score imply more stable banks.

Figure 6.1: Bank Profit Measures and Bank Fragility



Zscore is scaled down by 10. Data is for 26 SSA countries

Figure 6.1 shows that bank profits have increased from the early 1990s until around 1999, and have been on a decline since then. On the other hand, bank z-scores exhibit a declining trend and significant volatility over the period 1990 to 2006. The implication is that bank stability has worsened over the past two decades. Periods marked by high profit levels also have high z-scores, and vice-versa. The trends for both bank z-scores and profits, seem to

suggest that high profits are associated with low solvent ratios, which is reflected by stable banking systems.

6.3 Literature Review

Studies on the link between liberalisation, competition, bank risk-taking and banking crises show two competing views; a liberalisation-stability view which suggests that banks take more risk in concentrated markets and a liberalisation-fragility view which provides a counter argument that bank stability decreases with increase in competition[1].

Liberalisation-stability view

This strand of the literature provides evidence of a positive relationship between market concentration and bank risk-taking (De Nicolo et al., 2007; De Nicolo and Loukoianova, 2007; Boyd et al., 2006; Boyd and De Nicolo, 2005; De Nicolo, 2000). Boyd and De Nicolo (2005) introduce theoretical models that allow competition in both deposit and loan markets. In their model, market power in concentrated markets results in higher interest rates that are charged on business loans. High interest rates foster increases in credit risk for borrowers as a result of moral hazard and adverse selection problems. The consequent increase in firm default risk could lead to high non-performing loans and greater bank instability. In other studies Boyd et al. (2006), De Nicolo et al. (2007) and De Nicolo and Loukoianova (2007) find a positive and significant relationship between bank concentration and bank risk of failure implying that increased competition does not necessarily lead to unstable banking systems. Using data from 21 industrialized countries, De Nicolo (2000) shows that bank return on assets decreases with size and that large banks facing low competition usually take high risks and have higher returns.

There is also a theoretical explanation for the positive relationship between competition and bank stability. Regulators in concentrated markets are overly concerned about bank failures. As such, they adopt too-big-to fail policies that tend to provide large subsidies to banks. Such subsidies however enhance risk-taking incentives. It is further argued that large banks in concentrated markets may be too complex to supervise. As a result, these banks tend to indulge in high risk activities (Berger et al., 2004).

[1]Boyd and De Nicolo (2005) reviews empirical literature on the relationship between competition and risk in banking.

Liberalisation-fragility view

Literature pertaining to the liberalisation-fragility view has been reviewed in detail in Chapter 4 of this thesis, therefore, this section gives a summary of that review. Financial liberalisation leads to financial instability because of either of two factors. (i) Financial liberalisation erodes increases competition and previously earned monopoly profits that prior to liberalisation, served as an incentive for prudent bank behavior. (ii) Inadequate supervisory capacities translate to failure to monitor financial institutions. Several studies find evidence to support these assertions (Berger et al., 2009; Gonzalez, 2005; Allen and Gale, 2004; Hellmann et al., 2000; Hellmann et al., 1999; Demsetz et al., 1996; Matutes and Vives, 1996; Keeley, 1990).

Gan (2004) investigates the relationship between bank franchise value and a measure of market concentration defined as log (1+number of thrifts) in Texas. The study shows that market concentration is positively related to franchise value. Furthermore, the study gives evidence that the propensity of thrifts to increase risk is negatively related to franchise value.

Regarding bank-related franchise value, Bauer and Ryser (2004) investigate the impact of depository rents on bank risk-taking. The study finds that banks with some degree of monopolistic power or with valuable lending relationships take less risk. Similarly, Chan et al. (1986) suggest that increased competition erodes the surplus profits that banks earn through identifying high quality borrowers. The fall in bank franchise value then leaves banks with fewer incentives to screen their potential borrowers and hence the overall loan quality declines. These studies however do not investigate the link between the levels of franchise value and occurrence of banking crises.

Observations from the literature

As the debate on whether financial liberalisation and competition enhance bank fragility or not continues, the question that remains unanswered, at least empirically, is how this effect is precisely transmitted to the actual occurrence of banking crises. In other words, the channel through which the positive or negative link is attained has not been empirically verified, more so in SSA. One of the few exceptions is the work of Schaeck and Cihak (2010) who present evidence of a positive link between competition and bank soundness via the bank efficiency channel for European and US banks. The study employs a competition indicator developed by Boone (2008) to draw inferences on the effects of competition on efficiency and then link the derived competition indicator to measures of bank soundness. The thrust of the current study is similar to the work of Schaeck and Cihak (2010) except that this study focuses on franchise value as the channel linking liberalisation to banking

crises.

Contributions by Keeley (1990) and Gonzalez (2005) are also closely related to the current study. Keeley (1990) finds evidence of a negative influence of liberalisation on bank charter value and bank risk taking behaviour in the US banking industry. The study by Gonzalez (2005) confirms that the effect of regulatory restrictions on bank risk-taking incentives depends on the impact of these restrictions on franchise value.

The current study differs from previous studies in the following ways. The variable used by Gonzalez (2005) to define regulatory restrictions refers to freedom of banks to engage in securities, insurance and real estate activities. This is equivalent to elimination of activity restrictions in the context of the current study. On the other hand, liberalisation variables used by Keeley (1990) relate to reforms in the US laws governing state branching, multi-bank holding company and interstate expansion. The current study considers measures of liberalisation that track the presence of restrictions along seven aspects of the financial system. As already highlighted, these measures capture and reflect the extent and level of liberalisation; the actual types of restrictions that existed or have been abolished; policy reversals and the implementation rate. Furthermore, this study considers the impact of these liberalisation policies on franchise value but, most importantly, on the actual occurrence of both systemic and non-systemic banking crises instead of measures of bank risk-taking. By so doing, this study allows for a clear examination of the severity of the effects of franchise value on banks which could lead to banking crises.

6.3.1 Conceptual Framework

The majority of studies that find a positive link between liberalisation and banking sector stability point to reduction in franchise value as a source of imprudent bank behaviour. This section reviews a simplified theoretical framework for this link following the work of Weisbrod et al. (1992)[2]. The framework illustrates why incentives for banks to take on more risk increase when banks hold less valuable charters. The model is described as follows:

Consider an economy with 2 banks

Assume an economy with 2 banks, X and Y in the banking industry with a government guaranteed insurance scheme. The banks' insurance costs are unaffected by the risks they take. This assumption is not abstract especially in the context of SSA countries with government implicit insurance schemes[3]. Bank X accepts deposits and issues out loans.

[2]This section draws significantly from Weisbrod et al. (1992).

[3]Under implicit insurance, governments rescue failing deposit-taking institutions in the absence of an explicit statutory obligation on the part of government to protect depositors.

Bank Y has some investment in payments business and assume that the bank earns some positive fees from the investment per annum.

Both banks receive the same amount of deposits, P_d in current period t which is all given out as loans P_l, hence:

$$P_d = P_l \tag{6.1}$$

The loans are funded by the deposits, which are fully insured by the government.

Assuming an interest rate of 0.5 per period, then the future value of loans given out in period t is $1.5P_{l,t}$ in period $t+1$ in the event that the loans are repaid and 0 in the case of loan default i.e.

$$P_{l,t+1} = \begin{cases} 1.5P_{l,t} & if \quad \text{loans are fully serviced} \\ 0 & \text{loans are not serviced} \end{cases} \tag{6.2}$$

Period 1 Banks' Expected Gains

In period 1, Bank X has no equity, since the only assets for this bank are P_l that are being funded by P_d. However, Bank X has an expected gain realised from the issued loans, P_l:

$$(1,5P_{l,t} - P_d) \tag{6.3}$$

On the other hand, Bank Y has an equity equal to E_y representing the value of the income stream from its investment. Thus it has expected gains from the issued loans and an income stream from the investment. Assume the discounted value of the yearly cashflow from the income stream Bank Y earns is E_y, then the bank's expected gain is

$$E_y + (1,5P_{l,t} - P_d) \tag{6.4}$$

First period banks balance sheets are illustrated in (6.5)

Bank X

Assets		Liabilities	
loans	$P_{l,t}$	Deposits	P_d

Bank Y

Assets		Liabilities	
loans	$P_{l,t}$	Deposits	P_d
Investment	E_y	Equity	E_y^*

* N.B $P_l = P_d$ (6.5)

Banks' equity: assuming full loan repayments

Assuming that the risky loans issued by the banks are fully serviced, Bank X realises some equity equivalent to the expected gain, in equation (6.3), of $(1,5P_{l,t} - P_d)$. On the other hand, bank Y has an increase in its original equity of $(1,5P_{l,t} - P_d)$, thus has a total equity equivalent to $E_y + (1,5P_{l,t} - P_d)$. The balance sheets for the two banks are as shown in 6.6.

Bank X

Assets		Liabilities	
Loans	$1,5P_{l,t}$	Deposits	P_d
		Equity	$(1.5P_{l,t} - P_d)$

Bank Y

Assets		Liabilities	
Loans	$1,5P_{l,t}$	Deposits	P_d
Investment	E_y	Equity	$(1,5P_{l,t} + E_y) - P_d$

(6.6)

Losses resulting from loan defaults.

If the loans are not paid off, then both bank X and Y realise a loss of the total loan amount $P_{l,t}$ which would have been wholly funded by deposits P_d. The balance sheets are as shown in table 6.7.

Bank X

Assets		Liabilities	
Loans	0	Deposits	P_d
		Equity	$-Pd$

Bank Y

Assets		Liabilities	
Loans	0	Deposits	P_d
Investment	E_y	Equity	$E_y - P_d$

(6.7)

In the event of loan loss, Bank X has a negative equity, which happens to be a liability of the deposit insurance scheme. Bank Y has reduced equity compared to the first period. Bank Y has not only lost the loan amount, but also part of its original equity[4]. If both banks pursue a risky loan strategy, with deposit insurance, Bank X stands to lose nothing but gains $1,5P_l - P_d$. On the other hand, bank Y risks at most E_y, for a possible gain of $1,5P_l - P_d$, which is the same as that of Bank X. Therefore, type Y bank has less incentive to pursue a risky portfolio for fear of losing part of its income stream in the event of loan defaults compared to type X bank. The same would hold if E_y is the capital for Bank Y. The following hypothesis is deduced:

Type X bank's incentive to pursue risky portfolio is greater than that of type Y bank.

In a liberalised banking system, less stringent entry requirements may result in more type X banks in the market. As a result, the return on the risky portfolio is driven down. In

[4]In stage 1, Bank Y's original equity is E_y which is the flow of income from the its business.

such cases, type Y banks have very little to gain. For instance, if the future value of loans declines to $1,05P_l$, type X banks still risk nothing for a possible gain of $1,05P_l - P_d$, yet type Y banks still risk the discounted value of their yearly cashflows from the investments business, E_y, but for a lesser gain of $1,05P_l - P_d$. Type Y banks would only have an incentive to hold more of the risky portfolio if the value of E_y decreases relative to the rate of return on the risky portfolio. Thus, the following hypothesis can be derived:

Financial liberalisation that increases competition in the banking sector drives down the rate of return on investment and makes type Y banks less willing to hold the risky portfolio compared to type X bank.

Overall, if a risky strategy is pursued, type X banks gain more relative to type Y banks, if their deposits are insured. If more type X banks enter the market, the rate of return on the risky portfolio is driven down to low levels that makes the investment less attractive for type Y banks. It only makes business sense for type Y banks to hold less risky portfolios to safeguard their payments franchise. However, without an explicit deposit insurance scheme, depositors who lodged their funds with bank X would lose all their money whereas those who banked with bank Y would get some fraction of their deposited funds depending on the value of E_y. This would imply that those who bank with bank X would demand a higher ex ante deposit rate, ceteris paribus. The presence of the deposit insurance scheme however, means no depositor loses out, hence all investors are willing to make deposits with either bank at the same deposit rate.

In sum, insured banks with a profitable business and hence high franchise have lower expected return from taking risks than banks with less or no profitable business (no franchise value). If competition in the banking sector drives down profits for type Y banks, they become more inclined to take on risky portfolios since what they stand to lose (value of the franchise) decreases relative to the possible gain in the event that the loans are fully serviced. In view of this, a valuable franchise should be a powerful incentive to reduce banks' involvement in high risk activities. In this chapter, the study analyses the interactions between the franchise value of banks and incidences of bank failure.

The two hypothesis drawn from the present theoretical model are combined to form the following hypothesis that is then tested empirically.

A reduction in franchise values increases the incentives of banks with low franchise value to pursue risky portfolios, and hence increase the probability of banking crises occuring.

6.4 Estimation Strategy

This section presents the empirical models, data, as well as the description of the variables used in the empirical analysis.

6.4.1 Empirical Model

The ordered logit model is the main model employed in the empirical estimations. Ordered logit/probit models are an extension of the binary logit/probit models and are used to model a discrete dependent variable that takes ordered multinomial outcomes. This model specification is ideal given the discrete nature of the dependent variable, banking crises. The dependent variable takes the values of 0 for no crisis, 1 for non-systemic crises, and 2 for systemic crises. The probability that a crisis occurs at a given time t is assumed to be a function of bank frachise value and other explanatory variables. Thus, the likelihood of a crisis is modelled as follows;

$$Crisis_{it} = \alpha_i + \delta BP_{it} + \beta X_{it} + \mu_i + \varepsilon_{it} \tag{6.8}$$

where $Crisis_{it}$ is the crisis variable , BP_{it} is the proxy for bank franchise value for country i at time t. X_{it} is a matrix of control variables which are (a) macroeconomic (real GDP growth, inflation, real interest rate and change in terms of trade); (b) banking system characteristics (liquidity, share of private sector loans to GDP, real credit growth and ratio of M2 to foreign reserves); and (c) institutional and regulatory quality variables (liberalisation policies, GDP per capita, rule of law and presence of deposit insurance scheme). δ and β are slope coefficients, ε_{it} is a vector of error terms while μ_i is a vector of individual country effects.

This empirical specification is similar to model (4.1) in chapter 4 of this thesis. Therefore, the details of the model construction and the discussion on marginal effects that are reported from estimating such models will not be repeated for this chapter.

Although equation (6.8) is the baseline regression equation for this chapter, this thesis considers an indicator of the relationship between liberalisation and bank franchise value. This is presented next.

Franchise value-liberalisation indicator

The hypothesis that the negative impact of financial liberalisation on banking stability is transmitted via the franchise value channel entirely rests on the assumption that different liberalisation policies have the effect of reducing bank franchise values. In this regard,

this chapter considers an indicator that makes it possible to obtain information on how much bank profitability covaries with liberalisation policies that are important sources of bank franchise value. This is done by expressing franchise value as a function of financial liberalisation:

$$BP_{ct} = \alpha + \gamma lib_{ct} \tag{6.9}$$

where lib_{ct} is an index for competitive liberalisation and γ is the franchise value-liberalisation indicator. γ captures the impact of financial liberalisation on bank profits. Competitive liberalisation is an index of three liberalisation policies. (1) elimination of restrictions on entry and scope of bank activity, (2) elimination of capital account restrictions, and (3) removal of controls that govern security market policy. As discussed earlier in this thesis, all these policies have the same effect on the competitive environment in the financial sector and hence should have a similar impact on bank profitability. In sensitivity analysis, the study considers regressing total financial liberalisation index ($finref$) on bank profits as well as other sub indices constructed from the seven liberalisation policies. Empirically, from equation (5.10), measures of bank franchise value are regressed on the index for competitive liberalisation in a GMM framework.

$$BP_{ict} = \alpha + \lambda BP_{ic,t-1} + \gamma lib_{ct} + \mu_i + \varepsilon_{it} \tag{6.10}$$

Since a negative relationship between bank profits and liberalisation is expected apriori, $\gamma \prec 0$ therefore expresses a reduction in bank profits arising from the effects of implementing financial liberalisation policies that have the effect of increasing competition in the banking sector. The larger the absolute value of γ, the smaller the profit margins and the higher will be the reduction in franchise value due to competitive liberalisation.

The next step is to include γ in the crisis equation (6.8). The empirical model estimated is thus:

$$crisis_{it} = \alpha_i + \delta\gamma_{it} + \beta X_{it} + \mu_i + \varepsilon_{it} \tag{6.11}$$

As discussed above, X_{it} is a matrix of control variables which are (a) macroeconomic, (b) banking system characteristics, and (c) institutional variables. δ and β are slope coefficients. Apriori, the coefficient for γ is expected to be positive. Intuitively, a positive relationship between crisis and γ implies that a high reduction in franchise value due to liberalisation increases the chances of having a banking crisis. This would therefore confirm the assertion that franchise value is the conduit through which financial liberalisation increases the likelihood of having either systemic or non-systemic banking crises.

The empirical model incorporates interaction terms for the franchise value-liberalisation indicator first, with a deposit insurance dummy variable $depins \times \hat{libroa}$, and second, with the variable for presence of prudential supervision $superv \times \hat{libroa}$. These are included to capture different effects that competitive liberalisation policies may have on franchise value in countries with explicit deposit insurance and effective prudential supervision policies.

6.4.2 Data and variable description

Data

The regression analysis is carried out on data for 25 countries in SSA. The macroeconomic data is obtained from WDI, a World Bank database, and microeconomic data is from the IMF's International Financial Statistics. Data on liberalisation variables is obtained from the database by Abiad et al. (2008) and extended in this study. Bank-level data used for measures of franchise value is from Bankscope. This is for 144 banks in 25 countries in SSA. However, data on return on assets and on equity is limited in terms of time coverage. As such, the emperical analysis is carried out on data from 1996 to 2006. The variables are summarised in Table 6.4.1. Table 6.4.1 also presents the expected relationships between these variables and banking crises, as well as summary statistics. A detailed list of the data sources for the variables used in this chapter are presented in tables B.0.1 and B.0.2 in the appendix.

