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General Introduction

This dissertation is devoted to three important issues in the area of banking. The first chapter attempts to shed light on the risk features of Islamic banking as a new and distinctive mode of banking & finance which has expanded with a double-digit growth rate during the recent years and a considerable potential for further development in the future. The second chapter addresses the recent debates on whether commercial banks must expand their scope of activities to financial services other than traditional financial intermediation. Advances in technologies, emergence of financial innovations together with deregulation following the Second Banking Directive of 1989 in Europe and the Gramm-Leach-Bliley Act (1999) in the U.S. have modified the shape of the banking industry and raise serious concerns regarding its stability. Finally, the third chapter examines the new competition environment in many countries where Islamic banks operate alongside conventional banks in a dual banking system. Specifically, this chapter discusses the effects of the new architecture of the banking system on the size and quality of the financial intermediation sector. The motivations, research questions and the contributions to the literature of each of the three chapters are briefly presented as follows.

Chapter 1. Risk in Islamic Banking

During recent decades, Islamic banking and finance have evolved and grown very rapidly. According to Ernst & Young's World Islamic Banking Competitiveness Report 2013, the global Islamic banking assets reported in 2011 are expected to increase by $0.5 trillion to $1.8 trillion by the end of 2013. The share of Muslims in the World's population (23%) constitutes a great potential for further growth of this mode of financial services in the future. Islamic finance has also expanded outside the Muslim world to other continents such as Europe

and America. The British Prime Minister David Cameroon recently stated at a forum dubbed the "Davos of the Muslim World"[1] (October 2013) that London aims to become a hub of Islamic finance.

"*I don't just want London to be a great capital of Islamic finance in the Western world, I want London to stand alongside Dubai and Kuala Lumpur as one of the great capitals of Islamic Finance anywhere in the world,*".

Islamic finance has evolved on the basis of Islamic doctrine (*Sharia* law), which forbids payment or receipt of *Riba* (interest). *Riba* means an excess to be returned on money lending. "*Usury*"[2] is the corresponding Christian term for *Riba*. Originally *Usury* means payment or receipt of interest on money lending. When some western countries, for instance the United States, set limitations on interest rates, the term *Usury* is used to refer to the interest rate higher than the legal rate. *Riba* is prohibited in Judaism as well. The biblical Hebrew term for *Riba* is "*Neshekh*" and "*Marbit/Tarbit*". The term "*Ribbit*" in Modern Hebrew refers to the excess to be returned on lending. The holy Torah encourages lending provided that it is free of *Ribbit*. According to Jewish law, charging *Ribbit* is one of the worst sins[3].

Lending is highly appreciated in Islam; however, it must be free of *Riba*, and the lender should expect to receive only the principal amount; nevertheless it is strongly recommended that the borrower gives some gifts to the lender as a means of expressing gratitude. The Islamic terminology for such a kind of lending is "*Qard al-Hasan*"[4].

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[1] http://news.yahoo.com/britain-announce-islamic-index-stock-exchange-003441578.html.

[2] Sir Harry Page 'In Restraint of Usury: The Lending of Money at Interest' Chartered Institute for Public Finances and Accounts (CIPFA), London, 1985.

[3] Holy Hebrew Bible, Exodus, 22: 24, Leviticus 25:36-37and Deuteronomy, 23:20-21.

[4] A few Islamic scholars (Rashid Reza, 1947 and Shaltout, 1975 among others) believe that the prohibition on *Riba* relates to the *Qard al-Hasan*, where the borrower needs the lending for the necessary needs; for the business purposes, however, interest is not prohibited. The majority of the Islamic scholars do not agree with this argument, because they believe that the prohibition by *Sharia* is not limited to a special case.

It is interesting to note that *Sharia* recognizes the time value of money, since according to the Islamic rules, the price of a good to be sold on deferred payment basis can be different from its sight value. Interest reflects the time value of money and the interest rate is an exchange rate across time. While *Sharia* recognizes interest in business, it prohibits interest on lending, *Qard al-Hasan*.

Due to restrictions on payment or receipt of *Riba*, lending by Islamic banks and financiers is not profitable and practical. Hence, Islamic finance has evolved on the basis of the Islamic rules on transactions, *Figh al-Muamalat*. Islamic banks play the role of a trader or an investor. In debt-based or lease-based financing, they assume to arrange the underlying goods (projects) to be purchased (implemented) and then they sell or rent the said goods (or projects) to the client.

Islamic finance is still a developing field and overtime it has covered a broader array of financial products and services. It is worth noting that what is practiced as Islamic banking or *Sharia*-compliant banking is based on the understanding of the Islamic scholars and their attempt to build *Riba*-free banking. As such, the practice of Islamic banking varies slightly across the Muslim world, due to rather minor divergences in Islamic scholars' understanding of the issues.

An interesting dimension of Islamic banking is the disciplinary role of depositors and whether this is influenced by the religiosity of Islamic bank customers. Previous literature claims that religious people are more risk-averse (Miller and Hoffmann, 1995; Osoba, 2003; Hilary and Hui, 2009). Consequently, Islamic bank depositors may be more sensitive to bank performance and demonstrate greater withdrawal risk than those at conventional banks. Alternatively, they may show loyalty (for religious reasons) towards their bank and thus mitigate the discipline

exerted by withdrawal risks. In addition, Islamic bank clients may also be prepared to pay rents for receiving financial services compatible with their religious beliefs.

The first chapter contributes to the literature by investigating bank credit and insolvency risk for a sample of Islamic banks, conventional banks with Islamic windows and traditional commercial banks from 24 Muslim countries over 1999 to 2009. We also explore whether Islamic banks exploit the religiosity of their customers by extracting rents for offering *Sharia* compliant financial products. Overall we find that Islamic banks have lower credit risk than conventional banks, specifically small, leveraged or those operating in countries with more than 90% Muslim populations. In terms of insolvency risk, small Islamic banks are more stable than small conventional banks, as they are more capitalized; however, no significant difference between large Islamic and conventional banks is observed. Loan quality, (implicit) interest income and expense of Islamic banks are less sensitive to domestic interest rates compared to their conventional counterparts; however, the sensitivity of Islamic banks' stability to interest rates is not significantly different from conventional banks. Finally, we find no evidence that Islamic banks charge rents to their clients for offering *Sharia* compliant financial products.

Chapter 2. Non-interest Income and Bank Lending

During the recent decades, capital markets have grown very quickly, direct finance plays a more important role, nonbank lenders - especially for home mortgage loans - are more present than in the past, and competition has driven interest rates to historically low levels. Furthermore, the costs of switching from one financial intermediary to the other have sharply decreased. Such trends give banks more incentives to offer fee-base financial products and services. In addition, deregulation has further spurred such trends. Following the Second Banking Directive of 1989

that authorizes affiliation of commercial banking with other financial intermediary services, the share of non-interest income in the net operating income of European banks has risen from 26% in 1989 to 41% in 1998 (ECB, 2000). Such changes have also affected U.S. banks following the Gramm-Leach-Bliley Act (1999) which allows affiliation of commercial banking with other financial services such as underwriting and agency activities in securities and insurance.

The extant literature shows that revenue from non-interest generating businesses is highly correlated with that of traditional financial intermediation which limits the benefits of diversifying into such activities. Moreover, some of the non-interest income activities are rather volatile; they have lower switching cost, but higher operating and financial leverage than traditional financial services. The occurrence of the 2007-8 credit crisis in an environment with rather risky non-interest income businesses has also led to regulatory reforms which recommend restrictions on various bank non-interest revenue generating activities.

While the academic literature has focused on performance and stability issues associated with non-traditional banking activities, little attention has been paid to the potential consequences for lending of income diversity. Banks are expected to produce and convey information on the quality of borrowers which could be biased if non-interest activities provide incentives for weaker loan screening and monitoring. Alternatively, banks might have the ability to monitor borrowers that are tied by non-interest activities, more closely and efficiently. A closer look at how credit risk is affected by combining both traditional lending activities and non-interest businesses is therefore an important question. Banks can collect customer-specific information (beyond that available publicly) over time via multiple interactions with the same customer. Hence, expanding the scope and scale of client relationships may improve a bank's lending position, as it can provide banks with the opportunity to reach a wider array of potential

borrowers and can offer more information on client quality. Information obtained from offering multiple products can therefore build new, as well as enhance, existing relationships. Alternatively, a greater reliance on non-interest activities may increase credit risk due to agency problems or/and a loss of focus. Banks expanding into non-interest income activities may also lose their focus on lending. Moreover, lower credit exposure may encourage managers to be less conservative in their loan-granting activities.