Model Variables

Banking crisis variable

The dependant variable is banking crisis. This variable is defined and similarly used in the baseline econometric model in chapter 4 of this thesis. To reiterate, a systemic crisis is defined as such by at least one of the following conditions: (i) the ratio of non-performing loans to total loans in the banking sector is at least 10%, (ii) the cost of a rescue operation is at least 2% of GDP, (iii) banking problems have resulted in large scale nationalization of banks, (iv) occurrence of extensive bank runs, (iii) the adoption of emergency measures such as a deposit freeze, prolonged bank holidays or deposit guarantees by the government in response to the crisis. On the other hand, a crisis is classified as non-systemic if only a small segment of a country's banking sector is affected by bank failures.

Table 6.4.1: Variables used in evaluating effect of franchise value on banking crises

Variable	Variable name	Expected sign	mean	Std dev
Crises	Crises=Dependant variable		0.45	0.81
$\hat{libroa}$	Franchise value-liberalisation indicator	-	0.40	0.49
rgdpg	Rate of growth of real gdp	-	3.6	4.9
gdppc	Log of GDP per capita	-	2.7	0.48
Δtot	Change in terms of trade	-	0.18	10.7
infn	Inflation rate, change in GDP deflator	+	17.85	40.02
rir	Real interest rate	+	5.63	14.33
m2res	Ratio of M2 to international reserves	+	9.8	21.53
crgdp	Ratio of private credit to GDP	+	29.6	19.2
liq	Ratio of bank liquid reserves to bank assets		17.36	10
crgr_2	Two period lag of growth rate of domestic credit to GDP	+	10.97	33.96
depins	Deposit insurance dummy variable	+	0.12	0.33
regq	Regulatory quality= prees freedom	-	-0.56	0.68
sup	Bank supervision	-	0.51	0.66
dinslib	Interaction between deposit insurance and liberalisation	+/-	0.88	2.1
suplib	Interaction between bank supervision and liberalisation	-	0.38	0.61
$\hat{libroe}$	Alternative franchise value-liberalisation indicator	-	0.59	0.40
finref	Total financial liberalisation index	+	9.06	5.8
complib	competitive liberalisation index (ent +intk+secmkt)	+	5.80	1.50

Source: Author's calculations

Explanatory variables

Bank franchise value

Franchise value or charter value is defined as the present value of a firm's future profits. To quantify franchise value, one can look at the difference between a firm's market value and its replacement costs. This definition implies that a firm has a large franchise value when it has huge profits for the firm as a going concern. Both the market value of assets and replacement costs are generally difficult to measure directly. As such, some studies have used the sum of market value of equity and book value of liabilities to approximate a bank's market value of assets, net of replacement costs (calculated differently in different studies) (Demsetz et al., 1996; Keeley, 1990). From these, a ratio or proxy of Tobin's Q is derived[5]. Other measures, such as ratio of market to book equity ratios and measures of bank profitability (for instance net interest margin and after tax return on assets/equity)

[5]Tobin's Q= $\frac{MVE+BVL}{BVA}$ where MVE is market value of equity and BVA/L is book value of assets/liabilities.

have been used in the literature to measure bank franchise value (Demirguc-Kunt and Detragiache, 1998b).

For the purpose of this study, $ROAA$ and $ROAE$ are used as bank franchise value proxies. Net interest margin is also considered for robustness tests. Some criticisms have been raised against the use of $ROAA$ to proxy bank franchise values. Some researchers argue that $ROAA$ may be biased due to off-balance-sheet activities, whilst $ROAE$ disregards financial leverage and the associated risk (Flamini et al., 2009). These researchers suggest that an alternative risk adjusted profit estimate would be ideal considering that banks may be seeking to maximize the value of owner's equity. However, other previous studies have used both $ROAA$ and $ROAE$ with substantive results. For instance De Nicolo (2000) and Gan (2004) used $ROAA$ and $ROAE$ to proxy bank franchise value in separate studies.

Franchise value-liberalisation indicator

This is the coefficient on the liberalisation variable (γ in equation (6.10)) after regressing bank profits on different indices of financial liberalisation policies and other explanatory variables. In the results for the baseline model, equation (6.11), γ is derived from regressing $complib$ on $ROAA$ and is denoted by $\hat{libroa}$ in Table 6.5.1. Similarly, the cofficient on complib after regressing complib on $ROAE$ is $\hat{libroe}$. The study also uses $\hat{refroa}$ and $\hat{refroe}$ derived from regressing $finref$, the total liberalisation index, on $ROAA$ and $ROAE$ respectively.

Other explanatory variables

The rest of the explanatory variables used in this chapter are similar to the ones adopted in chapter 4 of this thesis. These include (i) macroeconomic variables (real gdp growth ($rgdpg$), inflation ($infn$), real interest rate (rir) as well as change in terms of trade (Δtot)), (ii) banking system characteristics variables (liquidity (liq), share of private sector loans to GDP (cr/gdp), lagged real credit growth ($crgr_{t-2}$), as well as ratio of broad money to foreign reserves ($m2res$)), (iii) institutional and regulatory quality variables (GDP per capita ($gdppc$), press freedom ($pressf$), governance (gov), required reserves ($reqres$), as well as presence of explicit deposit insurance ($depins$)).

6.5 Model Estimation and Result Analysis

Regression results on the link between franchise value and crises are presented in Table 6.5.1. The results are explained in terms of marginal effects.

In Column (1) $ROAA$ is the measure of franchise value whilst in column (2) $ROAE$ is used as a proxy for franchise value. After controlling for macroeconomic and bank spe-

Table 6.5.1: Franchise Value and Banking Crises: Profit-Liberalisation Indicator

	(1)			(2)		
Variables	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
$\widehat{libroa}$	-0.122***	0.0199**	0.102***			
	(0.012)	(0.008)	(0.006)			
rgdpg	0.016***	-0.004***	-0.012***	0.016***	-0.004***	-0.016***
	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)	(0.0009)
gdppc	0.021*	-0.023*	-0.028*	0.024*	-0.009*	-0.255*
	(0.0015)	(0.006)	(0.001)	(0.0090)	(0.0007)	(0.133)
Δ_{tot}	0.0041***	-0.001***	-0.0031***	0.0044***	-0.0015***	-0.0034***
	(0.0058)	(0.0002)	(0.074)	(0.0005)	(0.0002)	(0.0055)
infn	-0.0011**	0.0002**	0.001**	-0.001**	0.008**	0.008**
	(0.0001)	(0.00002)	(0.0002)	(0.0004)	(0.0052)	(0.015)
rir	-0.004***	0.0080***	0.0025***	-0.0034***	0.0082***	0.0025***
	(0.0003)	(0.0004)	(0.0004)	(0.0003)	(0.003)	(0.006)
m2res	-0.0033***	0.0003***	0.0031***	-0.0033***	0.0004***	0.0029***
	(0.0002)	(0.004)	(0.0002)	(0.0002)	(0.0004)	(0.005)
crgdp	-0.0001	0.0001	0.0002	-0.0001	0.0005	0.0002
	(0.002)	(0.008)	(0.009)	(0.0006)	(0.0009)	(0.0004)
liq	-0.005*	0.004*	0.006*	-0.004*	0.005*	0.003*
	(0.0023)	(0.0007)	(0.0033)	(0.0003)	(0.001)	(0.002)
crgr_2	-0.007*	0.0208*	0.0006*	-0.001*	0.0002*	0.0001*
	(0.0001)	(0.0002)	(0.0002)	(0.005)	(0.0002)	(0.002)
depins	-0457***	0.0589**	0.498**	-0.571***	0.0589*	0.513***
	0.0127	0.0260	0.0252	0.0131	0.0293	0.0270
gov	0.0212	-0.0133	-0.0079	0.0146	-0.0163	-0.0018
	0.0130	0.0155	0.0191	0.0147	0.0158	0.0220
sup	0.0942***	-0.0125***	-0.0817***	0.108***	-0.015**	-0.0929***
	0.0163	0.0084	0.0205	0.0167	0.0087	0.0211
dinslib	0.0525*	-0.279*	-0.0247*	0.0631**	-0.0356**	-0.0275**
	0.0141	0.0175	0.0232	0.165	0.0263	0.0333
suplib	0.170***	-0.038***	-0.132***	0.155***	-0.04***	-0.115***
	0.0195	0.0121	0.0233	0.0192	0.0151	0.0248
$\widehat{libroe}$				-0.131***	0.0205***	0.014***
				0.0133	0.0107	0.016
Prob>chi2		0.00			0.00	
log likelihood		-462.7			-459.1	
Pseudo R^2		0.32			0.291	

Robust standard errors in parentheses ***p<0.01, **p<0.05, *<0.1

cific effects on crises occurrence, the results show that the liberalisation-franchise value indicator has positive and significant marginal probability effects on both systemic and non-systemic banking crises. The marginal probability effects are stronger for systemic than for non-systemic banking crises. The result suggests that γ increases the marginal probability of occurrence of crises for both systemic and non-systemic crises. Since higher values of γ translate to higher reduction in franchise value due to liberalisation, this result underscores the notion that liberalisation increases the marginal probability effects of having either type of crises because of its negative impact on bank franchise value. Column (2) provides evidence that this relationship holds even when return on equity is used to measure franchise value. This result is consistent with established theory and empirical findings of mitigating effects of charter value on bank risk-taking reported by Keeley (1990) and Gonzalez (2005).

Table D.0.1 in the appendix presents results where the franchise value indicator $\hat{refroa}$ is derived from regressing $finref$, the total liberalisation index, on $ROAA$ and $\hat{refroe}$ is derived from regressing $finref$ on $ROAE$. The results in column (1) indicate that $\hat{refroa}$ has positive but insignificant marginal probability effects on both systemic and non-systemic banking crises. However, $\hat{refroe}$ reports a positive and significant coefficient, concuring with the earlier results.

With respect to institutional and regulatory environment, the results show that the marginal probability effects of having either type of crisis are greater in countries with explicit deposit insurance and less likely in countries with effective prudential supervision. This finding confirms the importance of directing efforts towards strengthening bank supervisory systems alongside financial liberalisation. This would ensure that risk-taking incentives that may arise from a decline in franchise value resulting from liberalisation are minimised.

Interestingly, the presence of explicit deposit insurance reduces the mitigating effects of franchise value as evidenced by the negative and significant coefficient on the interaction term $\hat{dinslibroa}$. This indirect influence of deposit insurance on crises may be due to the positive impact such schemes may have on bank profitability. Gonzalez (2005) argues that the presence of deposit insurance may increase bank profit margins[6].

The coefficient on the interaction term $sup \times \hat{libroa}$ is negative and significant. This result shows that while the marginal effect of a reduction in franchise value increases the chances of systemic crises, this effect can be reduced further if regulators employ effective prudential supervision.

[6]Demirguc-Kunt and Huizinga (1999) however find that explicit deposit insurance schemes lower net interest margins, because of design and implementation problems of the schemes.

The other macroeconomic and bank characteristic variables generally have significant marginal probability effects. High GDP growth reduce the chances of having either type of crisis at least at the 10% significance level, while adverse terms of trade shocks significantly increases the likelihood of banking sector crises. High interest rates and high inflation also increase the probability of banking crises occuring.

Regarding bank specific effects, the ratio of broad money to foreign exchange reserves, ratio of private sector credit to GDP, and real credit growth have positive marginal probability effects on both systemic and non-systemic bank crises, while liquidity has the opposite effect. However, the private sector credit to GDP ratio is generally not significant.

Finally, the coefficient on GDP per capita is negative and significant, suggesting that legal institutions capable of effective contract enforcement reduces the probability of having either type of crisis. The coefficient on the governance variable is however generally not significant.

6.6 Sensitivity Analysis

6.6.1 Two stage analysis

A two-stage least squares analysis is employed to check the robustness of the baseline results. Using this approach, predicted values of franchise values from the first stage (equation 5.10), duplicated below as equation (6.12), are incorporated in the second stage equation. The second stage equation tests the effect of franchise value on the likelihood of having a banking crisis[7]. The estimated models are thus:

$$BP_{ict} = \alpha + \lambda BP_{ic,t-1} + \beta X_{ic,t} + \gamma RIM_{ct} + u_i + e_{it} \tag{6.12}$$

$$crisis_{it} = \alpha_i + \delta \hat{BP}_{it} + \beta X_{it} + \mu_i + \varepsilon_{it} \tag{6.13}$$

All variables for equations (6.12) and (6.13) are as discussed in the baseline models, equations (5.10) and (6.8) respectively[8].

This two stage procedure takes into account the potential endogeneity of franchise value. It specifically deals with the potential bias likely to result from the correlation between

[7]Keeley (1990) uses a similar procedure in analysing how liberalisation affects charter value and how charter value affects bank risk-taking in the US banking sector. Gonzalez (2005) uses the same procedure to analyse the impact of bank regulation on bank charter value and risk-taking in 36 countries.

[8]The matrix X_{it} in equation (6.13) includes the financial liberalisation variables.

franchise value and the error term when observed values of bank profitability ($ROAA$ and $ROAE$) are instead used in equation (6.13).

Tables 6.6.1 and 6.6.2 present results from the second stage regressions[9]. $\hat{roa}$ and $\hat{roe}$ are the predicted values for franchise values indicators from equation (6.12). The coefficients on the predicted values, $\hat{roa}$ in column (1) and $\hat{roe}$ in column (2) have significant negative marginal probability effects on either type of crises. The marginal probability effects on systemic crises are higher than on non-systemic crises. This confirms the negative effects of low franchise value on banking stability.

The positive coefficients on competitive liberalisation and deposit insurance suggest that the chances of systemic crisis occurrence are higher in more liberalised countries with explicit deposit insurance schemes.The compound effect of financial liberalisation, prudential supervision and franchise value on banking crisis is accounted for by the interaction terms. The coefficient of the interaction term of franchise value and liberalisation, $\hat{roalib}$, is positive and significant. This suggests that the effect of franchise value on bank stability increases in more liberalised banking sectors. In fact, there are more chances that a decline in franchise value increases the probability of having systemic crises in a liberalised financial system than in highly regulated banking sectors.

Interacting franchise value with bank supervision, $\hat{roasup}$, gives an indication of the counter-effect of supervision on the effects of franchise value on banking crises. This shows that effective supervision reduces the effects of franchise value on the probability of having either systemic or non-systemic crises. Both sets of results suggest that an increase in franchise value reduces the probability of occurrence of both systemic and non-systemic crises in more liberalised countries. However, this only holds if such countries have effective prudential supervision in place.

Whilst results from Table 5.5.2 suggest that financial liberalisation reduces bank franchise value, those reported in table 6.6.1 show that franchise value has a negative impact on banking crises occurrence. Taken together, this implies that a fall in franchise value due to liberalisation increases the chances of having a crisis. This effect of franchise value is higher in more liberalised financial sectors with less effective bank supervision. This may suggest that high franchise values in less liberalised financial systems provide an incentive for banks to take less risk in order to protect their bank franchise. As a result, this reduces chances of banking crises occurring. This is consistent with findings by Gonzalez (2005) that low values of Tobin's Q, increases bank non-performing loans and stock price volatility.

[9]The first stage results are the same as presented already in chapter 4 of this thesis, hence are not presented here again.

Table 6.6.1: Bank franchise value and banking crises: Two-stage analysis

	(1)			(2)		
Variables	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
$\overset{\wedge}{\text{roa}}$	0.152***	-0.0336**	-0.118***			
	(0.0281)	(0.0146)	(0.0305)			
rgdpg	0.0146***	-0.0035***	-0.0114***	0.0143***	-0.003***	-0.0113***
	(0.0014)	(0.003)	(0.006)	(0.001)	(0.0028)	(0.0088)
gdppc	0.252**	-0.0474**	-0.205**	0.189*	-0.0145*	-0.175*
	(0.109)	(0.0567)	(0.118)	(0.0976)	(0.0530)	(0.108)
Δ_{tot}	0.0058***	-0.0014***	-0.0044***	0.0062***	-0.0016***	-0.0056***
	(0.0011)	(0.0037)	(0.0013)	(0.001)	(0.0002)	(0.002)
infn	0.0012	-0.0027	-0.0039	-0.0012*	0.0002*	0.001*
	(0.0017)	(0.0001)	(0.0001)	(0.0002)	(0.0005)	(0.002)
rir	-0.0031***	0.001***	0.0023***	-0.003***	0.001***	0.0023***
	(0.0087)	(0.0011)	(0.0038)	(0.0002)	(0.0002)	(0.0004)
m2res	-0.0033***	0.0031***	0.003***	-0.0032***	0.002***	0.003***
	(0.0002)	(0.003)	(0.0195)	(0.0002)	(0.0002)	(0.0001)
crgdp	-0.00102*	0.0005*	0.0002*	-0.002	0.02	0.004
	(0.0006)	(0.001)	(0.004)	(0.0002)	(0.0001)	(0.0005)
liq	0.0033*	-0.0004*	-0.003*	0.0034*	-0.0004*	-0.003*
	(0.0003)	(0.0002)	(0.0003)	(0.0003)	(0.0001)	(0.0003)
crgr_2	-0.0076	0.0069	0.007	0.008	-0.003	-0.006
	(0.002)	(0.0010)	(0.002)	(0.0002)	(0.0001)	(0.0004)
depins	-0.526***	0.0684***	0.458***	-0.532***	0.0583**	0.474***
	(0.0311)	(0.0156)	(0.0421)	(0.0353)	(0.0223)	(0.0520)
gov	0.0002*	-0.0129*	-0.0131*	0.00995	0.0120	-0.0220
	(0.0152)	(0.0170)	(0.0177)	(0.0175)	(0.0180)	(0.0201)
complib	-0.0341***	0.0071**	0.0270***	-0.0312*	0.001*	0.0321*
	(0.0057)	(0.0032)	(0.0068)	(0.0057)	(0.008)	(0.009)
sup	0.0268*	-0.0037*	-0.0232*	0.0441**	-0.0169**	-0.0272**
	(0.0156)	(0.0094)	(0.0194)	(0.0161)	(0.0096)	(0.0197)

Table 6.6.2: Franchise value and crises:Ttwo-stage analysis continued

	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
roalib	-0.0697***	0.0119**	0.0578***			
	(0.0082)	(0.0043)	(0.0091)			
roasup	0.248***	-0.0537***	-0.194***			
	(0.0235)	(0.0151)	(0.0252)			
$\overset{\wedge}{\text{roe}}$				0.167***	-0.0107***	-0.157***
				(0.0321)	(0.0293)	(0.0405)
roelib				-0.0687***	0.0031***	0.0656***
				(0.009)	(0.0098)	(0.0123)
roesup				0.229***	-0.0439**	-0.185***
				(0.0258)	(0.0221)	(0.0278)
Prob>chi2		0.00			0.00	
log likelihood		-466.1			-469.5	
Pseudo R^2		0.223			0.219	

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

6.6.2 Exogenous franchise value

In this section, a crisis model is estimated using observed values of franchise value to further check the robustness of the results presented above. Using observed values instead of predicted values of bank franchise value assumes that bank franchise value is an exogenous variable, its effect on the probability of occurrence of crisis is therefore independent of the effects of financial liberalisation[10]. In this case, the estimated model is equation (6.8) and the results are presented in Tables D.0.3 and D.0.4 in the appendix .

From column (1), the crisis-reducing effect of high franchise value is confirmed when $ROAA$ is considered as the measure of franchise value. The presence of explicit deposit insurance still has a positive impact on crisis occurrence. While financial liberalisation has a positive effect on crisis as shown in previous results, this effect is not significant at least at 10% level. Prudential supervision still has a negative though weak relationship with bank crises. The interaction terms on franchise value and liberalisation ($roalib$ and $roelib$) show a significant and positive relationship with crises. Similarly, the coefficient on the interaction terms on franchise value and supervision ($roasup$ and $roesup$) are negative and significant. This suggests that the effect of franchise value on banking crises is more in liberalised than controlled economies and this effect is reduced by the presence of prudential supervision.

While in previous specifications the results were consistent for the different definitions of

[10]See Gonzalez (2005).

franchise value, this is not so for the current specification. Column (2) shows that franchise value has a negative but insignificant relationship with crises. Column (3) shows instead a positive and significant relationship between franchise value, as defined $ROAE$, and the probability of occurrence of either type of crises. Furthermore, while liberalisation and supervision coefficients are significant and with expected signs, the interaction terms are all insignificant. These results seem to suggest some bias that may be due to the exogeneity assumption placed on franchise value in the current model specification.

6.6.3 Alternative liberalisation and crisis variable definitions

Finally, a robustness test is carried out by considering different definitions of the liberalisation and crisis variables. In both cases, logit and probit models are estimated instead of the ordered logit/probit models. Bank Z-scores as a measure of bank soundness are also considered instead of the banking crises variable. The results, are not significantly different from the ones already reported.

6.7 Summary and Conclusion

This chapter examined the relationship between bank franchise value and the actual occurrence of bank crises in selected African countries. Specifically, this chapter explores if the negative causal relationship between financial liberalisation and bank profitability confirmed in the previous chapter is the conduit through which liberalisation increases the chances of having either systemic or non-systemic crises.

This chapter tested the hypothesis that the likelihood of either systemic or non-systemic banking crises increases as a result of a decline in franchise value. To do so, a franchise value-liberalisation indicator that expresses the reduction in franchise value due to increased liberalisation is introduced. This indicator, obtained from regressing franchise value on the financial liberalisation indices, is then included in an ordered logit regression of the probability of having either no crisis, non-systemic crisis or systemic crisis.

The regression results show that this indicator has positive and significant marginal probability effects on both systemic and non-systemic banking crises. High values of the franchise value-liberalisation indicator translate to a further decline in franchise value. Therefore, the positive relationship reported implies that increased liberalisation significantly increases the probability of crises via the franchise value channel. Furthermore, the results show that while liberalisation promotes the effects of franchise value on banking crises, this effect is minimal in countries with prudential supervisory structures in place. Similarly, the

presence of explicit deposit insurance increases the probability of banking crises occurrence. However, a possible positive effect of deposit insurance on bank profitability reduces the negative impact of franchise value on the probability of crises occurrence. Consistent with existing literature, both macroeconomic and bank specific variables included in the models have significant marginal probability effects on either non-systemic or systemic crises.

The results from the main model are substantiated by different robustness tests. A two stage least squares analysis is employed in the first test. Forecasted values of franchise value estimated from the equation of the determinants of bank profitabilityare included in the regression for determinants of banking crises. The results confirm the negative relationship between franchise value and actual occurrence of banking crises. However, using observed values of franchise value seem to produce biased results. Overall, use of alternative liberalisation measures, franchise value and crises definitions together with different model specifications does not alter the main findings of this study.

Chapter 7

Conclusion and Policy Implications

7.1 Summary

This research is an in-depth analysis of the effects of liberalisation policies on banking sector stability in a sample of 26 countries in Sub Saharan Africa. The sample was determined mainly by data availability and covers the period 1986 to 2006 for the empirical analysis in chapter 4, and from 1996 to 2006 for chapters 5 and 6. This time frame covers periods before, during and after implementation of financial liberalisation in a majority of the countries. The study goes beyond a general investigation of overall financial sector reforms by examining the impact of disaggregated measures of financial liberalisation. The research is presented in seven chapters, including the introductory chapter. Three of these chapters are devoted to empirical analysis of inter-related research issues. Each of the empirical chapters specifies the relevant objective and hypotheses tested.

Chapter 1 introduced the main theme of the thesis by describing the problem statement, motivation and justification for the study, research questions and rationale of the study. Chapter 2, put the study into policy and historical context by providing the macroeconomic and financial landscape in Africa and presented both liberalisation and bank stability indicators for the countries under investigation. Chapter 3 presented an overview of banking crises theories. Chapters 4, 5, and 6 presented the empirical examination of the three themes of the study.

Chapter 4 investigated the effect of financial liberalisation on actual occurrence of systemic and non-systemic banking crises. This chapter examined the effect of the degree and intensity of liberalisation on the probability of occurrence of either type of crisis. Questions regarding whether the effect of liberalisation depends on institutional and development characteristics inherent in the liberalising countries are also addressed. These issues stem from policy concerns that the financial systems in SSA despite adopting financial reform

programmes, have been in distress for a long time, and generally lack the breadth necessary to foster economic development.

Chapter 5 examined the hypothesis that financial liberalisation by increasing competition, erodes market power and bank profits. Thus, Chapter 5 examined the determinants of bank profitability in SSA, specifically accounting for the effects of financial liberalisation.

Lastly, Chapter 6 tested the link between financial liberalisation, bank franchise values. and the probability of having a banking crisis. The empirical tests in this chapter tied together methods and findings from chapters four and five.

7.2 Main Findings

The main objective of this study was to evaluate the influence of different liberalisation policies on bank profitability, and the probability of occurrence of banking crises in countries in SSA. The main findings from the empirical chapters are highlighted below.

7.2.1 Liberalisation policies and banking sector crises

Chapter 4 assesed the contribution of each of the seven liberalisation policies to banking sector fragility. This chapter examined if disaggregating financial liberalisation into specific policies can reveal any new evidence regarding the relationship between financial liberalisation and banking crises occurrence.

The main findings are:

- Total financial liberalisation has a negative marginal effect on the likelihood of having either non-systemic or systemic banking sector crises. The result suggests that liberalisation might have improved bank stability through improved efficiency, more diversified asset portfolios and wider depositor bases.
- Regarding specific policies, the results indicate that policies that directly influence the competitive behaviour of banks have positive marginal probability effects on banking crises. Specifically, elimination of restrictions on entry and activity, as well as on international capital flows have a positive causal effect.
- By contrast, removal of credit controls, security market policy, and privatisation of previously state-owned banks all have negative and significant marginal probability effects on banking crises occurrence. Interestingly, privatisation has the largest

marginal effect. Against a backdrop of poorly performing state-owned banks characterised by low loan recovery rates and moral hazard problems, this result confirms that privately owned banks are more stable than state-owned banks.

- Financial reforms that entail the strengthening of supervision and prudential regulation have significant and negative marginal probability effects on both systemic and non-systemic crises. Furthermore, interacting the prudential supervision variable with policies that positively impact on banking crises reduces the significance of the relationship or changes the sign on the coefficients. This puts weight behind calls for reforming and strengthening of bank supervisory capacities, especially after regulatory oversight was cited as one of the contributing factors to the recent US subprime crises.

- The result pertaining to total liberalisation is overturned by the introducing of an interaction term with the prudential regulation and supervision variable. Thus, conditional on prudential supervision, the results report that overall financial liberalisation does not necessarily increase the chances of banking crises.

- The study replicates models that use a binary variable to proxy total financial liberalisation as presented in previous studies. The result suggests that the absence of interest rate controls has a positive marginal effect on the likelihood of having systemic crises. In the baseline model, it is shown that elimination of interest rate controls has a positive but insignificant effect. This may be due to the fact that unlike the binary variable, the graded interest rate liberalisation variable in the baseline model is able to capture policy changes regarding variations in both deposit and lending rates.

- Results from the regression of the effect of institutional and regulatory quality, and other control variables suggest that crisis frequency is high in economies characterised by low liquidity, high inflation, high real interest rates, and low economic growth. In addition, credit expansion precedes banking crises.

- In sum, the results in this chapter suggest that some liberalisation policies have a negative causal relationship with banking crises, while other policies have a negative effect. The destabilising effects of these policies is evident in counties with macroeconomic instability as well as countries with poor supervisory and regulatory frameworks.

7.2.2 Financial liberalisation and bank profitability

Chapter 5 tested the hypothesis that liberalisation policies have a negative influence on the levels of bank profitability. The main conclusions drawn from this analysis are summarised below.

- Correlation analysis results show a negative and highly significant correlation between total liberalisation and removal of entry barriers on one hand, and return on assets, net interest margin as well as market concentration, on the other. Intuitively, increasing liberalisation reduces bank profitability as banks begin to earn competitive profits, unlike previously earned monopoly profits. This is substantiated by the effect of liberalisation in reducing market concentration levels.

- The regression results for individual liberalisation policies are mixed. Elimination of entry barriers, and interest rate controls has negative and significant marginal effects. Strengthening supervisory capacities and institutional frameworks has a positive effect on bank profitability.

- Low profit persistence, as indicated by a positive and significant result on lagged profitability confirms significant levels of competition in the banking sectors in SSA economies. Furthermore, an analysis of results indicate that persistence levels are negatively related to comprehensive levels of financial liberalisation. In sum, the results indicate that following financial liberalisation, structural changes set in, which gave rise to changes in competition and profit levels.

- The results also indicate a positive causal effect of bank size, capital, and credit risk on bank profit measures. On the other hand, overhead costs have a negative impact, while foreign ownership, market concerntration and instituitional variables have no significant effect on bank profits.

- Stable economies provide enabling environments for good bank performance, whereas poor institutional structures expose banks to high loan defaults, resulting in poor performance.

7.2.3 Franchise value and banking crises

Chapter 6 reconciles findings from Chapters 4 and 5 to further explore whether the link between liberalisation and banking sector crises is transmitted through the effect of liberalisation on bank franchise value. This examination sought to give guidance on balancing the efficiency gains from competition and destabilising effects that competition may impose

through erosion of bank franchise value. An indicator that captures how much franchise value covaries with competitive liberalisation is introduced and included in a model for the probability of occurrence of banking crises. An alternative two stage analysis is employed where predicted values of bank profitability value in the first stage are included in a second stage regression on the likelihood of banking crises occurrence. The main results from this analysis are as follows:

- Controlling for macroeconomic and bank-specific effects, the results show a positive and significant marginal probability effects of the franchise value-liberalisation indicator on banking crisis incidences. Higher values of the indicator translate to higher reduction in franchise value due to liberalisation. Therefore, high levels of liberalisation increase the probability of systemic banking crises through the impact of liberalisation on bank franchise value. Using an alternative franchise value measure, $ROAE$, gives similar results.

- The results show that the chances of having either type of crises are more in countries with explicit deposit insurance schemes compared to countries with well developed institutions and supervisory capacities.

- The study also revealed an important issue regarding explicit deposit insurance schemes. It was observed that the presence of a deposit insurance scheme mitigates the effects of franchise value on banking crises. This is confirmed by a negative and significant result on the interaction term between the franchise value-liberalisation indicator and deposit insurance. This result likely stems from the positive causal impact of deposit insurance on bank profit margins.

- Interacting the variable for bank supervision and the indicator for franchise value shows that bank supervision can effectively mitigate the negative impact of low franchise values on bank stability.

- In sum, the impact of competitive liberalisation on banking crisis incidences is transmitted via a decline in bank franchise value. However, the marginal effects are minimised by the presence of deposit insurance schemes as well as prudential bank supervision.

7.2.4 Policy implications and recommendations

The analysis carried out in this study produced results from which valuable policy lessons can be derived. The main policy recommendations are discussed below.

- While financial liberalisation is important for financial stability, some policies negatively affect bank stability, especially in the absence of effictive prudential regulation and supervision.

- The importance of macroeconomic determinants suggests that policy-makers must ensure that comprehensive assessments of both the macroeconomic and specifically financial sector environments precede any implementation of liberalisation policies.

- Although financial liberalisation increases competition that in turn erodes bank franchise value, the results presented here do not advocate for policies that stifle competition, as a trade-off for bank stability. Instead, policy makers should consider policies that strengthen institutional capacities to curb risk-taking incentives that may arise due to decline in franchise value. This way, both bank efficiency and stability goals can be attained concurrently.

- Governments must prioritise development of legal and governance frameworks. These include upholding the rule of law, contract enforcement, good public sector management as well as updating regulations to ensure they are not overtaken by financial innovation and globalisation, together with financial liberalisation.

- In line with good governance, emphasis must be put on developing prudential regulatory and supervisory infrastructure. These should be designed to cater for new institutions (both bank and non-bank), financial instruments and activities resulting from liberalised financial systems, as well as financial innovation. This process of "re-regulation" must be a continous one, to allow supervisors to adapt to new challenges of bank risk that are inherent in free markets.

- Policy makers must also emphasise liberalisation policies that have an immediate positive impact on bank stability, for instance privatisation of state-owned banks that have been found to be highly fragile and have a long history of making losses.

References

Abiad, A., Detragiache, E. and Tressel, T. (2008). A new database of financial reforms, *IMF Working Paper 08/266* .

Allen, D. and Ndikumana, L. (2000). Financial intermediation and economic growth in Southern Africa, *Journal of African Economies* **9**(2): 132.

Allen, F. and Carletti, E. (2011). Systemic risk and macroprudential regulation, *Global Governance Programme* p. 35.

Allen, F., Carletti, E., Cull, R., Qian, J., Senbet, L. and Valenzuela, P. (2012). Resolving the African financial development gap: Cross-country comparisons and a within-country study of Kenya, *Technical report*, National Bureau of Economic Research.

Allen, F. and Gale, D. (1998). Optimal financial crises, *Journal of Finance* **53**(4): 1245–1284.

Allen, F. and Gale, D. (1999). Bubbles, crises, and policy, *Oxford Review of Economic Policy* **15**(3): 9.

Allen, F. and Gale, D. (2001). Bubbles and crises, *The Economic Journal* **110**(460): 236–255.

Allen, F. and Gale, D. (2004). Competition and financial stability., *Journal of Money, Credit and Banking* **36**(3).

Allen, F., Otchere, I. and Senbet, L. (2011). African financial systems: A review, *Review of Development Finance* **1**: 79–113.

Angkinand, A., Sawangngoenyuang, W. and Wihlborg, C. (2009). Financial liberalization and banking crises: A cross-country analysis, *SSRN: http://ssrn.com/abstract=1305711* .

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

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

Athanasoglou, P., Delis, M. and Staikouras, C. (2006). Determinants of bank profitability in the South Eastern European region, *Bank of Greece Working Paper 06/47* .

Azam, J., Biais, B. and Dia, M. (2004). Privatisation versus regulation in developing economies: The case of West African banks, *Journal of African Economies* **13**(3): 361–394.

Aziakpono, M. (2004). Financial intermediation and economic growth in a highly dependent African economy: Evidence from Lesotho, *Unpublished Paper, Department of Economics, Rhodes University* **17**.

Babus, A., Carletti, E. and Allen, F. (2009). Financial crises: Theory and evidence, *Available at SSRN 1422715* .

Bain, J. (1951). Relation of profit rate to industry concerntration: American manufacturing, 1936-1940, *The Quarterly Journal of Economics* **65**: 293–324.

Barth, J., Caprio, G. and Levine, R. (2004). Bank regulation and supervision: What works best?, *Journal of Financial Intermediation* **13**(2): 205–248.

Barth, J., Caprio, G. and Levine, R. (2006). *Rethinking Bank Regulation: Till Angels Govern*, Cambridge University Press.

Bauer, W. and Ryser, M. (2004). Risk management strategies for banks, *Journal of Banking and Finance* **28**(2): 331–352.

Bayraktar, N. and Wang, Y. (2004). Foreign bank entry, performance of domestic banks, and sequence of financial liberalization, *World Bank Policy Research Working Paper No. 3416* .

Beck, T. (2008). Bank competition and financial stability: Friends or foes?, *Competition in the Financial Sector* .

Beck, T., Cull, R. and Jerome, A. (2005). Bank privatisation and performance: Empirical evidence from Nigeria, *Journal of Banking and Finance* **29**(8): 2355–2379.