In the second chapter, using quarterly data of 7,578 U.S. community banks between 2003 and 2010, we investigate the impact on lending of banks' diversification into seven major business lines which we identify as playing an important role among a broader array of non-interest income items. These business lines provide banks with the opportunity to have access to more private information, and can enable them to reach a wider array of potential borrowers and depositors. Moreover, they are also likely to expand the scope of relationship with clients beyond merely lending-deposit activities. We investigate the influence of these activities on banks' lending in terms of loan quality, interest spread and loan portfolio composition. We also explore whether risk-return cross subsidization and cost complementarities can explain their joint production with lending.

Our credit risk analysis for community banks with total assets above $100 million indicates that an increase in income from fiduciary activities lowers credit risk, especially before and after the global financial crisis of 2007-2008. We also observe that non-interest income activities are also connected to loan portfolio compositions. For instance, greater reliance of total operating income on fiduciary business is linked to a smaller share of commercial and industrial loans in total loans during and after the 2007-2008crisis, and a larger share of loans to financial institutions in total loans during the before the crisis. We find little evidence of income or price

cross-subsidies between traditional intermediation and non-interest income activities except in the case of loan servicing (after the crisis) where we observe that higher income shares from this activity is associated with lower lending-deposit spreads. The results also show that some non-interest income activities contribute differently to risk-adjusted returns. Fiduciary income, for instance, increases risk-adjusted returns in the pre- and post-crisis periods, whereas during the crisis income from securities brokerage activities appears to increase returns per unit of risk. Finally, we investigate whether a pair-wise cost complementarity exists between lending (both secured and unsecured) and non-interest income activities that explains possible joint production. The results provide us with little evidence to support this hypothesis.

Chapter 3. Financial Development and Growth in a Dual Banking System

The financial system is expected to mobilize savings and efficiently allocate them to productive projects. The existing literature shows that a well-functioning financial market and efficient financial intermediation can spur capital productivity and foster economic growth. The third chapter is devoted to study whether the coexistence of Islamic and conventional banking contributes to financial development and economic growth. Emerging of Islamic banking has transformed the financial structure of certain Muslim countries, by introducing a dual financial system where both Islamic and conventional finance are operated. Islamic banking is expected to offer financial products and services that are compatible with the Islamic doctrine, and hence convince Muslim individuals and firms with religious concerns to have access to finance or move from the informal to the formal financial system. This suggests a positive impact of a dual banking system on the size of the financial intermediation sector, by boosting savings mobilization. In a dual banking system, Islamic and conventional banks do not merely play a

supplementary role to one another; they compete with each other in absorbing clients and investors, as a portion of Muslims may have low sensitivity to religious issues. Hence, we expect the presence of Islamic banking to also improve the quality and efficiency of financial intermediation.

For our study we focus on the commercial banking industry of 22 Muslim countries where a dual banking system is practiced during 1999 - 2009. Overall, we find that higher market share of Islamic banks is associated with greater bank deposits in relatively low income countries or countries which suffer more from corruption or economic repression, whereas in countries with comparatively less corruption the higher efficiency rank (rather than market share) of Islamic banks can boost savings mobilization. The results also show that in countries with relatively higher level of economic freedom, a greater market share of Islamic banks lowers lending allocated to the private sector; however, in rather low income countries, higher efficiency rank of Islamic banks is associated with more credit extension to the private sector. Moreover, an increase in efficiency of Islamic banks reduces the credit allocation to the Governmental sector in relatively corrupted or economically repressed countries, but increases credit extension to the Governmental sector in countries with relatively less corruption or economic repression. Higher efficiency rank of Islamic banks can also lower the lending-deposit spread in comparatively low income countries, countries with more economic freedom, or those less inclined to corruption. We notice that in countries with more corruption, the presence of Islamic banks can lower lending spreads only when they benefit from comparatively higher cost efficiency.

Chapter 1

Risks in Islamic Banking*

Abstract. This chapter investigates risk and stability features of Islamic banking using a sample of 553 banks from 24 countries between 1999 and 2009. Small Islamic banks that are leveraged or based in countries with predominantly Muslim populations have lower credit risk than conventional banks. In terms of insolvency risk, small Islamic banks also appear more stable. Moreover, we find little evidence that Islamic banks charge rents to their customers for offering *Sharia* compliant financial products. Our results also show that loan quality of Islamic banks is less responsive to domestic interest rates compared to conventional banks.

JEL Classifications: G21; G32

Keywords: Islamic banking, credit risk, stability

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1. Introduction

The world has observed various evolutionary stages in the field of banking and currently we see substantial growth in Islamic modes of banking and finance. According to TheCityUK (2011) the assets of Islamic banks (including the Islamic windows of conventional banks) increased to $1,041bn at the end of 2009 from $947bn in 2008. This is expected to have grown by 10-15% during 2010 amounting to around 1.5% of global financial assets (Financial Times, 2011). The share of Muslims in the World's population[5] also suggests greater potential for this type of financial activity in the future. Islamic banking has also experienced more rapid growth than conventional banking post-2008 crisis (Hasan and Dridi, 2010), has expanded outside the Muslim world to other continents including Europe and the Americas, and is continuing to develop a broad array of innovative solutions to meet Islamic financing demands (for instance, *Sharia* compliant credit default swaps). In line with these recent developments, the literature has grown rapidly, mirroring the growth of Islamic finance itself.

Islamic financial principles have evolved on the basis of *Sharia* law, which forbids payment or receipt of *Riba* – the payment or receipt of interest (Obaidullah, 2005). Financing principles are governed by Islamic rules on transactions "*Figh Al-Muamelat*" and follow both Profit and Loss Sharing (PLS) and non-PLS arrangements (such as leasing contracts). In addition to the prohibitions on interest, Islamic banks also face other restrictions – such as the use of many derivatives products, because according to *Sharia* all contracts should be free from excessive uncertainty "*Gharar"* (Obaidullah, 2005)[6].

Several papers have outlined the specific risks inherent in Islamic banking. Errico and Farahbakhsh (1998) for instance point out that prudential supervision and regulations governing

[5] Muslims represent around 23% of the world population as reported by Pew Research Center (2009).

[6] Islamic derivative products that are permissible include: spot commodity and money transactions (where exchange takes place contemporaneously or is deferred - the commodity is delivered at t+0 and the money delivered at t+1), and Salam contracts (where money is paid at t+0 and the commodity delivered at t+1). There is widespread debate as to whether Futures transactions (where money and commodity payments / deliverables are deferred) are Islamic.

Islamic banks should place a greater emphasis on operational risk and information disclosure. They explain the special risks attached to PLS. For instance, in certain cases Islamic banks cannot mitigate credit risk by demanding collateral from clients, as their relationship is established on the basis of partnership; moreover, they do not have enough control over the management of projects financed in the form of *Mudarabah*. Khan and Ahmad (2001) claim that sharing Islamic banks' profit or loss with their investment account holders introduces withdrawal risk. They also argue that different Islamic modes of finance have their own unique risk characteristics due to the various constraints enforced by *Sharia* (Islamic rules). Sundararajan and Errico (2002) suggest that the complexities of PLS modes of finance and the risks associated with the non-PLS activities should be taken into account to establish more effective risk management. They also point out various moral hazard issues that occur as a result of the special relationship between Islamic banks and investment account holders. Obaidullah (2005) argues that (deposit) withdrawal risk may persuade Islamic banks to deviate from traditional *Sharia* financing principles. This occurs if banks pay competitive market returns to investment account holders regardless of the bank's actual performance.

Table I provides a summary of empirical literature on Islamic banking where some of the aforementioned issues are analyzed. Early empirical work focuses on the efficiency and production technology features of banks (El-Gamal and Inanoglu, 2002; Yudistra, 2004) whereas more recent studies examine competition (Chong and Liu, 2009; Weill 2011), asset quality (Beck et al, 2013), stability (Čihák and Hesse 2010) and other risk dimensions including loan default rates (Baele et al, 2010). Apart from some notable exceptions, the empirical literature suggests no significant differences between Islamic and conventional banks in terms of their efficiency, competition and risk attributes.

Table I. Existing literature

This table presents a summary of selected empirical literature on Islamic banking.