Beck, T., Demirguc-Kunt, A. and Levine, R. (2009). Financial institutions and markets across countries and over time-data and analysis, *World Bank* .

Beck, T., Demirguc-Kunt, A. and Levine, R. (2010). Financial institutions and markets across countries and over time: The updated financial development and structure database, *The World Bank Economic Review* **24**(1): 77–92.

Beck, T., Levine, R. and Loayza, N. (2000). Finance and the sources of growth, *Journal of Financial Economics* **58**(1): 261–300.

Bektas, E. (2007). The persistence of profits in the Turkish banking system, *Applied Economics Letters* **14**(3): 187–190.

Bell, J. and Pain, D. (2000). Leading indicator models of banking crises–a critical review, *Financial Stability Review* **9**: 113–129.

Berger, A. (1995). The profit-structure relationship in banking: Tests of market-power and efficient-structure hypotheses, *Journal of Money, Credit and Banking* **27**(2): 404–431.

Berger, A., Bonime, S., Covitz, D. and Hancock, D. (2000). Why are bank profits so persistent?the roles of product market competition, informational opacity, and regional/macroeconomic shocks, *Journal of Banking and Finance* **24**(7): 1203–1235.

Berger, A., Demirguc-Kunt, A., Levine, R. and Haubrich, J. (2004). Bank concentration and competition: An evolution in the making., *Journal of Money, Credit and Banking* **36**(3).

Berger, A., Hasan, I. and Zhou, M. (2010). The effects of focus versus diversification on bank performance: Evidence from Chinese banks, *Journal of Banking and Finance* **34**(7): 1417–1435.

Berger, A., Klapper, L. and Turk-Ariss, R. (2009). Bank competition and financial stability, *Journal of Financial Services Research* **35**(2): 99–118.

Besanko, D. and Thakor, A. (1992). Banking deregulation: Allocational consequences of relaxing entry barriers, *Journal of Banking and Finance* **16**: 909–932.

Besanko, D. and Thakor, A. (1995). *Relationship banking, deposit insurance and bank portfolio*, Cambridge University Press.

Biekpe, N. (2011). The competitiveness of commercial banks in Ghana, *African Development Review* **23**(1): 75–87.

Bikker, J. and Haaf, K. (2002). Competition, concentration and their relationship: An empirical analysis of the banking industry, *Journal of Banking and Finance* **26**(11): 2191–2214.

Bond, S. (2002). Dynamic panel data models: A guide to micro data methods and practice, *Portuguese Economic Journal* **1**(2): 141–162.

Boone, J. (2008). A new way to measure competition, *The Economic Journal* **118**(531): 1245–1261.

Bordo, M., Eichengreen, B., Klingebiel, D. and Martinez-Peria, M. (2001). Financial crises: lessons from the last 120 years, *Economic Policy* **16**(32): 51–82.

Boubakri, N., Cosset, J., Fischer, K. and Guedhami, O. (2005). Privatisation and bank performance in developing countries, *Journal of Banking and Finance* **29**(8): 2015–2041.

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

Boyd, J. and De Nicolo, G. (2005). The theory of bank risk taking and competition revisited, *Journal of Finance* pp. 1329–1343.

Boyd, J., De Nicolo, G. and Jalal, A. (2006). Bank risk-taking and competition revisited: new theory and new evidence, *IMF Working Paper, 06/297* .

Boyd, J., De Nicolo, G. and Loukoianova, E. (2009). Banking crises and crisis dating: Theory and evidence, *IMF Working Paper 09/141* .

Brownbridge, M. (1998). The causes of financial distress in local banks in Africa and implications for prudential policy, *Journal of Development Policy Review* .

Brownbridge, M. and Harvey, C. (1998). *Banking in Africa: the impact of financial sector reform since independence*, James Currey.

Brownbridge, M. and Kirkpatrick, C. (2008). Financial regulation and supervision in developing countries: An overview of the issues, *Development Policy Review* **20**(3): 243–245.

Bryant, J. (1980). A model of reserves, bank runs, and deposit insurance, *Journal of Banking and Finance* **4**(4): 335–344.

Caprio, G. and Klingebiel, D. (1996). Bank insolvency: Bad luck, bad policy, or bad banking?, *Annual World Bank conference on development economics* **79**(0): 114.

Caprio, G. and Klingebiel, D. (2003). Episodes of systemic and borderline banking crises, *World Bank Development Research Group http://econ.worldbank.org/research* (428): 31–49.

Caprio Jr, G. . and Honohan, P. (2009). Banking crises, *The Oxford Handbook of Banking (Oxford University Press)* .

Caprio Jr, G. and Klingebiel, D. (1996). Bank insolvencies cross-country experience, *World Bank Policy Research Working Paper No. 1620* .

Carlson, M. and Mitchener, K. (2006). Branch banking, bank competition, and financial stability, *Journal of Money, Credit, and Banking* **38**(5): 1293–1328.

Chan, Y., Greenbaum Anjan, V. and Stuart, I. (1986). Information reusability, competition and bank asset quality, *Journal of Banking and Finance* **10**(2): 243–253.

Chari, V. and Jagannathan, R. (1988). Banking panics, information, and rational expectations equilibrium, *Journal of Finance* **43**(3): 749–761.

Chirwa, E. (2001). Market structure, liberalization, and performance in the Malawian banking industry, *African Economic Research Consortium Research Papers* **108**.

Claessens, S., Demirguc-Kunt, A. and Huizinga, H. (2001). How does foreign entry affect domestic banking markets?, *Journal of Banking and Finance* **25**(5): 891–911.

Claessens, S., Van Horen, N., Gurcanlar, T. and Mercado Sapiain, J. (2008). Foreign bank presence in developing countries 1995-2006: Data and trends, *Available at SSRN 1107295* .

Daniel, B. and Jones, J. (2007). Financial liberalisation and banking crises in emerging economies, *Journal of International Economics* **72**: 202–221.

Daumont, R., Le Gall, F. and Leroux, F. (2004). Banking in Sub-Saharan Africa: What went wrong?, *IMF Working Paper 04/2055* .

De Nicolo, G. (2000). Size, charter value and risk in banking: An international perspective, *International Finance Discussion Papers* **689**.

De Nicolo, G., Boyd, J. and Jalal, A. (2007). Bank risk-taking and competition revisited: New theory and new evidence, *IMF Working Paper 07/297* .

De Nicolo, G. and Loukoianova, E. (2007). Bank ownership, market structure and risk, *IMF Working Paper 07/215* .

Demirguc-Kunt, A. and Detragiache, E. (1998a). The determinants of banking crises in developing and developed countries, *IMF Staff Papers* **45**(1): 81–109.

Demirguc-Kunt, A. and Detragiache, E. (1998b). Financial liberalization and financial fragility, *The World Bank Policy Research Working Paper 1917* .

Demirguc-Kunt, A. and Detragiache, E. (2002). Does deposit insurance increase banking system stability?an empirical investigation, *Journal of Monetary Economics* **49**(7): 1373–1406.

Demirguc-Kunt, A. and Detragiache, E. (2005). Cross-country empirical studies of systemic bank distress: A survey, *National Institute Economic Review* **192**(1): 68.

Demirguc-Kunt, A., Detragiache, E. and Gupta, P. (2006). Inside the crisis: An empirical analysis of banking systems in distress, *Journal of International Money and Finance* **25**(5): 702–718.

Demirguc-Kunt, A. and Huizinga, H. (1999). Determinants of commercial bank interest margins and profitability: Some international evidence, *The World Bank Economic Review* **13**(2): 379–408.

Demirguc-Kunt, A., Laeven, L. and Levine, R. (2003). Regulations, market structure, institutions, and the cost of financial intermediation, *National Bureau of Economic Research* .

Demirguc-Kunt, A., Levine, R. and Min, H. (1998). Opening to foreign banks: Issues of stability, efficiency, and growth, *The Implications of Globalization of World Financial Markets* pp. 83–115.

Demsetz, H. (1973). Industry structure, market rivalry, and public policy, *Journal of Law and Economics* **16**.

Demsetz, R., Saidenberg, M. and Strahan, P. (1996). Banks with something to lose: The disciplinary role of franchise value, *Federal Reserve Bank of New York Economic Policy Review* **2**(2): 1–14.

Diamond, D. and Dybvig, P. (1983). Bank runs, deposit insurance, and liquidity, *The Journal of Political Economy* **91**(3).

Diaz-Alejandro, C. (1985). Good-bye financial repression, hello financial crash, *Journal of Development Economics* **19**(1-2): 1–24.

Dietrich, A. and Wanzenried, G. (2011). Determinants of bank profitability before and during the crisis: Evidence from Switzerland, *Journal of International Financial Markets, Institutions and Money* **21**(3): 307–327.

Eichengreen, B. and Arteta, C. (2002). Banking crises in emerging markets: Presumptions and evidence, *Financial Policies in Emerging Markets* pp. 47–94.

Flamini, V., McDonald, C. and Schumacher, L. (2009). The determinants of commercial bank profitability in Sub-Saharan Africa, *IMF Working Paper 09/15* .

Freixas, X. and Rochet, J. (1997). *Microeconomics of Banking*, The MIT Press.

Furlong, F. (1988). Changes in bank risk-taking, *Economic Review* (Spr): 45–56.

Gan, J. (2004). Banking market structure and financial stability: Evidence from the Texas real estate crisis in the 1980s, *Journal of Financial Economics* **73**(3): 567–601.

Gelbard, E. and Leite, S. (1999). Measuring financial development in Sub-Saharan Africa, *International Monetary Fund* .

Giannetti, M. (2007). Financial liberalisation and banking crises: The role of capital inflows and lack of transparency, *Journal of Financial Intermediation* **16**: 23–63.

Gibson, H. (2000). Greek banking profitability: Recent developments, *Economic Bulletin* **24**(24): 7–25.

Glen, J., Lee, K. and Singh, A. (2001). Persistence of profitability and competition in emerging markets, *Economics Letters* **72**(2): 247–253.

Glen, J., Lee, K. and Singh, A. (2003). Corporate profitability and the dynamics of competition in emerging markets: A time series analysis*, *The Economic Journal* **113**(491): F465–F484.

Goddard, J., Liu, H., Molyneux, P. and Wilson, J. (2011). The persistence of bank profit, *Journal of Banking and Finance* .

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

Goddard, J. and Wilson, J. (1999). The persistence of profit: A new empirical interpretation, *International Journal of Industrial Organization* **17**(5): 663–687.

Goldstein, I. and Pauzner, A. (2002). Demand deposit contracts and the probability of bank runs, *Available at SSRN 301287* .

Goldstein, M. and Turner, P. (1996). Banking crises in emerging economies: Origins and policy options, *BIS Economic Paper 46* .

Gonzalez, F. (2005). Bank regulation and risk-taking incentives: An international comparison of bank risk, *Journal of Banking and Finance* **29**(5): 1153–1184.

Gorton, G. (1985). Bank suspension of convertibility, *Journal of Monetary Economics* **15**(2): 177–193.

Gorton, G. (1988). Banking panics and business cycles, *Oxford Economic Papers* **40**(4): 751–781.

Hannan, T. (1991). Foundations of the structure-conduct-performance paradigm in banking, *Journal of Money, Credit and Banking* **23**(1): 68–84.

Hellmann, T., Murdock, K. and Stiglitz, J. (1999). Franchise value and the dynamics of financial liberalization: the use of capital requirements and deposit rate controls for prudential regulation, *Graduate School of Business, Stanford University* .

Hellmann, T., Murdock, K. and Stiglitz, J. (2000). Liberalization, moral hazard in banking, and prudential regulation: are capital requirements enough?, *American Economic Review* **90**(1): 147–165.

Honohan, P. (1993). Financial sector failures in Western Africa, *Journal of Modern African Studies* **31**.

Hove, S., Touna Mama, A. and Tchana Tchana, F. (2011). Do monetary, fiscal and financial institutions really matter for inflation targeting in emerging market economies?, *Economic Research Southern Africa Working Paper 247* .

Jacklin, C. and Bhattacharya, S. (1988). Distinguishing panics and information-based bank runs: Welfare and policy implications, *The Journal of Political Economy* pp. 568–592.

Kaminsky, G. and Reinhart, C. (1999). The twin crises: the causes of banking and balance-of-payments problems, *American Economic Review* **89**(3): 473–500.

Kane, E. and Rice, T. (2001). Bank runs and banking policies: lessons for African policy makers, *Journal of African Economies* **10**(Suppl 1): 36.

Kaufman, G. (1988). Bank runs: causes, benefits, and costs, *Cato Journal* **7**(3): 559–587.

Keeley, M. (1990). Deposit insurance, risk, and market power in banking, *The American Economic Review* **80**(5): 1183–1200.

Kindleberger, C. (1978). *Manias, Panics, and Crashes: A History of Financial Crises: New York*, Basic Books.

King, R. and Levine, R. (1993). Finance and growth: Schumpeter might be right, *The Quarterly Journal of Economics* **108**(3): 717–737.

Kirkpatrick, C. and Green, C. (2002). Finance and development: An overview of the issues, *Journal of International Development* **14**(2): 207–209.

Kirkpatrick, C., Murinde, V. and Tefula, M. (2008). The measurement and determinants of x-inefficiency in commercial banks in Sub-Saharan Africa, *The European Journal of Finance* **14**(7): 625–639.

Koeva, P. (2003). The performance of Indian banks during financial liberalisation, *IMF Working Paper 03/150* .

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

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

Lai, A. (2002). Modelling financial instability: A survey of the literature, *Bank of Canada Working Paper 2002-12* .

Lepetit, L., Nys, E., Rous, P. and Tarazi, A. (2008). Bank income structure and risk: An empirical analysis of European banks, *Journal of Banking and Finance* **32**(8): 1452–1467.

Levine, R., Loayza, N. and Beck, T. (2000). Financial intermediation and growth: Causality and causes, *Journal of Monetary Economics* **46**(1): 31–78.

Levonian, M. (1993). The persistence of bank profits: what the stock market implies, *Working Papers in Applied Economic Theory* .

Lindgren, C., Garcia, G. and Saal, M. (1996). *Bank soundness and macroeconomic policy*, International Monetary Fund.

Lloyd-Williams, D., Molyneux, P. and Thornton, J. (1994). Market structure and performance in Spanish banking, *Journal of Banking and Finance* **18**(3): 433–443.

Matutes, C. and Vives, X. (1996). Competition for deposits, fragility, and insurance, *Journal of Financial Intermediation* **5**: 184–216.

McKinnon, R. (1973). *Money and capital in economic development*, Brookings Institution Press.

Mehran, H. (1998). *Financial sector development in Sub-Saharan African countries*, International Monetary Fund.

Mishkin, F. (1996). Understanding financial crises: a developing country perspective, *NBER Working Paper* .

Mishkin, F. (1999). Lessons from the Tequila crisis, *Journal of Banking and Finance* **23**(10): 1521–1533.

Mitsuo, H. (2007). Models of banking crises: Explaining associations with output decline and financial liberalization, *Available at http://www.ide.go.jp* .

Molyneux, P. and Forbes, W. (1995). Market structure and performance in European banking, *Applied Economics* **27**(2): 155–159.

Molyneux, P. and Thornton, J. (1992). Determinants of European bank profitability: A note, *Journal of Banking and Finance* **16**(6): 1173–1178.

Morris, S. and Shin, H. (2001). Rethinking multiple equilibria in macroeconomic modeling, *NBER Macroeconomics Annual 2000*, MIT Press.

Mueller, D. (1977). The persistance of profits above the norm, *Economica* **44**: 369–380.

Mwega, F. (2011). The competitiveness and efficiency of the financial services sector in Africa: A case study of Kenya, *African Development Review* **23**(1): 44–59.

Naceur, S. and Omran, M. (2011). The effects of bank regulations, competition, and financial reforms on banks' performance, *Emerging markets review* **12**(1): 1–20.

Noy, I. (2004). Financial liberalization, prudential supervision, and the onset of banking crises, *Emerging Markets Review* **5**(3): 341–359.

Noy, I. (2005). Banking crises in East Asia: the price tag of liberalization?, *Asia Pacific Issues, Analysis from the East-West Center* .

Peltzman, S. (1977). The gains and losses from industrial concentration, *Journal of Law and Economics* **20 (October)**: 229–263.

Popiel, P. (1994). Financial systems in Sub-Saharan Africa: A comparative study, *World Bank Discussion Paper, 260* .

Quintyn, M. and Taylor, M. W. (2007). Building supervisory structures in Sub-Saharan Africa–an analytical framework, *IMF Working Paper 07/18* .

Rhoades, S. and Rutz, R. (1982). Market power and firm risk:: A test of the 'quiet life'hypothesis, *Journal of Monetary Economics* **9**(1): 73–85.

Roberts, P. (1999). Product innovation, product-market competition and persistent profitability in the US pharmaceutical industry, *Strategic Management Journal* **20**: 655–670.

Rossi, M. (1999). Financial fragility and economic performance in developing economies: do capital controls, prudential regulation and supervision matter?, *IMF Working Paper No. 99/66* .

Schaeck, K. and Cihak, M. (2010). Competition, efficiency, and soundness in banking: An industrial organization perspective, *European Banking Center Discussion paper* (2010-20S).

Shaw, E. (1973). *Financial deepening in economic development*, Oxford University Press.

Shehzad, C. and De Haan, J. (2009). Financial liberalization and banking crises, *Conference of the Royal Economic Society, University of Surrey.*

Smirlock, M. (1985). Evidence on the (non) relationship between concentration and profitability in banking, *Journal of Money, Credit and Banking* **17**(1): 69–83.

Tchana Tchana, F. (2008a). The empirics of banking regulation, *Available at SSRN: http://ssrn.com/abstract=1150739* .