Authors	Country(ies) of Study	Period	Data Type	Research Focus	Methodology	Main Finding
Bashir (1999)	Sudan	1979-1993	Yearly bank-level accounting data	Asset size and bank performance	Regression - OLS	Larger banks are more profitable yet have higher leverage. Analysis is based on only two Islamic banks.
Samad (1999)	Malaysia	1992-1996	Yearly bank-level accounting data	Cost efficiency	Descriptive statistics and ANOVA	Islamic banks are more efficient than their conventional counterparts.
El-Gamal and Inanoglu (2002)	Turkey	1990-2000	Yearly bank-level accounting data	Production technology	Stochastic Frontier Analysis	Islamic banks have a similar production technology to conventional commercial banks.
Hassan and Bashir (2003)	Islamic banks operating in 21 countries	1994-2001	Yearly bank-level accounting data	Determinants of bank profitability (ROA, ROE, NIM)	Regression - GLS	Controlling for macroeconomic environment, financial market structure, and taxation, the results indicate that high capital and loan-to-asset ratios lead to higher profitability (as does favourable macroeconomic conditions).
Majid et al. (2003)	Malaysia	1993-2000	Yearly bank-level accounting data	Cost efficiency	Stochastic Frontier Analysis	No statistically significant difference in the level of efficiency between Islamic and conventional banks and no evidence to suggest that ownership influences cost efficiency.
Yudistra (2004)	Islamic banks operating in 12countries	1997-2000	Yearly bank-level accounting data	Technical and scale efficiency	Data Envelopment Analysis (DEA) and OLS regression	Islamic bank inefficiencies appear relatively low (around 10%) compared with those for conventional banks derived from other studies. Small to medium-sized Islamic banks exhibit diseconomies of scale. Islamic banks in the Middle East are less efficient than those operating outside the region.
Al-Jarrah and Molyneux (2005)	Bahrain, Egypt, Jordan and Saudi-Arabia	1992-2000	Yearly bank-level accounting data	Cost and profit efficiency	Stochastic Frontier Analysis	Islamic banks are more cost and profit efficient banks compared to conventional commercial and investment banks.
Bader et al. (2008)	21 OIC countries	1995-2005	Yearly bank-level accounting data	Cost, revenue and profit efficiency	Data Envelopment Analysis	No significant difference between cost, revenue and profit efficiency of conventional versus Islamic banks. Note this study uses the same sample as Mohamed et al (2008).
Mohamad et al. (2008)	21 Organization of Islamic Conference (OIC) countries	1990-2005	Yearly bank-level accounting data	Cost and profit efficiency	Stochastic Frontier Analysis	No significant difference between cost and profit efficiency of conventional versus Islamic banks, irrespective of size, age and geographical location Islamic banks based in the Middle East and Turkey are more cost efficient than their African counterparts.
Chong and Liu (2009)	Malaysia	1995:04 – 2004:04	Monthly interest rates (rates of return for Islamic banks)	Causality relationship between Islamic banks deposits rates and interest rates in conventional banks	Granger causality test	Rates of return on the investment deposits of Islamic banks are closely related to rates on conventional banks' deposits.
Abdul-Majid et al. (2010)	10 countries	1996-2002	Yearly bank-level accounting data	Returns to scale and efficiency	Parametric output distance function	Islamic banks have moderately higher returns to scale than conventional banks but appear less efficient due to *Sharia* compliance. Country effects have a significant impact on efficiency differences.

Baele et al. (2010)	Pakistan	2006:04 – 2008:12	Monthly business loans	Loan default rate	Hazard function	Default rates on Islamic loans are lower than for conventional loans.
Čihák and Hesse (2010)	20 OIC member countries	1993-2004	Yearly bank-level accounting data	Insolvency risk	Regression – OLS and Robust	Small Islamic banks are more stable than small conventional banks; however, large Islamic banks are less stable than their conventional counter-parts.
Hasan and Dridi (2010)	8 countries	2007-2009	Yearly bank-level accounting data	Factors influencing performance, growth and ratings over crisis period	Regression – OLS	The credit and asset growth of Islamic banks was more than that of conventional banks from 2008 to 2009 'contributing to financial and economic stability', although profits of Islamic banks fell more than conventional banks in 2009 due to limitations in their risk management practices
Imam and Kpodar (2010)	117 countries	1992-2006	Country-level data	Determinants of the diffusion of Islamic banking	Regression - Tobit	Probability for Islamic banking to develop in a country rises with the share of the Muslim population, income per capita, and whether the country is a net exporter of oil. Increasing interest rates limit the diffusion of Islamic banking.
Rashwan (2010)	15 countries	2007-2009	Bank-level data	Profitability and efficiency over the banking crisis	Multivariate analysis of variance (MANOVA)	Islamic banks are more profitable and efficient than traditional banks pre-crisis but the opposite is the case post-crisis.
Ongena and Şendeniz-Yüncü (2011)	Turkey	2008	Bank-firm relationships	Firm bank choice	Multinomial logit	Islamic banks mainly have corporate clients that are young, transparent, industry-focused, and have multiple-bank relationships.
Weill (2011)	17 OIC member countries	2001–2007	Yearly bank-level accounting data	Market power	Regression – random effects GLS	Islamic banks have lower market power than conventional banks.
Beck et al. (2013)	141 countries (including 22 OIC member countries)	199 -2007	Yearly bank-level accounting data	Efficiency, asset quality, stability and business orientation	Regression – OLS Fixed effects, Robust	Few significant differences between Islamic and conventional banks.
This chapter	24 OIC member countries	1999-2009	Yearly bank-level accounting data	Credit risk, insolvency risk, interest rate risk and possibility of extracting religious rent	Regression – random effects	Islamic banks that are small, leveraged or based in countries with predominantly Muslim populations have lower credit risk than conventional banks. Small Islamic banks appear more stable than similar sized conventional banks. During the recent crisis, however, large Islamic banks exhibit lower stability than large conventional banks. Implicit interest income and expense, as well as credit risk of Islamic banks are less responsive to domestic interest rates. Islamic banks do not seem to charge special rents to their clients for offering *Sharia* compliant financial products.

An interesting and related dimension focuses on the disciplinary role of depositors and whether this is influenced by the religiosity of Islamic bank customers. Banking theory (Diamond and Rajan, 2000 and 2001) points out that the discipline imposed by depositors mitigates risky bank lending. In the context of Islamic banking the PLS relationship between the bank and investment account holders, however, appears less clear-cut than in conventional banking. Previous literature (such as Miller and Hoffmann, 1995 and Osoba, 2003) claims that religious people are more risk averse so Islamic bank depositors may be more sensitive to bank performance and demonstrate greater withdrawal risk than those at conventional banks. Alternatively, they may show loyalty (for religious reasons) towards their bank and thus mitigate the discipline exerted by withdrawal risks. In addition, Islamic bank clients may also be prepared to pay rents for receiving financial services compatible with their religious beliefs.

This chapter contributes to the most recent literature by investigating bank credit and insolvency risk[7] for a sample of Islamic banks, conventional banks with Islamic windows (hereafter referred to as Islamic window banks) and traditional commercial banks from 24 member countries of OIC over 1999 to 2009. We also explore whether Islamic banks exploit the religiosity of their customers by extracting rents (higher loan or lower deposit rates) for offering *Sharia* compliant products and services.

Overall we find that Islamic banks have lower credit risk than conventional banks, specifically small, leveraged or those operating in countries with more than 90% Muslim populations. In terms of insolvency risk small Islamic banks are more stable than small conventional banks, as they are more capitalized; however, no significant difference between

[7] In this chapter, we are interested in bank risk at the individual level, rather than systemic risk. Typically, the countries where our sample banks are based did not experience the credit crisis of 2008 onwards. These economies are also less leveraged than Western systems. For example, according to the World Bank web-site, in the U.S. domestic credit provided by the banking sector is estimated at around 219% of GDP between 1999 and 2009, compared with about 50% for the countries under study in this chapter.

large Islamic and conventional banks is observed. Loan quality, (implicit) interest income and expense of Islamic banks are less sensitive to domestic interest rates compared to their conventional counterparts; however, the sensitivity of Islamic banks' stability to interest rates is not significantly different from conventional banks. Finally, we find no evidence that Islamic banks charge rents to their clients for offering *Sharia* compliant financial products. The chapter is organized as follows. Section 2 discusses the key features of Islamic finance and risk issues and Section 3 outlines our methodology. Section 4 describes the data and Section 5 presents the results. Finally, section 6 concludes.

2. Background on Islamic Banking

This section briefly explains the key features of Islamic finance and its possible impact on the risk and stability of banks.

2.1 FEATURES OF ISLAMIC FINANCE

Islamic finance is based on *Sharia* principles which forbid payment or receipt of *Riba*[8]. *Riba* refers to an excess to be returned on money lending. The Islamic terminology for such a kind of lending is "*Qard Al-Hasan*". It is interesting to note that *Sharia* recognizes the time value of money, since according to Islamic rules the price of a good to be sold on a deferred payment basis can be different from its current value. Interest reflects the time value of money and the interest rate is an exchange rate across time. While *Sharia* recognizes interest in business it prohibits interest on lending (Obaidullah, 2005).

[8] There are two types of *Riba*: *Riba* in debt and *Riba* in exchange. For more details see Obaidullah (2005). This chapter focuses only on *Riba* in debt.

Islamic finance has evolved on the basis of Islamic rules on transactions, *Figh Al-Muamalat,* and can mainly be categorized as: 1) Debt-based financing: the financier purchases or has the underlying assets constructed or purchased and then this is sold to the client. The sale would be on a deferred-payment basis with one or several installments. 2) Lease-based financing: the financier purchases or has the underlying assets constructed or purchased and then rents it to the client. At the end of the rental period (or proportionate to the rentals) ownership would be transferred wholly or partially to the client. 3) PLS financing: the financier is the partner of the client and the realized profit or loss would be shared according to pre-agreed proportions (Khan and Ahmed, 2001). The first two Islamic finance methods are collectively known as Non-Profit and Loss Sharing "Non-PLS". Besides restrictions on *Riba*, *Sharia* has various other prohibitions which should be taken into account. For instance, according to the *Sharia* all contracts should be free from excessive uncertainty "*Gharar"* (Obaidullah, 2005)*;* hence as noted earlier, Islamic financial institutions face some restrictions on application of financial derivatives and other types of contracts (including various forms of insurance policies).

2.2. ARE ISLAMIC BANKS RISKIER THAN CONVENTIONAL BANKS?

In this section, the asset and liabilities structure of Islamic banks are analyzed highlighting their specific risk features.

2.2.a. LIABILITIES

Islamic banks are authorized to receive deposits mainly in the following two forms (Iqbal, et al., 1998): current accounts[9] that bear no interest but are obliged to pay principal to

[9] Deposits are received by Islamic banks in the form of "*Qard Al-Hasan*" or "*Amanaa*".

holders on demand, and investment (or savings) accounts that generate a return based on profit rates. Such rates may be adjusted according to the realized profit or even loss which would then be shared between the Islamic bank and the investment account holders. This PLS arrangement can (in theory at least) provide pro-cyclical protection to banks in the event of adverse conditions – profit rates decline in bad times and increase in good times. The extent to which investment deposits are important as a source of funding, therefore, can have an impact on the asset portfolio of Islamic banks.

Due to the obligations towards depositors as debt-holders, conventional banks aim to allocate a part of their funds to liquid assets, and endeavor to decrease the volatility and uncertainty of loan revenues so as to meet depositor obligations. Islamic banks, however, have more flexibility, since they can consider investment depositors more like equity holders. However, this flexibility may be mitigated by the fact that Islamic banks have limited access to wholesale funding. There is a fledgling Islamic money market (noticeably in Bahrain and Malaysia) although only the largest institutions have access. As such, Islamic banks are rather constrained from engaging in active liability management like conventional banks.

Calomiris and Kahn (1991) and Jeanne (2000) argue that short-term debt is useful in disciplining financial intermediaries. Diamond and Rajan (2000, 2001) also show that the issue of demand deposits encourages banks to monitor their lending activities. They also claim that a bank run is the Nash equilibrium for individual depositors, although in the case of a run they may collectively receive less than originally promised. In Islamic banking the payoff to investment account holders is contingent on both the performance of the bank as well as the religiosity of depositors. This can result in an ambiguous outcome – religious depositors may be more loyal and prepared to take lower returns, refusing (or at least stalling) from withdrawing deposits even

if the performance of the bank deteriorates. Alternatively, religious depositors may be more risk averse showing greater sensitivity to bank's performance and demanding higher returns. In such a case investment account funding may be more fragile than time deposits, imposing greater discipline on Islamic banks.

The case where religious factors lead to lower withdrawal risk for investment account holders may influence Islamic banks' lending behavior. It may weaken their incentives for due diligence and loan monitoring, since Islamic banks can transfer credit risk to investment account holders who do not have the same rights as equity holders but share the same risk (Sundararajan and Errico, 2002). Alternatively, the special relationship can discipline Islamic banks more effectively (compared to conventional banks) since investment accounts holders have greater incentives to monitor Islamic bank performance. In such a case, Islamic depositors are more likely to shift their deposits from poor-performing banks to those offering higher returns or even to conventional banks. Hence, there could be greater potential for withdrawal risk (Khan and Ahmed, 2001) and as such depositors can discipline Islamic banks more actively.

Sharing the realized profit or loss with investment account holders may make Islamic banks more risky. On the upside, larger payouts to investment account holders may increase deposits and this can force bank shareholders to raise more equity capital in order to maintain capital ratios and prevent dilution of their ownership rights. Conversely, poor payouts may encourage deposit withdrawals leading to potential liquidity and (ultimately) solvency problems.

2.2.b. ISLAMIC BANKING: PRINCIPLES and PRACTICE

Islamic banks, in practice, tend to deviate somewhat from the above mentioned financing principles and can operate similarly to conventional banks. Obaidullah (2005) claims that

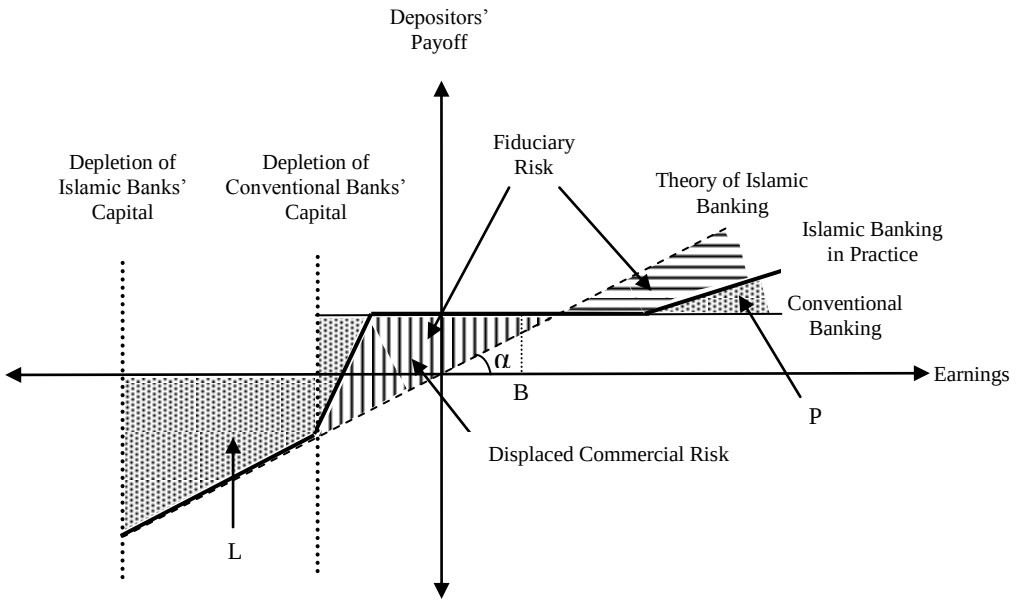
withdrawal risks may persuade management to vary from PLS principles by paying competitive market returns to investment account holders regardless of realized performance. Chong and Liu (2009) use Malaysian data to show that investment deposit rates of Islamic banks are closely linked to those of their conventional counterparts. They argue that competitive pressure from conventional banks constrains the actual implementation of PLS arrangements. This strategy can also help management to mitigate the sensitivity of investment account holders to bank's performance and hence avoid greater discipline.

In other words, equity-holders of Islamic banks can be at risk from transferring a part of their profits to investment account holders so as to reduce withdrawal risk. Such a risk is known as *Displaced Commercial Risk* (AAOIFI, 1999). Nevertheless, in the likelihood of crisis, management is highly likely to share realized losses with investment account holders to avoid insolvency. This suggests that Islamic banks may have a greater capacity to bear losses compared to conventional banks. The magnitude of the extra capacity depends on the weight of investment deposits in total funding. When Islamic banks are performing well they may adjust profit rates upward but at a slower rate than realized profitability so as to limit the level and volatility of deposit inflows.

Implicitly, investment account holders own a bond, a long position on a call option and a short position on a put option. The strike price of the call, however, is determined arbitrarily by Islamic banks, in the absence of supportive regulations on the account holders' rights. The strike price of the put is determined based on the degree of market competitive pressures, level of incurred loss and the capital ratio of the Islamic bank. Figure (1) illustrates how the special relationship between investment account holders and an individual Islamic bank works in theory and practice compared to holders of time deposits in a typical conventional bank.