Tchana Tchana, F. (2008b). Regulation and banking stability: A survey of empirical studies, *University of Cape Town* .

Trujillo-Ponce, A. (2011). What determines the profitability of banks? evidence from Spain, *Accounting and Finance* .

Waring, G. (1996). Industry differences in the persistence of firm-specific returns, *The American Economic Review* **86**(5): 1253–1265.

Weisbrod, S., Lee, H., Rojas-Suarez, L. and Floor, T. (1992). Bank risk and the declining franchise value of the banking systems in the United States and Japan, *IMF Working Paper 92/45* .

Weller, C. (2001). Financial crises after financial liberalisation: exceptional circumstances or structural weakness?, *Journal of Development Studies* **38**(1): 98–127.

Williamson, J. and Mahar, M. (1998). A survey on financial liberalization, essays in international finance, *Department of Economics, Princeton University* .

Wilmarth Jr, A. (2003). *Too-Big-To-Fail: Policies and Practices In Government Bailouts*, Greenwood Publishing Group, chapter Does Financial Liberalization Increase the Likelihood of a Systemic Banking Crisis? Evidence from the Past Three Decades and the Great Depression.

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step gmm estimators, *Journal of econometrics* **126**(1): 25–51.

Wooldridge, J. (2001). *Econometric analysis of cross section and panel data*, MIT press.

World Development Report (2002). *Technical report*, World Bank.

Yartey, C. and Adjasi, C. (2007). Stock market development in Sub-Saharan Africa: Critical issues and challenges, *IMF Working Paper 07/201* (2007-2209).

Zarruk, E. and Madura, J. (1992). Optimal bank interest margin under capital regulation and deposit insurance, *Journal of Financial and Quantitative Analysis* **27**(1): 143–149.

Zhao, T. and Murinde, V. (2009). Bank competition, risk taking and productive efficiency: Evidence from Nigeria's banking reform experiments, *Stirling Economics Discussion Paper 23* .

Appendix A

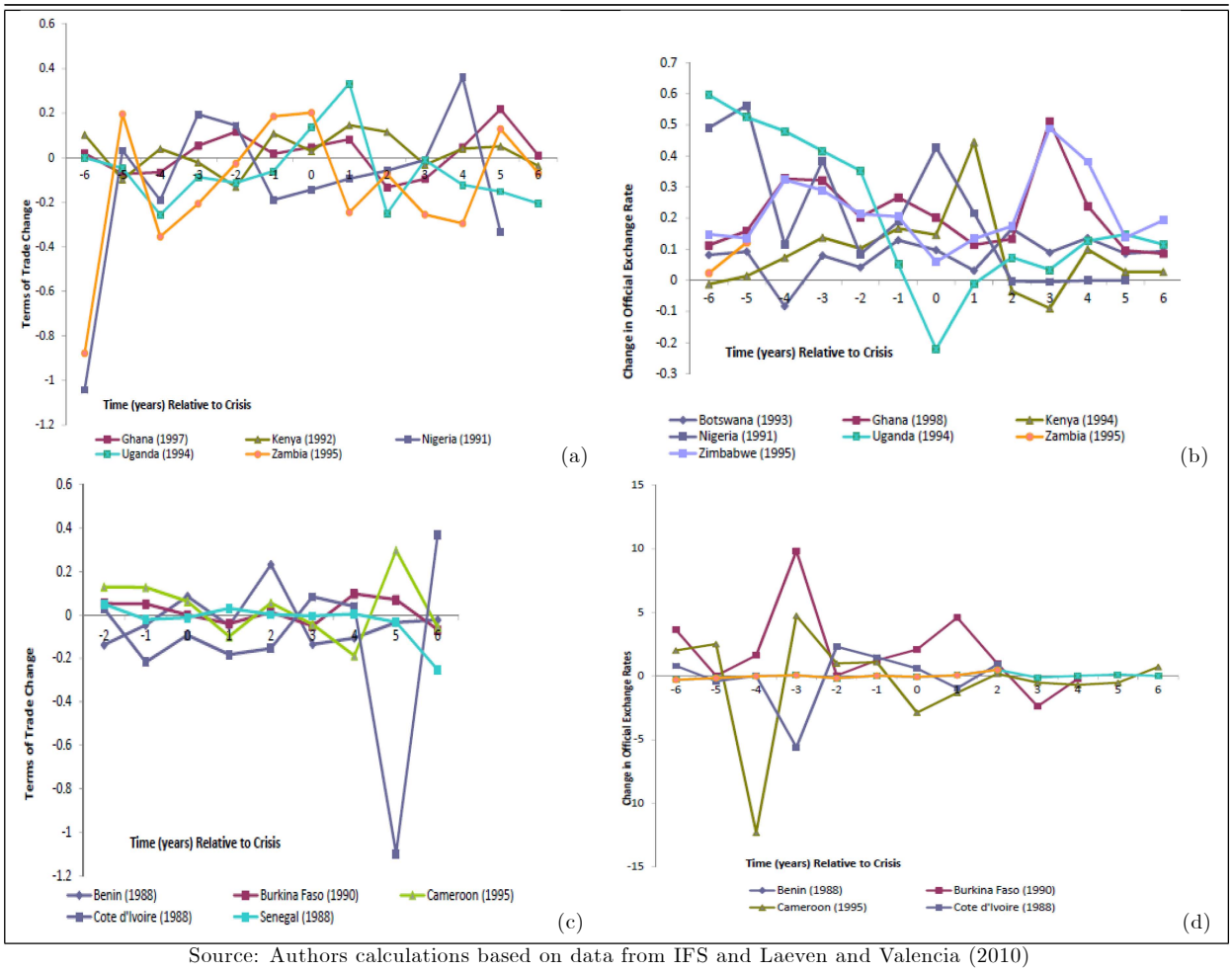
Appendix for Chapter 2

Table A.0.1: Financial Sector Deposits and Liquid Liabilities in SSA 1986-2006

	SSA		South Africa		Sychelles		Chad		Madagasca	
Year	llgdp	fdgdp	llgdp	fdgdp	llgdp	fdgdp	llgdp	fdgdp	llgdp	fdgdp
1986-1990	24.8	19.2	49.8	47.2	29.4	24.6	16.5	6.1	14.9	10.2
1990-1995	26.2	19.9	47.9	43.5	49.9	44.5	13.3	4	19.1	13.9
1996-2000	26.7	21.5	51.6	49.1	78.7	72.1	12	3.5	18.4	12.9
2001	28.7	23.5	48.3	50.9	96.7	87.2	11.1	3.8	20.4	13.7
2002	29.1	23.8	42.5	50	100.8	90.1	12.3	4.5	24.8	16.85
2003	30.7	25.2	41.9	51.4	108.7	97.8	11.8	4.5	22.2	15
2004	31.7	26.2	40.4	51.3	117.7	100.4	8	3.2	21.8	15
2005	32.6	27.1	41.4	53.2	127.2	104.8	7.3	2.9	20	14
2006	34.2	28.6	52.9	57.4	116.9	98.1	9.6	3.9	19.5	13.9
2007	25.1	22.6	45.3	61.4	98.4	85.2	11.6	4.6	20.5	14.9

Source: Author's calculations using Financial Structure & Development Database. Beck et.al (2009).

Figure A.1: External Sector Indicators



Source: Authors calculations based on data from IFS and Laeven and Valencia (2010)

Panels (a) and (b) are for countries outside the CFA franc zone and (c) and (d) are for CFA franc zone countries

Table A.0.2: Episodes of Banking Crisis in Sub Saharan Africa

Country &Dates	Scope
Botswana 1994-5	non-systemic: 1bank merged in 1994, 1 liquidated in 1995. State owned bank
Reform=1991	recapitalised at 0.6% of GDP
Cameroon (1995-98)	3 banks were restructured & 5 closed during 1987-93. Two banks were
Reform =1990	restructured and 2 were closed during 1995-98. 118% of GDP output loss. 65% NPL
Chad	2 state banks liquidated; 2 privatized during 1979-83.Banking system almost totally
1979-83; 1992-3	collapsed in 1992; liquidity crises in 1993. Output loss = 37% of GDP, 75% NPL
Cote d' Ivoire (1987-91)	4 large banks (90% of loans) distressed. 6 state banks closed. Government
Reform =1988	estimated costs were 25% of GDP. 50%NPL
Ghana (1989-91)	7 out of 11 banks insolvent. 40% of bank credit non-performing. 1 bank insolvent
(1997-2003**)	in 1991 due to excessive forex exposure.1 bank closed in 1995,later recapitalized
Reform=1987	In 1997 two state banks (34% market share) in bad shape.3 banks (4% of total
	deposits) insolvent in 2003. Output loss equivalent to 16% of GDP, 35% NPL
Kenya (1986-89)	3 banks failed in 1986. 4 banks, 24 NBFI (15% of financial system liabilities) had
(1992-98)	solvency problems. During 1985-89 banks holding 30% of total assets distressed.
Reform= 1989	2 banks were liquidated in 1993-94, estimated output loss, 23% GDP.
	non-systemic:3 banks liquidated in 1996,5 under management in 1998.66%, 32% NPL

Table A.0.3: Episodes of Banking Crisis Continued

Nigeria (1991-95)	8 banks insolvent in1992, 34 out of 115 banks (10% of deposits) insolvent in 1994. In 1995,
(1998-99)	60 of 115 banks were distressed. In 1997 distressed banks held 4% of total assets. 26 banks
Reform=1986	were liquidated in 1998 and another 7 in 1999. Output loss was 0.4% of GDP, 77% NPL
Senegal (1988)	7 banks (20-30% of total banking assets) closed in 1988, 2 in 1990, loss= 17% of GDP, 50% NPL
Reform =1989	
South Africa	non-systemic: By end of 1994, 60%-80% of loans at state banks were non-performing
(1989-94)	
Tanzania (1987, 1992)	In 1990 3 public banks insolvent, with $\succ$75% NPL. In 1992 a state bank (95%
Reform =1991	of total banking assets) declared to have been insolvent since 1990. Implied losses10% of GDP
Uganda	Half of the banking system faced insolvency between 1994 and 1998. 3 private banks were
(1994-2004)	liquidated in 1995. In 1998 UCB was recapitalized and privatized. In1998, 2 banks were closed,
Reform=1992	another 2 in 1999. In 2002 one small bank was bailed out, 2 others had serious problems.
Zambia (1995-1999)	3 banks closed in 1995, 4 failed in 1997 & 1 in 1998. 4 banks underwent liquidation in 1998/99
Reform=1992	Estimated losses were 0.5% of GDP
Zimbabwe (1991-2004)	1 bank failed in 1991 & was wholly taken over by the state. 2 of 5 commercial banks had high NPL
Reform=1990	in 1995. One big bank closed & 3 reported near to collapse in 1998. In 2004, 9 banks placed under
	curatorship, 3 were consolidated into a single bank & 3 were liquidated. 2.4% of GDP implied losses.

* NPL share in Total Loans at crisis peak, ** non-systemic Crisis

Reform indicates year in which initial libelarisation measures were implemented. Crises years in parenthesis

Sources: Laeven and Valencia (2010), Caprio and Klingebiel (2003); Kane and Rice (2001); IMF country reports, and various central bank reports for different countries.

Table A.0.4: Financial Liberalisation and Banking Crises Episodes

	Liberalisation policy start date								
Country	Lib year*	cr	ir	ent	sup	pvt	intk	secmkt	Banking Crisis†
Botswana	1989		1986	1990	1991	1990	1990	1989	1994**
Burkina Faso	1989	p1980	1989	p1980	1991	1995	1975	1993	1988
Cameroon	1990	1991	1990	1992	1997	1992	p1980	1996	1987
Chad	1991	1991	1991	1992	1997	1992		0	1992
Cote d'Ivoire	1988	p1980	1990	p1980	1991	p1980	p1980	1976	1988
Ethiopia	1996	1991	1998	1994	1996	0	2001	1997	1994
Gabon	1992		1990	1992	1997	1992		0	1995**
Gambia	1986	1987	1985	1980	1985	1985	1988	1995	1985**
Ghana	1987	1990	1987	1988	2001	1996	1987	1990	1982, 1997**
Kenya	1991	p1980	1991	p1980	1997	1978	p1980	p1980	1985, 1996**
Lesotho	1993		1993	1993	1999		2003		1988**1999**
Madagascar	1994	1986	1983	p1980	1991	1991	p73	1987	1988
Malawi	1988	1989	1988	1990	1989		1994	1996	
Mali	1989	1989	1989		1990	1990			1987
Mauritius	1981	1981	1988	1986	1988	1995		1989	1996**
Mozambique	1991	1991	1994	p1980	1995	1996	1993	1998	1987
Nigeria	1986	p1980	1987	p1980	1991	p73	1990	p1980	1991, 1997**
Senegal	1989	p1980	1989	p1980	1988	1989	p1980	1986	1988
Seychelles	1993		1994		1996	1993		1996	
Siera Leone	1991	1993	1992	2001	1994	1992	0		1990
Swaziland								1997	1995
South Africa	1980	p73	1980	1983	1986	p1980	1993	1982	1989**
Tanzania	1991	1993	1991	1991	1995	2000	1994	1994	1987
Uganda	1992	p1980	1992	p1980	1993	1995	1993	1993	1994
Zambia	1992		1992	1991	1994	1995	1992	1994	1995
Zimbabwe	1990	1990	1990	1993	2004	p1980	p1980	1979	1995

* Starting date of major steps towards financial liberalisation.

p1980 means some form of liberalisation was in place as early as 1980, 0 means no liberalisation yet.

Sources: Abiad et.al (2008), updated by authors using various central bank reports, SADC CCBG reports, various

†Year of first major bank closures/systemic crisis or borderline crisis (**)

Crisis data sources Caprio et.al (2003), Laevine (2010)

Appendix B

Appendix for Chapter 4

Table B.0.1: Variable Definition and Data Sources

Variable	Definition	Source
Crisis Variables		
Banking Crises	Dummy : =2 for systemic cries,= 1 for borderline crises, 0 otherwise	Laeven & Valencia (2010,2008), Caprio & Klingebiel (2003), Kane & Rice (2001)
NPL	Non Performing loans	Beck et.al (2010), WDI*, Bankscope
Z-score		Beck et.al (2010), Bankscope
Liberalisation Variables		
Fin lib	Dummy Variable, =1 in year when interest , rate controls were scrapped, 0 otherwise	Various published papers, central banks and IMF reports
Finreform; credit,entry interest rate, supervision, privatisation, security policies, international capital	liberalisation index & liberalisation policies	Abiad et.al (2008), Authors computations
Macroeconomic Variables		
rgdpg	Rate of growth of real GDP	WDI
Δ_{tot}	Change in terms of Trade	WDI
rir	Real interest rate	WDI
Infn	Rate of Change of GDP Deflator	WDI
Banking System Characteristics		
M2/Res	Ratio of M2 to International Reserves	IFS**
cr/gdp	Ratio of private credit to GDP	WDI
crgr	Rate of Growth of real Domestic credit to private sector	WDI
Liq	Ratio of bank liquid reservesto bank assets	WDI

Table B.0.2: Definitions and Sources continued

Institutional and regulatory quality measures		
gdppc	Real GDP per capita	WDI
DepIns	Dummy Variable, =1 if a country has explicit deposit insurance, 0 otherwise for a given year	Demirguc-Kunt, et.al. (2004), completed using IMF and World Bank reports
ReqRes	Required reserves is the percentage of reserves regulators require to hold.	
Press freedom	Freedom of media ranging from 0 to 2 with higher values corresponding to more freedom.	Freedom House
Gov	Governance, index ranging from -2.5 to 2.5 with higher values corresponding to better outcomes	Governance Indicators, Kaufmann et.al. 2007

*World Development Indicators **International Financial Statistics

Table B.0.3: Correlations Among Liberalisation Components: Levels

	cr	ir	ent	sup	pvt	intk	secmkt
cr	1						
ir	0.5047	1					
ent	0.5655	0.4576	1				
sup	0.5930	0.5570	0.6197	1			
pvt	0.5381	0.5004	0.5824	0.5564	1		
intk	0.3413	0.3748	0.3148	0.3560	0.3599	1	
secmkt	0.3682	0.3540	0.3483	0.5308	0.4435	0.4379	1

Table B.0.4: Correlations Among Liberalisation Components: Changes

	cr	ir	ent	sup	pvt	intk	secmkt
cr	1						
ir	-0.0046	1					
ent	0.0055	0.0234	1				
sup	0.2296	0.3000	0.1233	1			
pvt	-0.0067	-0.0284	-0.0340	0.0766	1		
intk	-0.1646	0.0655	0.2095	-0.0087	-0.0282	1	
secmkt	-0.0248	-0.0299	-0.0358	-0.0572	-0.1312	0.1109	1

Table B.0.5: Liberalisation, Bank Supervision and Banking Crises

	(1)			(2)		
Variables	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
rgdpg	0.011***	-0.002***	-0.009***	0.012***	-0.002***	-0.01***
	(0.0004)	(0.0002)	(0.0005)	(0.001)	(0.0002)	(0.002)
lgdppc	0.038**	-0.007**	-0.030**	-0.106**	0.046**	0.060**
	(0.004)	(0.001)	(0.005)	(0.0752)	(0.026)	(0.068)
ctot	0.001	-0.003	-0.001	0.002	-0.007	-0.002
	(0.075)	(0.026)	(0.068)	(0.021)	(0.032)	(0.029)
infn	-0.001*	0.001*	0.007*	-0.001***	0.004***	0.001***
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.007)	(0.0002)
rir	-0.002***	0.001***	0.0012***	-0.003***	0.001***	0.0022***
	(0.0002)	(0.0005)	(0.0002)	(0.0003)	(0.0001)	(0.0003)
m2res	-0.004***	0.0003***	0.004***	-0.0033***	0.0002***	0.003***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
crgdp	0.0001***	-0.0001***	-0.0001***	0.0001***	-0.0001***	-0.0001
	(0.0002)	(0.00001)	(0.0003)	(0.0001)	(0.0001)	(0.0002)
liq	-0.003***	0.0002***	0.0023***	-0.003***	0.0004***	0.003***
	(0.0001)	(0.001)	(0.0002)	(0.0004)	(0.0001)	(0.0004)
crgr_2	-0.001***	0.0001	0.001***	-0.001***	0.0004***	0.001***
	(0.0004)	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0002)
depins	-0.320***	0.051***	0.269***	-0.385***	0.025***	0.360***
	(0.005)	(0.004)	(0.0063)	(0.0163)	(0.0157)	(0.029)
finreform	0.025***	-0.004***	-0.022***	-0.005	0.001	0.005
	(0.002)	(0.001)	(0.002)	(0.003)	(0.0013)	(0.003)
finrefsup				0.014***	-0.030***	-0.011***
				(0.0021)	(0.001)	(0.002)
Prob>chi2		0.00			0.00	
Log likelihood		-471.2			-469.8	
pseudo R^2		0.25			0.229	

Robust standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1; marginal effects reported.