Figure 1. Depositors' payoff in Islamic and conventional banking

This figure illustrates the payoffs from investment account depositors in Islamic banking versus time depositors in conventional banking. The horizontal axis represents a bank's earnings before paying interest expense. The vertical axis shows the interest expense to be paid to depositors (depositors' payoff). A conventional bank incurs loss for any earnings less than B, where the earnings equal to the interest expense. Depositors of conventional banks receive interest irrespective of the realized earnings, to the extent that the possible loss does not completely deplete the capital. Hence, the ex-post relationship between earnings and depositors' payoff is depicted by the horizontal line (earnings and depositors' payoffs are positively correlated in the ex-ante relationship, since depositors demand higher payoffs from banks with higher expected earnings, as they are expected to be more risky). The figure shows that the depletion occurs when earnings are negative; however, in reality depletion can happen when earnings are positive. In theory, the realized profit or loss should be shared between depositors and equity-holders. The dashed line with a slope less than 45 degrees (α) shows that depositors payoff is proportionate to realized performance; however, in practice there is substantial evidence that Islamic banks pay a competitive rate of return, irrespective of actual performance. Also Islamic banks may adjust profit rates upward but at a slower rate than realized profitability so as to limit the level and volatility of deposit payoffs. At the time of crisis, however, Islamic banks may share the realized loss with investment account holders to avoid insolvency (the bold line is simply illustrative and does not necessarily show the real scale and magnitude of divergence from conventional depositors' payoffs). This suggests that Islamic banks may have a greater capacity to bear losses compared to conventional banks. The magnitude of the extra capacity (and hence the exact position of the vertical line that illustrates the capital depletion of a typical Islamic bank) depends on the weight of investment deposits in the total funding of the Islamic bank. Implicitly, investment account holders own a bond, a long position on a call option and a short position on a put option. The strike price of the call is determined arbitrarily by Islamic banks, and the strike price of the put is determined based on the degree of deposit market competition, level of incurred losses and capital strength. Overall, when Islamic banks are profitable investment account holders may get P over the depositor payoffs at conventional banks, at the expense of L in the case of a scenario where losses occur. Hence, in practice the difference between depositors' payoffs of Islamic versus conventional banks can appear mostly in the tails distribution of bank's earnings. Displaced commercial risk illustrates the situation where equity-holders have to transfer (or sacrifice) a part of their profit or incur a portion of depositors' loss to avoid deposit withdrawal. Fiduciary risk is the risk associated with Islamic banks deviating from *Sharia* principles in sharing returns between investment account holders and equity-holders. It may be that depositors do not have the relevant incentives or/and expertise to observe or take action against such deviations.



2.2.c. ASSETS

In the process of lending, Islamic banks tend to apply non-PLS principles due to the risks and complexities associated with the PLS method. For instance, under PLS financing, Islamic banks need to determine the profit or loss sharing ratio for each project which can be complicated due to difficulties in quantifying the characteristics of clients and the proposed business opportunity. Revenue is not guaranteed and since they cannot collect collateral, they need to put more effort into selection and monitoring so as to ensure that informational rents are not extracted by borrowers. Hence, for short-term financing, it is not viable for Islamic banks to use the PLS method. Moreover, under the *Mudarabah* contract, Islamic banks have limited means to control and intervene in the management of a project[10].

Aggarwal and Yousef (2000) find that Islamic banks mainly use Non-PLS instruments to avoid the moral hazard problem associated with PLS financing. Chong and Liu (2009) show that in Malaysia, only 0.5% of Islamic bank finance is based on PLS principles. Dar and Presley (2000) claim that even Mudarabah companies in Pakistan, which are supposed to operate in the form of PLS mainly follow Non-PLS modes of finance. This is also emphasized by Baele et al (2010). According to Bank Indonesia (2009) PLS modes of finance accounted for 35.7% in the financing of Islamic banks operating in the country by the end of 2008. The report points out that the use of the PLS method in Indonesia is among the highest compared to what is practiced in other countries. Mills and Presley (1999) also claim that PLS is only marginally practiced in Bangladesh, Egypt, Iran, Pakistan, Philippines and Sudan. However, while Islamic banks appear to refrain from practicing PLS modes of finance they still face possible greater withdrawal risks than conventional banks (Khan and Ahmad, 2001; and Sundararajan and Errico, 2002).

[10] Errico and Farahbakhsh (1998), Dar and Presley (2000) and Sundarajan and Errico (2002) discuss the complexity of the PLS method.

2.2.d. COMPLEXITY of ISLAMIC MODES of FINANCE

Islamic financing agreements[11], even for Non-PLS methods, are not as straightforward as conventional loan contracts (and according to anecdotal evidence also take longer to process). Generally, in debt-based or lease-based finance, such as *Murabaha,* Islamic banks arrange for the goods/projects to be purchased and then sell or rent them to clients. For purchase/implementation of the goods/projects, Islamic banks normally appoint the client as their agent. Such a framework is somewhat complicated as compared to conventional loan contracts. Sundarajan and Errico (2002) note the specific risks attached to various Non-PLS methods, such as *Salam* and *Ijara*. In the former, Islamic banks are exposed to both credit and commodity price risks; in the latter, unlike conventional lease contracts, Islamic banks cannot transfer ownership and therefore have to bear all the risks until the end of the lease period.

Another area of debate relates to the treatment of default penalties. Some jurisdictions rule that such penalties are not authorized by *Sharia*[12], so banks make use of rebates instead (Khan and Ahmed, 2001). Here the mark-up on the finance arrangement implicitly covers the return to the banks as well as a default penalty component. If the client repays the loan in a timely manner then they will receive the rebate. While default interest payments are typically calculated over the delayed period in conventional banking, some Islamic banks collect the delayed penalty over the whole financing period. In addition, Islamic banks can also face restrictions regarding the use of derivatives as well as different types of collateral, for instance,

[11] See Khan (1991), Khan (1992), Ahmad (1993) and Iqbal and Mirakhor (2007) for details on the features of various Islamic financial instruments.

[12] Islamic scholars generally consider the default penalty as the interest on debt which is prohibited by *Sharia* as explained in sub-section 2.1.; however, it is treated differently across countries. In Iran, for instance, default penalty is a penalty for non-fulfillment of a commitment and it should not be classified as the interest on debt. In Pakistan, Islamic experts have authorized the default penalty, only if it is spent on charity (Baele et al., 2010).

they are not authorized to use interest-based assets, like bonds, for security (Khan and Ahmed, 2001).

2.2.e. INVESTMENT LIMITATIONS

In addition to lending, conventional banks also allocate a part of their funds to investments. Such investments normally include purchase of bonds (as well as instruments with shorter maturities) of different types that have risk/return features that help manage portfolio risk. However, Islamic banks have limited options for such investments since they are not authorized to invest in interest bearing instruments. Alternatively they can invest in Islamic bonds, known as *Sukuk*[13]. Although (like in short-term Islamic money markets) this asset class still remains relatively underdeveloped, limitations on Islamic bank investment opportunities have been weakened over time due to the expansion of alternative Islamic financing instruments.

2.2.f. CLIENTS' RISK AVERSION and RELIGIOSITY

Since Islamic banking is characterized by observing *Sharia* requirements, clients with religious beliefs are more likely to prefer Islamic to conventional banking. In a dual banking system where both Islamic and conventional banking are practiced, the market is segmented: religious clients may choose Islamic banking, while others might be indifferent between Islamic and conventional banks. The existing literature shows a positive relationship between religiosity and an individual's risk aversion (Miller and Hoffmann, 1995; Osoba, 2003; Hilary and Hui, 2009).We have already noted that religiosity may affect the bank's lending from the liability side through the disciplinary role of deposits. It can also influence the bank's performance from the

[13] They are similar in nature to debt certificates, and can only be issued on the basis of the revenue which is expected to be generated by an underlying asset.

asset side by encouraging borrowers to fulfill their obligations under Islamic loan contracts. All in all, assuming all other factors equal, whether Islamic banks face more or less credit risk compared to conventional banks is likely to be influenced by the religious features of the client base.

Overall, Islamic banking is characterized by various features that appear on the one hand to reduce credit risk. Greater discipline associated with higher deposits fragility (exerted by depositors' risk aversion) and the religious beliefs of borrowers may induce loyalty and discourage default. On the other hand Islamic banks may face greater credit risk due a variety of factors such as: the complexity of Islamic loan contracts, limited default penalties and moral hazard incentives caused by PLS contracts. In terms of insolvency risk, the special relationship with depositors could provide Islamic banks with greater capacity to bear losses yet at the same time, operational limitations on investment and risk management activities could make them less stable than their conventional counterparts. Also, while interest is forbidden in Islamic banking, those institutions that compete with conventional banks may be forced to mirror their pricing behavior and as such may be sensitive to interest rate changes. Whether they have higher or lower sensitivity compared to conventional banks is an empirical question which we try to answer in this chapter. Specifically we are interested in investigating whether Islamic bank's credit risk is more or less responsive to interest rate movements, taking into account the (expected) higher risk aversion of Islamic borrowers. We also examine the interest rate sensitivity of insolvency risk.

Understanding the risk features of Islamic versus conventional banks enables us to investigate whether Islamic banks extract special rents from clients for offering financial products that are compatible with their religious beliefs. Phrased differently, knowing the

constraints of religious clients, Islamic banks may charge higher rates to borrowers and give lower rates to depositors. The extra rents would then be considered as the price of offering *Sharia*-compliant products.

During the Islamic Finance World North America conference (Toronto-2007), it was reported that at least one third of North American Muslims refuse conventional mortgages and are willing to pay more for religiously sound products. In Canada, Islamic mortgages are between 100-300 basis points more expensive than conventional mortgages. In the U.S. the spread is 40 to 100 basis points[14]. Baele et al (2010) find that in Pakistan, the interest (mark-up) rate is, on average, two percentage points higher for Islamic than for conventional loans, even though the default probability of the former is lower. However, Weill (2011), using a sample of 1,301 observations for 34 Islamic and 230 conventional banks operating in 17 OIC member countries between 2001 and 2007, computes Lerner indices and finds that Islamic banks have lower price mark-ups (market power) than conventional banks.

3. Methodology and Econometric Specifications

Our methodology compares the risk features of Islamic and conventional banks while controlling for a variety of potentially influential factors. A similar approach is used to investigate whether Islamic banks extract special rents from their clients. We believe that Islamic and traditional banks can be compared as previous literature (Chong and Liu, 2009) finds that the former can mimic the latter in terms of financial behavior notwithstanding operational differences (Islamic contracts, PLS arrangements and so on) that can cause risk divergence. The following three model specifications are estimated:

[14]See http://www.canada.com/nationalpost/financialpost/story.html?id=01ff2407-f4fe-4c16-80ad-1172d0d25763&k=5052.

$$\text{Credit\_Risk}_{i,t} = \alpha_0 + \alpha_1\times\text{Islamic\_Bank}_{i,t} + \alpha_2\times\text{Islamic\_Window\_Bank}_{i,t} + \alpha_3\times\text{Size}_{i,t-1} + \alpha_4\times\text{Market\_Share}_{i,t-1} + \alpha_5\times\text{Capital\_Asset\_Ratio}_{i,t-1} + \alpha_6\times\text{Loan\_Growth}_{i,t-1} + \alpha_7\times\text{Noninterest\_Income}_{i,t-1} + \alpha_8\times\text{Cost\_Inefficiency}_{i,t-1} + \alpha_9\times\text{State\_Bank}_{i,t} + \alpha_{10}\times\text{Foreign\_Bank}_{i,t} + \alpha_{11}\times\text{Subsidiary}_{i,t} + \alpha_{12}\times\text{Young\_Bank}_{i,t} + \alpha_{13}\times\text{Middle\_Aged\_Bank}_{i,t} + \alpha_{14}\times\text{Muslim\_Share}_{i} + \alpha_{15}\times\text{Domestic\_Interest\_Rate}_{i,t-1} + \alpha_{16}\times\text{HHI}_{i,t-1} + \alpha_{17}\times\text{GDP\_Per\_Capita}_{i,t-1} + \alpha_{18}\times\text{GDP\_Per\_Capita\_Growth}_{i,t-1} + \sum_{y=1}^{9}\alpha_{19,y}\times\text{Year\_Dummies}_{t,y} + \sum_{c=1}^{23}\alpha_{20,c}\times\text{Country\_Dummies}_{i,c} + \varepsilon_{i,t} \quad (1)$$

$$\text{Insolvency\_Risk}_{i,t} = \beta_0 + \beta_1\times\text{Islamic\_Bank}_{i,t} + \beta_2\times\text{Islamic\_Window\_Bank}_{i,t} + \beta_3\times\text{Size}_{i,t-1} + \beta_4\times\text{Market\_Share}_{i,t-1} + \beta_5\times\text{Loan\_Total\_Earning\_Asset\_Ratio}_{i,t-1} + \beta_6\times\text{Asset\_Growth}_{i,t-1} + \beta_7\times\text{Noninterest\_Income}_{i,t-1} + \beta_8\times\text{Cost\_Inefficiency}_{i,t-1} + \beta_9\times\text{State\_Bank}_{i,t} + \beta_{10}\times\text{Foreign\_Bank}_{i,t} + \beta_{11}\times\text{Subsidiary}_{i,t} + \beta_{12}\times\text{Young\_Bank}_{i,t} + \beta_{13}\times\text{Middle\_Aged\_Bank}_{i,t} + \beta_{14}\times\text{Muslim\_Share}_{i} + \beta_{15}\times\text{Domestic\_Interest\_Rate}_{i,t-1} + \beta_{16}\times\text{HHI}_{i,t-1} + \beta_{17}\times\text{GDP\_Per\_Capita}_{i,t-1} + \beta_{18}\times\text{GDP\_Per\_Capita\_Growth}_{i,t-1} + \sum_{y=1}^{9}\beta_{19,y}\times\text{Year\_Dummies}_{t,y} + \sum_{c=1}^{23}\beta_{20,c}\times\text{Country\_Dummies}_{i,c} + \eta_{i,t} \quad (2)$$

$$\text{Bank\_Interest\_Rate}_{i,t} = \gamma_0 + \gamma_1\times\text{Islamic\_Bank}_{i,t} + \gamma_2\times\text{Islamic\_Window\_Bank}_{i,t} + \gamma_3\times\text{Size}_{i,t-1} + \gamma_4\times\text{Market\_Share}_{i,t-1} + \gamma_5\times\text{Capital\_Asset\_Ratio}_{i,t-1} + \gamma_6\times\text{Noninterest\_Income}_{i,t-1} + \gamma_7\times\text{Cost\_Inefficiency}_{i,t-1} + \gamma_8\times\text{Credit\_Risk}_{i,t-1} + \gamma_9\times\text{State\_Bank}_{i,t} + \gamma_{10}\times\text{Foreign\_Bank}_{i,t} + \gamma_{11}\times\text{Subsidiary}_{i,t} + \gamma_{12}\times\text{Young\_Bank}_{i,t} + \gamma_{13}\times\text{Middle\_Aged\_Bank}_{i,t} + \gamma_{14}\times\text{Muslim\_Share}_{i} + \gamma_{15}\times\text{Domestic\_Interest\_Rate}_{i,t-1} + \gamma_{16}\times\text{HHI}_{i,t-1} + \gamma_{17}\times\text{GDP\_Per\_Capita}_{i,t-1} + \gamma_{18}\times\text{GDP\_Per\_Capita\_Growth}_{i,t-1} + \sum_{y=1}^{9}\gamma_{19,y}\times\text{Year\_Dummies}_{t,y} + \sum_{c=1}^{23}\gamma_{20,c}\times\text{Country\_Dummies}_{i,c} + \Theta_{i,t} \quad (3)$$

Where i subscripts denote individual banks and t denotes the time dimension. Credit risk, insolvency risk and bank interest rates are modeled in Equations (1) to (3), respectively. Credit risk relates to loan quality, insolvency risk represents a bank's stability and the interest rate model is expected to capture any special rents extracted by Islamic banks from their clients.

The first and second Equations enable us to compare credit and insolvency risks of Islamic versus conventional banks, using a dummy variable which takes the value of one when a bank is Islamic and zero otherwise (*Islamic_Bank*). Islamic window banks are also represented by a dummy variable (*Islamic_Window_Bank*)[15]. Hence, conventional banks are considered the benchmark. The third Equation aims to investigate whether Islamic banks charge rents (compared to conventional banks) for their *Sharia* compliant services. Simply, Equation (3) analyzes the determinants of a range of interest rate measures (net interest margin, interest

[15] Controlling for Islamic window banks enables us to compare fully Islamic versus fully conventional banks. It would have been interesting to compare the credit risk of conventional and Islamic windows of the same bank, but due to data unavailability this was not feasible.

income and interest expense – including Islamic equivalents) to test for Islamic bank rent seeking behavior[16]. Higher net interest margin or implicit interest income rates on loans (or lower implicit interest expense on deposits) would suggest that Islamic banks extract rents from their clients for offering Islamic products/services.