Table B.0.6: Liberalisation, Bank Supervision and Banking Crises continued

	(3)			(4)		
Variables	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
rgdpg	0.012***	-0.003***	-0.01***	0.014***	-0.003***	-0.011***
	(0.0015)	(0.0002)	(0.001)	(0.0015)	(0.0002)	(0.002)
lgdppc	0.004**	-0.04**	-0.035**	0.06**	-0.033**	-0.026**
	(0.0002)	(0.007)	(0.006)	(0.005)	(0.003)	(0.002)
ctot	0.0001	-0.0001	-0.0002	0.0001	-0.0003	-0.0006
	(0.0002)	(0.0005)	(0.0002)	(0.0011)	(0.0004)	(0.001)
infn	-0.001**	0.0001**	0.001**	-0.001***	0.0001***	0.001***
	(0.0002)	(0.001)	(0.0002)	(0.0002)	(0.0001)	(0.0002)
rir	-0.003***	0.001***	0.0024***	-0.003***	0.001***	0.002***
	(0.0003)	(0.0001)	(0.0003)	(0.0003)	(0.001)	(0.002)
m2res	-0.004***	0.0003***	0.004***	-0.004***	0.0004***	0.004***
	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0002)
crgdp	-0.0006**	0.001***	0.001***	-0.0001***	0.0001***	0.0001***
	(0.000)	(0.0001)	(0.0001)	(0.0001)	(0.00001)	(0.0001)
liq	0.004***	-0.0005***	-0.004***	0.004***	-0.0004***	-0.003***
	(0.0004)	(0.0001)	(0.001)	(0.0002)	(0.0001)	(0.0002)
crgr_2	-0.001***	0.0001***	0.001***	-0.001***	0.0003***	0.001***
	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0002)
depins	-0.31***	0.030	0.28***	-0.34***	0.03**	0.31***
	(0.013)	(0.02)	(0.03)	(0.02)	(0.014)	(0.027)
sup	0.27***	-0.05***	-0.26***	0.211***	-0.04***	-0.18***
	(0.02)	(0.007)	(0.023)	(0.02)	(0.01)	(0.022)
ir	-0.052***	0.07***	0.045***			
	(0.005)	(0.003)	(0.006)			
ent				-0.01	0.001*	0.005*
				(0.01)	(0.0004)	(0.001)
Prob>chi2		0.00			0.00	
log likelihood		-468.1			-472.4	
Pseudo R^2		0.28			0.271	

Robust standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1; marginal effects reported.

Table B.0.7: Liberalisation, Bank Supervision and Banking Crises continued

	(5)			(6)		
Variables	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
rgdpg	0.012***	-0.002***	-0.01***	0.014***	-0.003***	-0.011***
	(0.001)	(0.0002)	(0.001)	(0.001)	(0.0002)	(0.001)
lgdppc	0.0104*	-0.03*	-0.02*	0.06*	-0.04*	-0.02
	(0.006)	(0.03)	(0.006)	(0.05)	(0.03)	(0.005)
ctot	-0.001	0.0002	0.0003	-0.001	0.0004	0.001
	(0.006)	(0.007)	(0.0002)	(0.008)	(0.005)	(0.004)
infn	-0.001*	0.0001*	0.001*	-0.002**	0.0001*	0.001*
	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0002)
rir	-0.003***	0.001***	0.002***	-0.003***	0.001***	0.002***
	(0.0002)	(0.00004)	(0.0002)	(0.0003)	(0.0001)	(0.0003)
m2res	-0.003***	0.001**	0.003***	-0.004***	0.005***	0.004***
	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0002)
crgdp	-0.0001***	0.009***	0.01***	-0.009***	0.002***	0.0001***
	(0.00001)	(0.001)	(0.003)	(0.001)	(0.0001)	(0.0001)
liq	-0.003***	0.0002***	0.003***	-0.004***	0.004***	0.003***
	(0.0004)	(0.0001)	(0.0006)	(0.0002)	(0.0001)	(0.002)
crgr_2	-0.001**	0.0001*	0.001**	-0.001**	0.0001*	-0.001**
	(0.0001)	(0.0001)	(0.0001)	(0.001)	(0.0001)	(0.0002)
depins	-0.34***	0.027*	0.31***	-0.35***	0.031**	0.32***
	(0.013)	(0.015)	(0.02)	(0.02)	(0.01)	(0.03)
sup	0.18***	-0.03***	-0.15***	0.20***	-0.04***	-0.17***
	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)
cr	0.07***	-0.014***	-0.05***			
	(0.006)	(0.003)	(0.008)			
intk				-0.014	0.003**	0.02**
				(0.001)	(0.002)	(0.01)
Prob>chi2		0.00			0.001	
log likelihood		-489.1			-491.7	
Pseudo R^2		0.29			0.31	

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; marginal effects reported.

Table B.0.8: Liberalisation,Bank Supervision and Banking Crises continued

	(7)			(8)		
Variables	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
rgdpg	0.011***	-0.002***	-0.01***	0.013***	-0.002***	-0.011***
	(0.001)	(0.0002)	(0.002)	(0.001)	(0.001)	(0.001)
lgdppc	0.142*	-0.03*	-0.113*	0.13**	0.04	0.10*
	(0.07)	(0.02)	(0.06)	(0.06)	(0.008)	(0.05)
ctot	-0.001	0.0003	0.0004	-0.0008	0.0004**	0.0005***
	(0.006)	(0.007)	(0.002)	(0.009)	(0.0005)	(0.0001)
infn	-0.001***	0.0003	0.001***	-0.001***	0.0002***	-0.001***
	(0.0001)	(0.0008)	(0.0002)	(0.0001)	(0.0000)	(0.0002)
rir	-0.003***	0.001***	0.002***	-0.003*	0.001*	0.002*
	(0.0003)	(0.0005)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
m2res	-0.003***	0.0001***	0.003***	-0.003***	0.0001***	0.004***
	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0000)	(0.0002)
crgdp	-0.001***	0.002***	0.007***	-0.001***	0.001***	0.005***
	(0.0001)	(0.0000)	(0.0001)	(0.0000755)	(0.0003)	(0.0008)
liq	-0.003***	0.0003**	0.003***	-0.003***	0.002**	0.003***
	(0.0005)	(0.0001)	(0.001)	(0.0001)	(0.0002)	(0.0002)
crgr_2	-0.001***	0.01**	0.06***	-0.008***	0.01**	0.05***
	(0.0001)	(0.002)	(0.01)	(0.001)	(0.006)	(0.001)
depins	-0.356***	0.021**	0.335***	-0.368***	0.025***	0.331***
	(0.017)	(0.002)	(0.030)	(0.02)	(0.003)	(0.025)
sup	0.140***	-0.025***	-0.12***	0.17***	-0.064***	-0.144***
	(0.011)	(0.005)	(0.013)	(0.021)	(0.015)	(0.022)
pvt	0.10***	-0.024***	-0.08***			
	(0.01)	(0.004)	(0.01)			
secmkt				0.063***	-0.057***	-0.051***
				(0.006)	(0.012)	(0.007)
Prob>chi2		0.00			0.00	
log likelihood		-451.7			-442.9	
pseudo R^2		0.31			0.29	

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; marginal effects reported.

Table B.0.9: Crises, Regulatory and Institutional Measures

	(1)			(2)		
Variables	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
rgdpg	0.012***	-0.002***	-0.012***	0.012***	-0.02***	-0.06***
	(0.001)	(0.0003)	(0.002)	(0.001)	(0.001)	(0.001)
lgdppc	0.06*	-0.03*	-0.02	0.08**	0.04*	0.07*
	(0.06)	(0.02)	(0.005)	(0.04)	(0.01)	(0.05)
ctot	-0.005	0.002	0.0002	-0.002	0.004	0.002
	(0.007)	(0.005)	(0.0003)	(0.003)	(0.006)	(0.003)
infn	0.08***	0.04	0.07***	-0.06***	0.08***	0.006***
	(0.004)	(0.001)	(0.001)	(0.001)	(0.009)	(0.0001)
rir	-0.003***	0.001***	0.002***	-0.002***	0.001***	0.001***
	(0.0003)	(0.0005)	(0.0003)	(0.0002)	(0.0001)	(0.0002)
m2res	-0.003***	0.0002**	0.003***	-0.01***	0.0003***	0.003***
	(0.0001)	(0.0001)	(0.0002)	(0.001)	(0.0001)	(0.0002)
crgdp	-0.001***	0.0001***	0.001***	-0.001***	-0.002***	-0.001***
	(0.0001)	(0.00003)	(0.0001)	(0.0003)	(0.0001)	(0.0001)
liq	-0.003***	0.0003***	0.003***	-0.001***	0.001***	0.0011***
	(0.0004)	(0.0001)	(0.0005)	(0.0001)	(0.0002)	(0.00012)
crgr_2	-0.001***	0.0002	-0.001***	-0.001***	0.0001**	0.001***
	(0.0001)	(0.000)	(0.0001)	(0.0008)	(0.0000)	(0.0001)
depins	-0.377***	0.030**	0.34***	-0.34***	0.06***	0.29***
	(0.013)	(0.013)	(0.025)	(0.009)	(0.004)	(0.012)
sup	0.174***	-0.031***	-0.143***			
	(0.018)	(0.0062)	(0.021)			
finreform	0.012***	-0.001**	-0.01***	0.021***	-0.004***	-0.018***
	(0.002)	(0.001)	(0.003)	(0.002)	(0.001)	(0.003)
reqres				0.157***	-0.088***	-0.09***
				(0.053)	(0.009)	(0.006)
Prob>chi2		0.00			0.00	
log likelihood		-469.2			-471.7	
pseudo R^2		0.27			0.29	

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; marginal effects reported.

Table B.0.10: Crises, Regulatory and Institutional Measures

	(3)			(4)		
Variables	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
rgdpg	0.0112***	-0.002***	-0.01***	0.0119***	-0.0022***	-0.01***
	(0.0004)	(0.0002)	(0.0004)	(0.001)	(0.0002)	(0.001)
lgdppc	0.04**	-0.006**	-0.03**	0.033**	-0.017**	-0.016**
	(0.03)	(0.001)	(0.003)	(0.004)	(0.013)	(0.005)
ctot	-0.002	0.001	0.001	-0.001	0.0003	0.001
	(0.005)	(0.006)	(0.065)	(0.067)	(0.0038)	(0.000172)
infn	-0.001***	0.001***	0.001***	-0.001***	0.002	0.001***
	(0.0001)	(0.0001)	(0.0001)	(0.001)	(0.001)	(0.001)
rir	-0.002***	0.001***	0.001***	-0.002***	0.001***	0.0012***
	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0002)
m2res	-0.004***	0.003***	0.0035***	-0.004***	0.001***	0.004***
	(0.001)	(0.0001)	(0.0001)	(0.0008)	(0.0004)	(0.0002)
crgdp	-0.001***	0.0002***	-0.001***	-0.009***	-0.005***	-0.007***
	(0.0002)	(0.00001)	(0.0000)	(0.0002)	(0.0001)	(0.001)
liq	-0.0025***	0.0002***	0.0022***	-0.0023***	0.0002	0.0025***
	(0.0001)	(0.001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)
crgr_2	-0.001***	0.001**	0.001***	-0.001***	0.0003	0.001***
	(0.0001)	(0.0001)	(0.0001)	(0.001)	(0.0001)	(0.0001)
depins	-0.316***	0.048***	0.268***	-0.340***	0.057***	0.283***
	(0.005)	(0.004)	(0.007)	(0.008)	(0.005)	(0.009)
finreform	0.025***	-0.03***	-0.022***	0.025***	-0.004***	-0.021***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.003)
pressf	0.016	-0.0023	-0.014			
	(0.014)	(0.002)	(0.015)			
gov				-0.028	0.005	0.023
				(0.005)	(0.001)	(0.005)
Prob>chi2		0.00			0.00	
log likelihood		-399.6			-425.4	
Pseudo R^2		0.26			0.28	

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; marginal effects reported.

Table B.0.11: Robustness Tests: Logit Estimation Results; Using Different Crises Definition

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
rgdpg	-0.012**	-0.012**	-0.011*	-0.010*	-0.011*	-0.011**	-0.011*	-0.012**
	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)
lgdppc	-0.05*	-0.063*	-0.072**	-0.04**	-0.07**	-0.03**	-0.064*	-0.061*
	(0.03)	(0.03)	(0.036)	(0.003)	(0.037)	(0.004)	(0.04)	(0.035)
ctot	-0.001	-0.001	0.0004	0.0001	0.0004	0.0002	0.0002	-0.0005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.0026)	(0.0027)	(0.0027)
infn	0.03**	0.02*	0.04**	0.003*	0.0004*	0.0002	0.0003	0.0002
	(0.007)	(0.007)	(0.007)	(0.002)	(0.006)	(0.001)	(0.001)	(0.001)
rir	0.004**	0.0041**	0.004*	0.004*	0.004*	0.0036*	0.0037*	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.0018)	(0.002)	(0.002)
m2res	0.003***	0.004***	0.004***	0.003***	0.004***	0.004***	0.0034***	0.0033***
	(0.001)	(0.001)	(0.0011)	(0.001)	(0.0011)	(0.0011)	(0.0011)	(0.001)
crgdp	0.0001*	-0.0003	0.0004*	0.0001	0.0004	0.0001*	0.0004*	0.0001*
	(0.0001)	(0.0009)	(0.0001)	(0.0008)	(0.0009)	(0.00001)	(0.0002)	(0.0001)
liq	0.003**	0.004**	0.002	0.004***	0.003*	0.003**	0.002	0.003***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
crgr_2	0.001	0.001	0.001	0.001	0.001	0.0005	0.0005	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.0009)	(0.001)
depins	0.232***	0.187***	0.208**	0.238***	0.203***	0.232**	0.226**	0.197**
	(0.104)	(0.097)	(0.104)	(0.107)	(0.103)	(0.105)	(0.108)	(0.100)
pressf	-0.095**	-0.09**	-0.13***	0.116	0.128	0.098	-0.125***	-0.093**
	(0.040)	(0.041)	(0.044)	(0.043)	(0.044)	(0.040)	(0.044)	(0.041)
sup	-0.130**	-0.197***	-0.167***	-0.170***	-0.176***	-0.0964***	-0.153***	-0.184***
	(0.052)	(0.043)	(0.046)	(0.048)	(0.043)	(0.043)	(0.045)	(0.041)
finreform	-0.010*							
	(0.008)							
ir		0.03						
		(0.02)						
ent			0.01**					
			(0.003)					
cr				-0.05				
				(0.03)				
intk					0.01**			
					(0.0032)			
pvt						-0.099***		
						(0.0322)		
secmkt							-0.04*	
							(0.03)	
finlib								0.04*
								(0.006)
Prob>chi2	0.000	0.002	0.000	0.000	0.001	0.00	0.000	0.002
Pseudo R^2	0.24	0.26	0.22	0.30	0.24	0.27	0.26	0.25
log likelihood	-469	-467	-477.4	-467.2	-472	-471	-468.6	-472.2

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; marginal effects reported.