The established literature shows that interest rate changes can affect banks' soundness through changes in banks' asset quality (Jarrow and Turnbull, 2000; Carling et al., 2007; Drehmann et al., 2010 and Alessandri and Drehmann, 2010). In our analysis, therefore we study the influence of domestic interest rates through three channels: its impact on credit risk (Equation (1)), insolvency risk (Equation (2)) and on various bank-level interest rate prices (Equation (3)). For the first channel, we include interest rates in our model of credit risk and also add an interest rate and Islamic bank dummy interaction term – this shows the sensitivity of Islamic banks' credit risk to interest rate variation. The second channel (Equation (2)) explores whether the insolvency risk of Islamic banks has a different sensitivity to interest rates compared to conventional banks. For the third channel, we examine the determinants of a variety of bank-level interest rate (implicit and explicit) prices including: net interest margin, interest income and expense (as well as loan and deposit rates) using a set of controls and explanatory variables. Similar to the previous channels, the interaction term of our interest rate variable and the Islamic bank dummy shows whether earnings and expenses of Islamic banks are more or less exposed to interest rate variation than their conventional counterparts. The model also tests for possible rent seeking behavior in Islamic banking using the variety of implicit and explicit interest rate dependent variables and the Islamic bank dummy.

[16] The specification of Equation (3) is based on the bank interest margin literature (Angbazo, 1997; Wong, 1997; Maudos and De Guevara, 2004; Carbo and Rodriguez (2007) and Lepetit et al. (2008b).

3.1. DEPENDENT VARIABLES

We primarily use the ratio of loan-loss reserves to gross loans (*Loan_Loss_Reserve*) as a proxy for credit risk (*Credit_Risk*). This variable represents managers' assessment of the quality of the loan portfolio, including performing and non-performing loans. *Loan_Loss_Reserve* takes into account the past performance and the expectation for future performance of the existing loan portfolio (a bank may have lower non-performing loans simply because the repayment period of the major part of its loan portfolio has not yet started). Its periodic adjustment is reflected in the income statement in the form of loan loss provision. As a robustness check we also employ the ratio of impaired loans to gross loans (*Impaired_Loans*) and the ratio of loan-loss provisions to average gross loans (*Loan_Loss_Provision*) both backward-looking proxies for credit risk. All three proxies represent the quality of bank's existing loans and are widely used in the empirical banking literature (for instance, Angbazo, 1997; Kwan and Eisenbeis, 1997; Shiers, 2002; Konishi and Yasuda, 2004; Cebenoyan and Strahan, 2004; Gonzalez, 2005; Altunbas et al., 2007 and Lepetit et al., 2008a). It should be noted, however, that these indicators of credit risk only partly reflect the quality of the loan portfolio, since variation across banks may be due to different internal policies regarding problem loan classification, reserve requirements and write-off policies.

For insolvency risk analysis, we employ the Zscore measure which is widely used in the literature as a stability indicator (see, for instance, Goyeau and Tarazi, 1992; Boyd and Runkle, 1993; Lepetit et al., 2008a; Hesse and Čihák, 2007; Čihák et al., 2009; Laeven and Levine, 2009; Čihák and Hesse, 2010). Using accounting information on asset returns, its volatility and leverage, the Zscore is calculated as follows: $Zscore = \frac{E(ROA)+ CAR}{SD(ROA)}$, where E(ROA) is the expected return on assets, *CAR* is the ratio of equity capital to assets and SD(ROA) is the

standard deviation of ROA. Zscore is inversely related to the probability of a bank's insolvency. A bank becomes insolvent when its asset value drops below its debt. The insolvency probability can be written as P(ROA<-CAR). If we use the standardized ROA, the probability would be equal to $P\left(\frac{ROA-E(ROA)}{SD(ROA)} < -Zscore\right)$. Hence the Zscore shows the number of standard deviation that a bank's return has to fall below its expected value to deplete equity and make the bank insolvent. A higher Zscore implies that the bank is more stable. To control for outliers and skewness of the distribution, we use the logarithm of the Zscore and its components.

Finally, we examine whether Islamic banks charge rents to their clients, in the form of charging higher rates to borrowers or offering lower rates to depositors. First, we use net interest margins (*Net_Interest_Margin*) that may capture rents collectively on both the loan and deposits sides. As further robustness checks, we also use the implicit interest income rate (*Interest_Income_Rate*), implicit interest expense rate (*Interest_Expense_Rate*), implicit interest rate on loans (*Loan_Rate*) and the implicit interest rate on deposits (*Deposit_Rate*). It is worth noting that while Islamic banks do not pay or earn interest, they do charge their clients a mark-up which is equivalent (similar) to interest in conventional banking. Table AI in the appendix defines our risk proxies and control variables.

3.2. CONTROL VARIABLES

Islamic_Bank and *Islamic_Window_Bank* are dummies for Islamic banks and windows, respectively. A variety of other control variables are included in the estimation of our models: *Size*, *Market_Share*, *Capital_Asset_Ratio*, *Loan_Total_Earning_Asset_Ratio*, *Loan_Growth*, *Asset_Growth*, *Noninterest_Income* and *Cost_Inefficiency*. We also control for:

- Ownership structure, using three dummy variables: *State_Bank*, *Foreign_Bank* and *Subsidiary*;
- Bank age or experience level, using two dummies: *Young_Bank* and *Middle_Aged_Bank*;
- Macroeconomic indicators: *Muslim_Share*, *Domestic_Interest_Rate*, *HHI*, *GDP_Per_Capita* and *GDP_Per_Capita_Growth*;
- Year and country dummies.

The rationale for their inclusion is set-out below.

The logarithm of total asset is considered as a proxy for size (*Size*). Large banks can benefit from both scale economies and diversification as claimed by Hughes et al. (2001). At the same time, larger banks might be more risky, since they may try and exploit Too-Big-To-Fail safety net subsidies (Kane, 2010). Market share measured as bank assets over total banking sector assets (*Market_Share*) is used as the proxy for market power (as in Berger, 1995).

The share of equity capital in total assets (*Capital_Asset_Ratio*) is included in the first (*Credit_Risk*) and the third (*Bank_Interest_Rate*) Equations[17]. We include *Capital_Asset_Ratio* in the credit risk Equation, since on the one hand, an increase in equity can lower moral hazard problems and increase the monitoring incentives of banks (Diamond, 1984). On the other hand, higher equity can increase banks' risk-taking capacity. This variable is included as it allows us to investigate whether the relationship between equity capital and risk varies between Islamic and conventional banks. *Capital_Asset_Ratio* is also used in the *Bank_Interest_Rate* Equation, as previous studies on the determinants of margins suggest a positive relationship (Carbo and Rodriguez, 2007). Equity can be considered as a risk aversion proxy (McShane and Sharpe, 1985 and Maudos and De Guevara, 2004) and banks with higher equity expect higher returns.

[17] This is not incorporated in the second equation, since our insolvency risk proxy accounts for the degree of leverage.

Islamic banks can have various limitations in their investment of other earning assets (section (2.2.e)) which may adversely affect their stability. Hence, we include the share of net loans in total earning assets (*Loan_Total_Earning_Asset_Ratio*) in the second model to investigate the extent to which the composition of total earning assets impacts on insolvency risk.

The growth rate of gross loans (*Loan_Growth*) is controlled for in the credit risk Equation since a considerable increase in credit may reflect weaker screening standards, relaxed collateral requirements or lower interest rates (Dell'Ariccia and Marquez, 2006; Ogura, 2006). Clair (1992) finds a negative effect of credit expansion on non-performing loans and loan charge-off rates, although for subsequent years a positive link is detected. As pointed out by Berger and Udell (2004) and Foos et al. (2010) borrowers do not default immediately after taking-on loans. For insolvency risk analysis, as we need to take into account the growth strategy of banks, we use total asset growth (*Asset_Growth*) in lieu of loan growth.

Share of non-interest income in total operating income (*Noninterest Income*) and cost inefficiency are included in all three models. A bank may lose its focus on loan activity as it moves towards noninterest income businesses. Alternatively, the expanding scope of activities may improve a bank's position in lending as it can collect valuable information from different business lines that can be used for lending. According to previous studies, an increase in the share of non-interest income in total operating income is expected to lower stability. DeYoung and Roland (2001) and Stiroh (2004, 2006, 2010), for instance, claim that the increased reliance on non-interest income has raised the volatility of bank portfolios without increasing average profits. Lepetit et al. (2008a) show that European banks with a higher non-interest income share in their net operating income, exhibit a higher insolvency risk. The share of noninterest income

in total operating income is also included in the third Equation, as Carbo and Rodriguez (2007) and Lepetit et al. (2008b) show that noninterest income enables banks to lower margins.

Kwan and Eisenbeis (1997) show that inefficiency increases bank risks – illustrating moral hazard that poorly-run banks have greater incentives for risk-taking. Hence, we control for cost inefficiency (*Cost_Inefficiency*) using the cost to income ratio in our credit and insolvency Equations[18]. A bank with greater cost inefficiency needs to have higher net interest margins to compensate for losses incurred due to inefficiency. Thus, *Cost_Inefficiency* is included in the *Bank_Interest_Rate* Equation. In the third Equation, we also control for credit risk, using the *Loan_Loss_Reserve* proxy, that can influence interest margins (Angbazo, 1997; Wong, 1997; Maudos and De Guevara, 2004; Carbo and Rodriguez, 2007).