Table B.0.12: Robustness Tests: Using Removal of Interest Rate Controls to Proxy Overal Liberalisation

	(1)	(2)	(3)
Variable	crises=0	crises=1	crises=2
rgdpg	0.013***	-0.003***	-0.010***
	(0.0005)	(0.0001)	(0.0005)
lgdppc	0.101**	-0.03**	-0.08*
	(0.05)	(0.011)	(0.05)
ctot	-0.001	0.0002	0.001
	(0.001)	(0.005)	(0.0024)
infn	-0.001***	0.001***	0.001***
	(0.0001)	(0.0001)	(0.0001)
rir	-0.001***	0.0004***	0.001***
	(0.0001)	(0.0001)	(0.0001)
m2res	-0.005***	0.0004***	0.004***
	(0.0001)	(0.0002)	(0.0003)
crgdp	0.0001	-0.0001	-0.0001
	(0.0002)	(0.0001)	(0.00002)
liq	-0.003***	0.0004***	0.003***
	(0.0001)	(0.0001)	(0.0002)
crgr_2	-0.001***	0.0001***	0.001***
	(0.0001)	(0.0001)	(0.0002)
depins	-0.217***	0.043***	0.174***
	(0.011)	(0.007)	(0.015)
finlib	-0.143***	0.024***	0.119***
	(0.0112)	(0.006)	(0.002)
Constant	-0.0003	-0.0004	0.0006
	(0.0005)	(0.0003)	(0.0008)
Prob>chi2		0.000	
Pseudo R^2		0.35	

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Appendix C

Appendix for Chapter 5

Table C.0.1: Countries in Sample

Country	Banks	Country	Banks	Country	Banks
Botswana	3	Kenya	14	Sierra Leone	4
Burkina Faso	7	Lesotho	3	Swaziland	5
Cameroon	7	Madagasca	6	South Africa	6
Chad	3	Malawi	3	Seychelles	2
Cote d'Ivoire	7	Mali	3	Tanzania	6
Ethiopia	7	Mauritius	7	Uganda	7
Ghana	12	Mozambique	5	Zambia	8
Gabon	3	Nigeria	7	Zimbabwe	3
Gambia	3	Senegal	7		

Source: Bankscope data

Table C.0.2: Summary statistics for the entire sample

Variable	Obs	Mean	Std. Dev	Min	Max
ROAA	1266	2.2	4.26	-56.7	49.46
ROAE	1246	19.98	35.08	-317	454
NIM	1281	7.06	6.88	-6.57	107.34
Size	1288	5.54	2.9	2.3	15.8
$Size^2$	1288	39.33	44.9	0	251.1
Costs	1260	3.06	2.92	-3.21	13.4
Capital	1118	12.67	9.75	-40.7	80.2
Cr_risk	1034	42.9	19.56	0.03	89
risk	824	9.0	14	0	108
Conc	1343	0.77	0.18	0.38	1
fown	1255	50.54	27.50	0	100
fown1	1193	53.74	31.73	0	100
Finref	1343	12.68	4.58	0	20
Finlib	1343	0.99	0.54	0	1
Complib	1231	5.8	1.47	1	9
Crgdp	1343	21.18	26.04	2.07	157.1
gdpg	1343	4.19	4.2	-17.6	33.6
Infn	1343	13.32	37.32	-30.16	495.3
lgdppc	1343	6.2	0.96	4.7	9.3
pressf	1343	0.73	0.68	0	2
gov	1343	-0.1	1.22	-4.15	2.69
rlaw	1343	-0.64	0.64	-2.27	0.93

Source: Author's calculations

Table C.0.3: Financial Liberalisation and Bank Profitability:Two-step GMM Estimation Results

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ROA_1	0.27***	0.26**	0.28***	0.25**	0.27***	0.29***	0.26***
	(0.09)	(0.06)	(0.06)	(0.10)	(0.11)	(0.07)	0.09
Capital	-0.09*	0.09	-0.11**	-0.07*	0.08	-0.06*	-0.09
	(0.04)	(0.07)	(0.06)	(0.08)	(0.16)	(0.01)	0.08
Cr_risk	0.17***	0.16***	0.15**	0.15***	0.14**	0.15***	0.16***
	(0.04)	(0.04)	(0.04)	(0.08)	(0.05)	(0.05)	0.04
Costs	-2.7***	-2.8***	-2.6***	-2.9***	-2.4***	-2.8**	-2.7***
	(0.92)	(0.91)	(0.86)	(0.07)	(0.9)	(0.84)	0.89
Size	10.7**	10.14*	10.93*	8.21*	6.02**	2.3***	10.5**
	(4.8)	(4.9)	(5.05)	(3.21)	(2.9)	(1.6)	4.7
Size2	-0.30*	-0.29*	-0.33	-0.33*	-0.33*	-0.28	-0.29
	(0.23)	(0.24)	(0.21)	(0.2)	(0.21)	(0.2)	0.23
gdpg	0.13**	0.11**	0.12*	0.11**	0.11***	0.10***	0.11***
	(0.05)	(0.04)	(0.04)	(0.04)	(0.03)	(0.06)	0.04
Infn	0.34**	0.03***	0.02**	0.01**	0.03**	0.03**	0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	0.01
Conc	-0.11	-6.7	-3.7	-1.6	-5.6	-0.85	-7.06
	(0.87)	(3.84)	(3.3)	(0.57)	(2.8)	(0.58)	5.4
fown	0.11	-0.05	-0.04	-0.05	-0.05*	-0.07	-0.05
	(0.08)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
lgdppc	0.97**	0.67**	0.74**	0.38*	0.36*	0.63*	0.71*
	(0.33)	(1.02)	(0.40)	(0.20)	(0.22)	(0.25)	(0.31)
pressf	0.11	-0.09	-0.26	0.9	-0.72	-1.26*	1.38*
	(0.87)	(1.01)	(0.95)	(0.96)	(1.3)	(0.4)	(0.55)
†cr/ir/ent/superv/pvt/intk/secmkt	-0.19	-0.75*	-2.99*	1.83**	0.65*	-0.4	-0.16*
	(0.41)	(1.4)	(1.2)	(0.85)	(0.15)	(1.0)	(1.06)
Wald Chi2()[1]	132***	189***	105***	119***	101***	124***	201***
AR(1)[2]	-1.57**	-1.69***	-2.1***	-1.62**	-2.0***	-1.5***	-1.32***
AR(2)[3]	0.39	0.4	0.9	-0.36	0.36	0.4	-0.9
Sargan Test[4]	100	104	102	105	112	104	103
†							

Windmeijer (2005)-corrected robust standard errors in parentheses;*** p<0.01, ** p<0.05, * p<0.1

†Columns 1 to 7 correspond to liberalisation of credit controls, interest rates, entry restrictions, bank supervision, privatisation, international capital flows, and security market policies respectively

[1] Wald statistic: H_0 All coefficients are zero.

[2,3] AR(1) and AR(2) tests for 1st and 2nd-order autocorrelation, H_0 No autocorrelation of residuals

[4] Sargan Test of overidentifying restrictions: H_0 Overidentifying restrictions are valid

Table C.0.4: Financial liberalisation and bank net interest margins: 2-step GMM results

Variable	(1)	(2)	(3)	(4)	(5)	(6)
NIM_1	0.53***	0.46**	0.38***	0.46**	0.25**	0.34**
	(0.21)	(0.17)	(0.14)	(0.20)	(0.11)	(0.03)
Capital	0.04*	0.03	0.11**	0.16***	0.19***	0.14***
	(0.03)	(0.03)	(0.06)	(0.04)	(0.04)	(0.04)
Cr_risk	0.21***	0.16***	0.25**	0.03*	0.19***	0.02*
	(0.08)	(0.05)	(0.07)	(0.03)	(0.08)	(0.01)
Costs	2.36*	2.8**	2.58**	3.06**	3.94**	2.81**
	(1.12)	(1.5)	(1.64)	(1.47)	(2.24)	(1.27)
Size	3.1**	2.54**	2.4**	2.6*	0.17*	2.16*
	(1.16)	(0.91)	(0.89)	(1.30)	(0.12)	(1.10)
Size2	-0.17*	-0.18*	-0.14**	-0.04	-0.09*	-0.06*
	(0.05)	(0.06)	(0.05)	(0.14)	(0.11)	(0.03)
gdpg	0.09**	0.08**	0.12**	0.08**	0.10**	0.07**
	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)	(0.03)
Infn	0.04**	0.03***	0.01**	0.03**	0.01**	0.02**
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.01)
Conc	-0.74	0.70	-0.4	-0.62	-0.39	-4.3
	(0.62)	(0.9)	(0.36)	(0.57)	(0.59)	(2.20)
fown	-0.03	-0.06	-0.04	0.01	-0.02	-0.01
	(0.04)	(0.04)	(0.05)	(0.04)	(0.03)	(0.05)
lgdppc	0.17**	0.21**	0.14**	1.64*	0.23**	2.4**
	(0.05)	(0.07)	(0.08)	(0.42)	(0.09)	(0.50)
pressf	-0.31	-0.09	-0.26	0.29	0.71	0.62
	(0.17)	(1.01)	(0.95)	(2.11)	(0.51)	(2.50)
gov	0.15	0.26	0.36	-0.09	0.90	-1.6
	(0.38)	(0.04)	(0.12)	(1.20)	(0.74)	(1.90)
finref	0.05			0.01		
	(0.36)			(0.35)		
complib		-0.12**			-0.25***	
		(0.04)			(0.07)	
crgdp			-0.24***			-0.29***
			(0.08)			(0.08)
cir				-0.04***	-0.02**	-0.03***
				(0.01)	(0.01)	(0.01)
AR(1)[2]	-2.14**	-2.05***	-2.01***	-1.78**	-2.6**	-2.61***
AR(2)[3]	-0.27	-0.84	1.2	-0.21	0.92	0.14
Sargan Test[4]	89	80	101	97	93	94
Windmeijer (2005)-corrected robust standard errors in parentheses						
***=p<0.01, **= p<0.05, *= p<0.1						

2,3 AR(1) and AR(2) tests for 1st and 2nd-order autocorrelation, H_0 No autocorrelation of residuals

4 Sargan Test of overidentifying restrictions: H_0 Overidentifying restrictions are valid

Table C.0.5: Estimation Results Using Fixed Effects

Dep Var *ROA*	(1)		(2)		(3)	
Variable	coeff	std error	coeff	std error	coeff	std error
costs	-0.56*	0.24	-0.40*	0.12	-0.52*	0.15
size	3.12**	1.5	3.22**	1.63	3.25**	1.6
size2	-0.04*	0.04	-0.06	0.15	-0.07*	0.06
capital	0.20***	0.06	0.21**	0.06	0.19**	0.06
cr_risk	0.02	0.01	0.06*	0.03	0.01*	0.01
gdpg	0.19***	0.07	0.21**	0.09	0.15***	0.07***
infn	0.04**	0.01	0.04***	0.02	0.09**	0.04
conc	-1.66	1.88	-1.80	2.2	-3.2	2.07
fown	0.03*	0.02	0.04	0.12	0.09	0.16
lgdppc	3.7**	1.8	3.9**	2.01	3.1**	1.10
rlaw	-0.94	1.2	-1.23	1.31	-0.53	1.19
gov	0.46	0.83	0.73	0.87	0.02	0.78
finref	0.20	0.12				
complib			-0.29**	0.09		
crgdp					-0.09***	0.02
constant	1.11*	0.38	1.54	0.56	1.16	0.58*
R^2	0.46		0.61		0.59	
Hausman specification test						
chi2(14)	163.03		193.94		241	
Prob>chi2	0.0001		0.0020		0.0002	
H_0: difference in coefficients not systematic						
Breusch-Pagan LM test						
chi2(1)	13.73		8.35		13.52	
Prob>ch2	0.0002		0.0039		0.0002	
H_0:Var(v_i) = 0						

Appendix D

Appendix for chapter 6

Table D.0.1: Franchise Value and Banking Crises: Alternative Profit-Liberalisation Indicator

Variables	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
$\widehat{refroa}$	-0.10	0.014	0.09			
	(0.022)	(0.019)	(0.124)			
rgdpg	0.026***	-0.14***	-0.013***	0.014***	-0.014***	-0.017***
	(0.01)	(0.03)	(0.005)	(0.001)	(0.003)	(0.001)
gdppc	0.021*	-0.013*	-0.027*	0.026*	-0.008*	-0.245*
	(0.005)	(0.005)	(0.001)	(0.0090)	(0.0008)	(0.101)
Δ_{tot}	0.001	-0.001	-0.003	0.0054	-0.0014	-0.003
	(0.058)	(0.002)	(0.074)	(0.065)	(0.012)	(0.04)
infn	-0.001**	0.004**	0.002**	-0.003**	0.006**	0.01**
	(0.0001)	(0.002)	(0.0001)	(0.001)	(0.0032)	(0.005)
rir	-0.04***	0.007***	0.005***	-0.004***	0.007***	0.005***
	(0.0003)	(0.0004)	(0.0004)	(0.0003)	(0.004)	(0.001)
m2res	-0.003***	0.0002***	0.011***	-0.004***	0.0005***	0.0019***
	(0.0002)	(0.004)	(0.0002)	(0.0002)	(0.0004)	(0.005)
crgdp	-0.0002	0.000	0.002	-0.001	0.0004	0.0002
	(0.002)	(0.008)	(0.009)	(0.005)	(0.0009)	(0.0003)
liq	-0.005*	0.005*	0.006*	-0.004*	0.004*	0.003*
	(0.0023)	(0.0004)	(0.0033)	(0.0003)	(0.001)	(0.002)
crgr_2	-0.009*	0.021*	0.0006*	-0.001*	0.0002*	0.0001*
	(0.0001)	(0.0002)	(0.0002)	(0.005)	(0.0002)	(0.002)
depins	-047***	0.059**	0.498**	-0.51***	0.069*	0.517***
	0.0127	0.0260	0.0212	0.0131	0.0233	0.0210
gov	0.021	-0.0143	-0.008	0.0156	-0.0169	-0.0018
	0.0130	0.0155	0.0191	0.0147	0.0158	0.0220
sup	0.062***	-0.015***	-0.077***	0.018***	-0.015**	-0.069***
	0.0163	0.0084	0.0205	0.0167	0.0087	0.0211

Table D.0.2: Alternative Profit-Liberalisation Indicator continued

dinslib	0.055*	-0.29*	-0.47*	0.031**	-0.06**	-0.05**
	0.011	0.018	0.023	0.155	0.0233	0.033
suplib	0.150***	-0.048***	-0.135***	0.145***	-0.046***	-0.125***
	0.015	0.0121	0.0243	0.0112	0.0152	0.0238
$\hat{refroe}$				-0.19*	0.04*	0.06*
				0.013	0.011	0.04
Prob>chi2		0.00			0.00	
log likelihood		-482			-469	
Pseudo R^2		0.22			0.26	

Robust standard errors in parentheses ***p<0.01, **p<0.05, *<0.1

Table D.0.3: Robustness Test: Exogenous Franchise Value

	(1)			(2)			(3)		
Variables	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
roa	0.616***	-0.180**	-0.436***						
	(0.110)	(0.0803)	(0.115)						
rgdpg	0.0054**	-0.0023***	-0.0032**	0.0037**	-0.0014**	-0.0023*	0.0054**	-0.002**	-0.004**
	(0.002)	(0.007)	(0.0015)	(0.00146)	(0.000488)	(0.00130)	(0.0015)	(0.0006)	(0.0015)
gdppc	0.0168	-0.181	-0.198	0.228*	-0.236*	-0.0082*	-0.0301	-0.0718	0.102
	(0.290)	(0.195)	(0.184)	(0.137)	(0.0595)	(0.154)	(0.138)	(0.0728)	(0.140)
Δ_{tot}	-0.003*	0.003*	0.005*	0.0014**	-0.0019**	-0.0005**	0.004**	-0.003***	-0.0011***
	(0.0018)	(0.007)	(0.0013)	(0.0017)	(0.0006)	(0.003)	(0.0012)	(0.0004)	(0.0008)
infn	0.005	-0.004	-0.003	0.009	-0.005	-0.001	-0.002	-0.0003	0.0002
	(0.003)	(0.001)	(0.001)	(0.0031)	(0.005)	(0.001)	(0.0001)	(0.005)	(0.0002)
rir	-0.0017***	0.0015***	0.006***	-0.041***	0.0038***	0.008**	-0.0012***	0.0003**	0.001**
	(0.0005)	(0.003)	(0.004)	(0.098)	(0.0079)	(0.0015)	(0.0002)	(0.0003)	(0.0003)
m2res	-0.0015***	0.0006***	0.0009***	-0.002***	0.0006***	0.0013***	-0.0003***	0.008**	0.007**
	(0.0002)	(0.0002)	(0.0002)	(0.002)	(0.006)	(0.001)	(0.0006)	(0.0007)	(0.0001)
crgdp	0.0011	-0.0024	-0.0013	0.006	-0.0011	0.005	-0.0003	0.0003	0.0006
	(0.006)	(0.004)	(0.004)	(0.0082)	(0.0074)	(0.0052)	(0.0006)	(0.0004)	(0.0005)
liq	0.0073**	-0.0052**	-0.0011**	0.0005	-0.005	-0.0004	0.0027***	-0.0012***	-0.0015**
	(0.007)	(0.009)	(0.0055)	(0.0068)	(0.055)	(0.000592)	(0.0006)	(0.0004)	(0.0005)
crgr_1	-0.001***	0.008**	0.008***	0.003	-0.0004	-0.006	-0.0015***	0.0005***	0.0009***
	(0.000182)	(8.05e-05)	(0.000162)	(0.0014)	(0.0002)	(0.008)	(0.0002)	(0.0007)	(0.0002)
depins	-0.405***	0.122***	0.283***	-0.388***	0.0634**	0.325***	-0.0003*	0.009*	0.009*
	(0.0544)	(0.0381)	(0.0823)	(0.0826)	(0.0234)	(0.0813)	(0.0417)	(0.0118)	(0.0477)
rlaw	0.131***	-0.0165**	-0.147***	0.151***	-0.0032**	-0.148***	0.251***	-0.0431**	-0.208***
	(0.0181)	(0.0378)	(0.0424)	(0.0261)	(0.0367)	(0.0395)	(0.0301)	(0.0383)	(0.0552)
complib	-0.0011	0.017	0.04	-0.0201**	0.0106**	0.0095**	-0.0672***	0.0304***	0.0368***
	(0.0084)	(0.0042)	(0.0083)	(0.0087)	(0.004)	(0.0087)	(0.0140)	(0.0075)	(0.0115)
sup	0.104**	-0.0455**	-0.0580**	0.0810*	-0.0436*	-0.0374*	0.0828**	-0.0519**	-0.031**
	(0.0297)	(0.0202)	(0.0337)	(0.0317)	(0.0165)	(0.0389)	(0.0326)	(0.0199)	(0.0327)

Table D.0.4: Exogenous Franchise Value Continued

	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2	crises=0	crises=1	crises=2
roalib	-0.170**	0.0348**	0.135**						
	(0.0214)	(0.0223)	(0.0323)						
roasup	0.445**	-0.0975**	-0.347**						
	(0.0900)	(0.0527)	(0.0927)						
roe				0.741	-1.023	-1.764			
				(1.169)	(0.855)	(1.639)			
roelib				-0.206	0.180	0.286			
				(0.309)	(0.250)	(0.490)			
roesup				4.947	-1.098	-3.849			
				(0.751)	(0.498)	(1.098)			
nim							-0.296**	0.528**	0.768**
							(0.644)	(0.380)	(0.677)
nimlib							0.332**	-0.250**	-0.0820**
							(0.139)	(0.1)	(0.158)
nimsup							0.647*	-0.199*	-0.449*
							(0.286)	(0.116)	(0.286)
Prob>chi2		0.00			0.00			0.00	
log likelihood		-456.2			-461.7			-455.1	
Pseudo R^2		0.29			0.31			0.34	

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix E

Data Appendix

E.1 Computation of liberalisation Variables

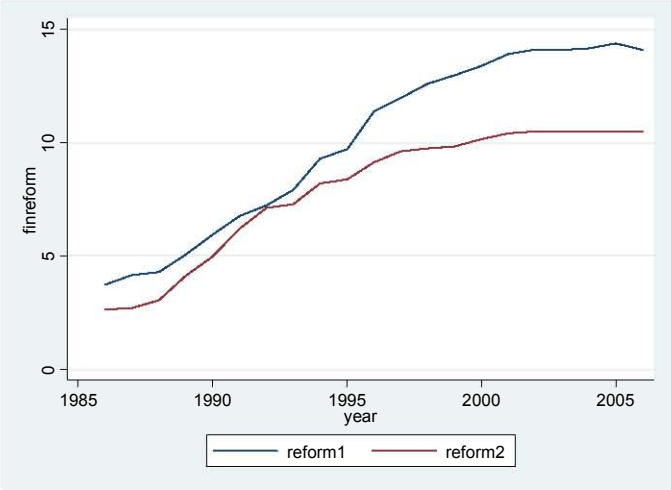
A score is given for each of the questions that are set for a specific dimension. Next, a final score is given along each dimension. This score ranges between zero and three, with three corresponding to full liberalisation, 2 refers to largely liberalised, 1 means partially repressed, while zero indicates highly repressed financial system. For bank regulation and supervision, 0 correspond to unregulated and unsupervised through to 3 which corresponds to strongly regulated and supervised.[1]

After assigning scores to the seven financial liberalisation policies, we derive a matrix X of liberalisation, with scores for each dimension being the columns of the matrix. Using this information, we construct two main indices of financial reform. The first one, $finreform$ is a sum of individual components for each country in each year[2]. Since the scale ranges between 0 and 3, the index ranges between 0 and 21. Figure E.1 displays the two indices for financial reform.

[1]The study uses information from various country and regional IMF and World Bank reports, SADC Committee for Central bank Governors (CCBG) reports, published papers, as well as central bank reports to assign the codes and the scores.

[2]The second index is constructed using principal component analysis.

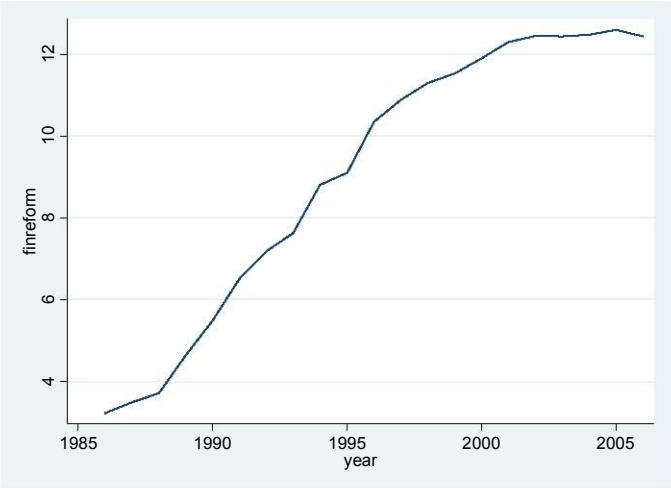
Figure E.1: Financial Liberalisation Index by Data Groups



Data for reform1 is from Abiad et.al. (2008), for 14 countries. reform2 data has been computed in this study, covering 12 countries.

Figure E.1 confirms that total financial liberalisation was less gradual between 1986 and about 1992, before accelerating sharply between 1993 and 2000 in both sets of countries. Thereafter, the liberalisation process slowed down, maybe because most countries had by then liberalised a greater part of their financial sectors (Abiad et al., 2008). The aggregate index in Figure E.2 confirms that financial liberalisation process was most intense from the early 1990's to about the year 2000. The index for total liberalisation increased by about 120% in 2000 from its 1990 level, but only increased by about 4% in 2006 from its 1990 level.

Figure E.2: Aggregate Financial Liberalisation Index for SSA 1986 to 2006



At country level, the process was less smooth, with periods of no change in policy as well as policy reversals. For instance, Kenya, Nigeria, Uganda and Zimbabwe experienced policy reversals between 1994 and 2000.

Turning now to individual policies, the liberalisation components are highly correlated (Table B.0.3 and Figure E.3), signifying that countries with restrictive policies in one area are more likely to have restrictive policies in other areas as well.

Figure E.3: Financial Liberalisation Index in SSA by Components

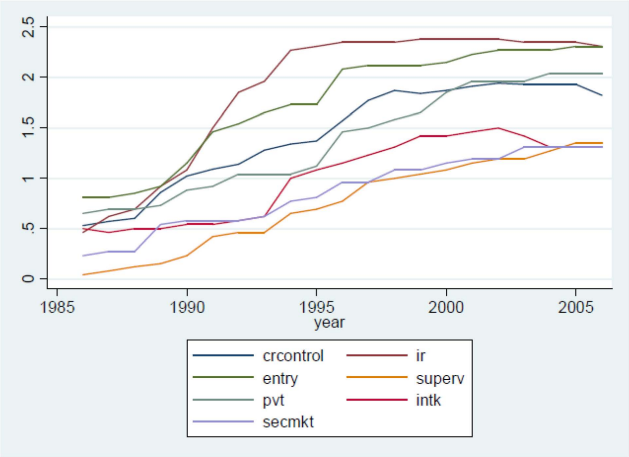


Table E.1.1: Financial Liberalisation in SSA by Component

year	cr	ir	ent	sup	pvt	intk	secmkt
1986	0.53	0.46	0.81	0.04	0.65	0.50	0.23
1987	0.57	0.62	0.81	0.08	0.69	0.46	0.27
1988	0.60	0.69	0.85	0.12	0.69	0.50	0.27
1989	0.86	0.92	0.92	0.15	0.73	0.50	0.54
1990	1.02	1.08	1.15	0.23	0.88	0.54	0.58
1991	1.09	1.50	1.46	0.42	0.92	0.54	0.58
1992	1.14	1.85	1.54	0.46	1.04	0.58	0.58
1993	1.28	1.96	1.65	0.46	1.04	0.62	0.62
1994	1.34	2.27	1.73	0.65	1.04	1.00	0.77
1995	1.37	2.31	1.73	0.69	1.12	1.08	0.81
1996	1.57	2.35	2.08	0.77	1.46	1.15	0.96
1997	1.77	2.35	2.12	0.96	1.50	1.23	0.96
1998	1.87	2.35	2.12	1.00	1.58	1.31	1.08
1999	1.84	2.38	2.12	1.04	1.65	1.42	1.08
2000	1.87	2.38	2.15	1.08	1.85	1.42	1.15
2001	1.91	2.38	2.23	1.15	1.96	1.46	1.19
2002	1.94	2.38	2.27	1.19	1.96	1.50	1.19
2003	1.93	2.35	2.27	1.19	1.96	1.42	1.31
2004	1.93	2.35	2.27	1.27	2.04	1.31	1.31
2005	1.93	2.35	2.31	1.35	2.04	1.31	1.31
2006	1.82	2.31	2.31	1.35	2.04	1.31	1.31

The data in Table E.1.1 shows that interest rate liberalisation is the most advanced dimension for each year, and by end of period average. Second and third is liberalisation of bank entry and activity restrictions, as well as bank privatisation respectively. On the other hand, the least advanced dimensions are security market policies, international capital controls, and bank supervision and prudential regulation, respectively.

We also computed annual changes for each liberalisation policy. The corresponding correlations are presented in table B.0.4**.** The annual changes in the component indices are less correlated. This suggests that liberalisation may have been carried out at different times for different dimensions and in different countries.

E.2 Coding Rules for Financial Liberalisation Policies and Indices

To construct indices for the seven facets of liberalisation, the following questions were considered. The questions and the coding rules were adopted from Abiad et al. (2008). Each dimension has various sub-dimensions. A raw score is assigned according to set rules for each sub-dimension. This raw score is then normalised on a 0 to 3 scale. The scale is as follows. Fully liberalised = 3, partially liberalised = 2, partially repressed = 1, and fully repressed = 0.

E.2.1 Credit Controls and Reserve Requirement

1) Are reserve requirements restrictive?

- Coded as 0 if reserve requirement is more than 20%
- Coded as 1 if reserve requirements are reduced to 10-20% or regulations to set reserve requirements are simplified as a step towards reducing reserve requirements.
- Coded as 2 if reserve requirements are less than 10%

2) Are there minimum amounts of credit that must be channelled to certain sectors?

- Coded as 0 if credit allocations are determined by the central bank or mandatory allocations to certain sectors exist.
- Coded as 1 if mandatory allocations to certain sectors are eliminated or do not exist.

3) Are there any credits supplied to certain sectors at subsidised rates?

- Coded as 0 when banks have to supply credits at subsidised rates to certain sectors.
- Coded as 1 when the mandatory requirement of credit allocation at subsidised rates is eliminated or banks do not have to supply credits at subsidised rates.

4) Aggregate credit ceilings

- *Coded as 0 if ceilings on expansion of bank credit are in place. This includes bank-specific credit ceilings imposed by the central bank.*

- *Coded as 1 if no restrictions exist on the expansion of bank credit.*

The scores from these questions are then summed as follows: Fully liberalised = 4, Largely liberalised = 3, Partially repressed = (1,2), Fully repressed = 0. This is then referred to the normalisation and the final scale is given below.

Sum/raw score	Normalised scale
4	3
3	2
1,2	1
0	0

E.2.2 Interest rate liberalisation

Deposit and lending rates are seperately considered and coded as being government set (code =0), fluctuating within a band (code=1) or freely floating (code =2). The following describes the coding rules used.

1) Fully liberalised (FL) = 4 [2, 2]

- Both deposit rates and interest rates are market determined.

2) Largely liberalised (LL) = 3 [2,1]

- Either deposit rates or lending rates are freed but the other rates are subject to a band or only a part of interest rates are determined at market rates.

3) Partially repressed (PR) = 2/1 [2,0] [1,1] [1,0]

- Either deposit or lending rates are freed but the other interest rates are set by the government, or subject to ceiling or floor; or both deposit and lending rates are sublect to a band or partially liberalised; or either deposit or lending rates are subject to band or partially liberalised.

4) Fully repressed (FR) = [0,0]

- Both deposit and lending rates are set by the government or subject to a ceiling or floor.

Score	Normalised scale
FL=4	3
LL=3	2
PR=2/1	1
FR=0	0

E.2.3 Banking sector entry and activity restrictions

The first question examines the extent of foreign bank entry into the domestic market, branching restrictions on foreign banks, as well as equity ownership of domestic banks by non-residents.

1) To what extent does government allow foreign banks to enter into a domestic market?

- Coded as 0 when no entry of foreign banks is allowed; or tight restrictions on the opening of new foreign banks are in place.
- Coded as 1 when foreign bank entry is allowed, but nonresidents must hold less than 50% equity share.
- Coded as 2 when the majority of share of equity ownership of domestic banks by nonresidents is allowed; or equal treatment is ensured for both foreign banks and domestic banks; or an unlimited number of branching is allowed for foreign banks.

Questions 2 to 4 consider policies to enhance the competition in the domestic banking market.

2) Does the government allow the entry of new domestic banks?

- Coded as zero when the entry of new domestic banks is not allowed or strictly regulated.
- Coded as 1 when the entry of new domestic banks or other financial institutions is allowed into the domestic market.

3) Are there restrictions on branching?

- Coded as 0 when restrictions are in place
- Coded as 1 when there are no branching restrictions or if restrictions are eased.

4) Does the government allow banks to engage in a wide range of activities?

- Coded as 0 when the range of activities that banks can take consists of only banking activities.
- Coded as 1 when banks are allowed to become unioversal banks.

The sum of scores from these four questions is then scaled as follows.

Score	Normalised Scale
FL = 4 or 5	3
LL = 3	2
PR = 1 or 2	1
FR = 0	0

E.2.4 International capital account controls

1) Is the exchange rate unified?

- Coded as 0 when a special exchange rate regime for either capital or current account transactions exists.
- Coded as 1 when the exchange rate system is unified

2) Does the country set restrictions on capital inflow?

- Coded as 0 when significant restrictions exist on capital inflows.
- Coded as 1 when banks are allowed to borrow from abroad freely without restrictions and there are no tight restrictions on other capital inflows.

3) Does a country set restrictions on capital outflow?

- Coded as 0 when restrictions exist on capital outflows.
- Coded as 1 when capital outflows are allowed to flow freely or with minimal approval restrictions.

The sum of these three sub-scores are coded as follows.

Score	Scale
FL = 3	3
LL = 2	2
PR = 1	1
FR = 0	0

E.2.5 Privatisation

Privatisation is coded as follows.

- Fully liberalised if no state banks exist or state-owned banks do not consist of any significant portion of banks and/ or the percentage of bank assets is less than 10%.
- Largely liberalised if most banks are privately owned and/or the percentage of of public bank assets is from 10% to 25%.
- Partially repressed if many banks are privately owned but major banks are still state-owned and/ or the percentage of public bank assets is above 25% upto 50%
- Fully repressed if major banks are all state owned banks and/ or the percentage of public bank assets is from from 50% to 100%.

Score	Scale
FL	3
LL	2
PR	1
FR	0

E.2.6 Securities markets

Has a country taken measures to develop securities markets?

- Coded as 0 if a securities market does not exist.
- Coded as 1 when a securities market is starting to form with the introduction of auctioning of T-bills or the establishment of a security commission.

- Coded as 2 when further measures have been taken to develop securities markets (tax exemptions, introduction of medium and long-term government bonds in order to build the benchmark of a yield curve, policies to develop corporate bond and equity markets, or the introduction of a primary dealer system to develop government security markets).
- Coded as 3 when further policy measures have been taken to develop derivative markets or to broaden the institutional investor base by deregulating portfolio investments and pension funds or completing the full deregulation of stock exchanges.

2) Is a country's equity market open to foreign investors?

- Coded as 0 if no foreign equity ownership is allowed
- Coded as 1 when foreign equity ownership is allowed but there is less than 50 percent foreign ownership.
- Coded as 2 when majority equity share of foreign ownership is allowed.

The sum of these 2 questions are then coded as follows.

Score	Scale
FL	4 or 5
LL	3
PR	1,2
FR	0

If information on question 2 is not available, the measure is coded using information from question 1, in which case, a 0 -3 scale is assigned based on the score on question 1.

E.2.7 Banking sector supervision

1) Has a country adopted a capital adequacy ratio based on the Basle standard?

- Coded as 0 if the Basle risk-weighted CAR is not implemented. Date of implementation is important, in terms of passing legislation to enforce the Basle requirement of 8% CAR.
- Coded as 1 when Basle CAR is in force (if the large majority of banks meet the prudential requirement of an 8% risk-weighted CAR, but this is not a mandatory ratio as in Basle, the measure is still classified as 1).

Prior to 1993, when the Basle regulations were not in place internationally, this measure takes the value of 0.

2) Is the banking supervisory agency independent from the influence of the executives.

- Coded as 0 when the banking supervisory agency does not have an adequate legal framework to promptly interven in banks' activities; and/ or when there is lack of legal framework for the independence of the supervisory agency such as the appointment and removal of the head of banking supervisory agency; or the ultimate jurisdiction of the banking supervision is under the ministry of finance; or when a frequent turnover of the head of the supervisory agency is experienced.
- Coded as 1 when the objective of supervisory agency is clearly defined and an adequate legal framework to resolve banking problems is provided (the revocation and suspension of authorisation of banks, and the removal of banks' executives etc.) but potential problems remain concerning the independence of the banking supervisory agency (for example, when the ministry of finance may intervene into the banking supervision in such cases as when the board of the banking supervisory agency is chaired by the ministry of finance, although the fixed term of the board is ensured by law); or although clear legal objectives and legal independence are observed, the adequate legal framework for resolving problems is not well articulated.
- Coded as 2 when a legal framework for the objectives and resolution of troubled banks is set up and if the banking supervisory agency is legally independent from the executive branch and actually not interfered with by the executive branch.

3) Does a banking supervisory agency conduct effective supervisions through on-site and off-site examinations (done to monitor balance sheets)?

- Coded as 0 when a country has no legal framework and practices of on-site and off-site examinations is not provided or when no on-site and off-site examinations are conducted.
- Coded as 1 when the legal framework of on-site and off-site examinations is set up and the banking supervisory agency have conducted examinations but in an ineffective or insufficient manner.
- Coded as 2 when the banking supervisory agency conducts effective and sophisticated examinations.

4) Does a country's banking supervisory agency cover all financial institutions without exception?

- Coded as 1 when all banks are under supervision by the supervisory agencies without exception.
- Coded as 0 if some kind of financial institutions are not exclusively supervised or are excluded from banking supervisory agency oversights.

These four dimensions are summed up and are assigned a degree of freedom as follows.

Score	Normalised Scale
Highly regulated = 6	3
Largely regulated = 4-5	2
Less regulated = 2-3	1
Not regulated = 0-1	0