Bank ownership structure should also be taken into account. La Porta et al. (2002) analyze government ownership of large banks in 92 countries and show that it reduces efficiency. Bonin et al. (2005) investigate the impact of ownership on bank efficiency for eleven transition countries and find that foreign-owned banks are more cost efficient than other banks. Iannotta et al. (2007) using a sample of 181 large banks from 15 European countries claim that state-owned banks have poorer loan quality and higher insolvency risk than other types of banks[19]. In our model, we classify banks into four categories[20]: domestic privately-owned banks,

[18] See Mohamad et al. (2008) for a cross-country study of Islamic versus conventional banks using the stochastic frontier approach and a sample of 37 conventional and 43 Islamic banks operating in 21 OIC member countries for the 1990-2005 period. They find no significant difference in terms of efficiency between Islamic and conventional banks; however, Abdul-Majid et al. (2010) apply a distance function approach and find that Islamic banks are less technically efficient than their conventional counterparts. They use a sample of 558 observations covering 23 Islamic and 88 conventional banks that operate in 10 OIC member countries over 1996 and 2002. Beck et al (2013) use more conventional measures of bank efficiency – overhead costs and the cost-to-income ratio. Starting with a sample of 2,956 banks (of which 99 are Islamic) from 141 countries between 1995 and 2007. Islamic banks appear more efficient than their conventional counterparts. However, when they examine data from the 22 countries where Islamic and conventional banks compete together they find that Islamic banks have significantly higher overhead costs but only slightly higher cost to income ratio compared to conventional banks.

[19] For a discussion of empirical investigation of ownership issues in banking see Altunbas et al. (2001) and Goddard et al. (2004). More recent studies include Barry et al. (2011), Taboada (2011), Forssbæck (2011) and Berger et al. (2009).

domestic state-owned banks (*State_Bank*), foreign-owned banks (*Foreign_Bank*) and subsidiaries (*Subsidiary*). Domestic privately-owned banks are used as the benchmark and hence three dummies are introduced to represent the other banks.

State-owned banks may invest in risky projects as a result of political influence, or/and they may also enjoy some benefits and informational rents from political bodies. Foreign-owners can face greater risk in monitoring the bank's activities since they may be less familiar with the legal and judicial setting in which they operate. Alternatively, due to such problems they may pursue relatively conservative strategies. A subsidiary might structure a risky portfolio of loans, simply because such a portfolio can beneficially contribute to diversification of the parent's overall portfolio. Failure of a subsidiary may not be viewed as undesirable in the event of a crisis if reputational risks are low.

We also consider the age of the bank by defining two dummy variables. Banks with at most three years of operation are categorized as young banks (*Young_Bank*) and those which have been operating for a period ranging from three to seven years are considered as middle aged (*Middle_Aged_Bank*). Other banks, called mature banks, are considered as the benchmark. The age of banks is expected to proxy for experience and informational advantages. Older banks are likely to have longer term relationships and other informational advantages (experience operating in new geographies and product markets) that are reflected in efficiency and risk advantages. Of course, it could be the case that younger institutions have tougher regulatory oversight and therefore operate more cautiously.

[20] We classify a bank as a state-owned bank when at least fifty percent of the equity belongs to the government. Similarly, at least fifty percent of a bank should be owned by one or more foreign entity(ies) to be classified as a foreign-owned bank. A bank which is owned by a foreign government is considered as a foreign-owned bank. We assume that although a government may decide to invest in a bank abroad based on political ties with the host country, it will not intervene in the bank's operation as intensively as the host country's government.

We also introduce five country level variables to control for cross-country variations. First we control for the degree of religiosity, using two interchangeable proxies: the share of Muslim population in each country (*Muslim_Share*) and an index representing the country's legal system (*Legal_System*). In the latter case, the index takes a value of zero for countries which do not use *Sharia* law to define their legal system, a value of one for those countries that have legal systems based on both *Sharia* and other legal traditions (such as English or French laws); and finally, the index has a value of two for countries with exclusive *Sharia* based legal systems (such as Iran and Saudi Arabia).

We also control for the level of domestic interest rates (*Domestic_Interest_Rate*). The existing literature shows that the level of domestic interest rates can influence banks' risk appetite (Dell' Ariccia and Marquez, 2006; Rajan, 2006; Borio and Zhu, 2008; Delis and Kouretas, 2010; Maddaloni and Peydró, 2011). Typically, banks have a higher risk-taking appetite when interest rates are low. However, interest rate levels can influence the ability of borrowers to re-pay (Jarrow and Turnbull, 2000; Carling et al., 2007; Drehmann et al., 2010 and Alessandri and Drehmann, 2010) - at higher levels the incentive to default (moral hazard) increases. We try to capture the possible impact of banking sector concentration on risk-taking behavior by including the Herfindahl-Hirschman Index (*HHI*) in the model. Finally, we control for the level and growth in the prosperity of the population by including the following variables - GDP per capita (*GDP_Per_Capita*) and growth in GDP per capita (*GDP_Per_Capita_Growth*). Year dummies are introduced to control for time fixed effects[21] and we also include country dummies to capture heterogeneity across different banking systems[22].

[21] The sample covers eleven years, however, since all accounting and macro level variables are lagged for one year, we use nine year dummies (2001-2009) in our estimations.

[22] This is particularly important due to differences in the nature of Islamic banking across countries. Unfortunately, our data does not enable us to construct an index reflecting the degree of difference between Islamic and

4. Data and Descriptive Statistics

Bank-level data was retrieved from the Bankscope database and the web sites of individual banks. Country-level variables, including *Domestic_Interest_Rate*[23], *GDP_Per_Capita* and the *GDP_Per_Capita_Growth* are collected from the World Bank web-site. The share of Muslim population in each country is obtained from Pew Research Center (2009)[24] and the data on legal systems are obtained from the World Factbook (2009). The Bankscope classification for Islamic banks is incorrect in places so all banks have been cross-checked with their websites to ensure accuracy[25]. The sample covers 3870 observations for 553 commercial banks, across 24 country[26] members of the OIC where Islamic banking is practiced over the period 1999 to 2009 (see Panel A in Table AII for a detailed summary of cross-country and bank type specifications). Our sample comprises 118 Islamic commercial banks, 81 commercial banks with Islamic window/branches and 354 conventional commercial banks. For Iran, observations are only available for Islamic banks as its banking system is 100% *Riba*-free. In other countries, both Islamic and conventional banking are authorized and practiced. The largest number of observations is from Indonesia and the lowest from Brunei. Approximately, 20% of the total observations are for Islamic banks; Islamic window banks represent 17% of the sample (the remaining 63% relate to conventional banks). Panel B in Table AII shows the

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conventional banks in each country. Nevertheless, we control for this dimension by introducing 23 country dummy variables. It is worth noting that since *Muslim_Share* and *Legal_System* are time-invariant country level variables, we use country dummies and *Muslim_Share* / *Legal_System* interchangeably to avoid perfect multi-collinearity.

[23] We use deposit interest rate announced by the World Bank; for years and countries with missing observations, the data is obtained from the web-site of central banks.

[24] Please visit http://pewforum.org/Mapping-the-Global-Muslim-Population.aspx

[25] Bankscope classifies banks as commercial, Islamic or other types. However an Islamic bank can be a commercial or a non-commercial bank. Such a classification is problematic: (1) In Bankscope some Islamic banks are mistakenly categorized as commercial banks. (2) Some Islamic banks are investment banks or other types that are not comparable with commercial banks. (3) The data-set also does not differentiate conventional banks with Islamic windows from Islamic or conventional banks.

[26] Algeria, Bahrain, Bangladesh, Brunei, Egypt, Gambia, Indonesia, Iran, Iraq, Jordan, Kuwait, Lebanon, Malaysia, Mauritania, Pakistan, Qatar, Saudi Arabia, Senegal, Syria, Sudan, Tunisia, Turkey, UAE and Yemen.

ownership structure and age (experience level) of banks in our sample. The data reveal that Islamic banks are relatively younger than conventional banks and also the number with foreign owners is proportionately higher. Table AIII also shows the macroeconomic and banking indicators for the countries under study.

Table II illustrates sample descriptive statistics. It shows that relatively large conventional banks establish Islamic windows. Islamic banks are, on average, more capitalized and profitable than conventional banks. The lower levels of debt (possibly as a response to higher withdrawal risk) and higher non-interest income of Islamic banks might partly explain their greater profitability. Net interest margin of Islamic banks does not appear to be significantly different from that of conventional banks; however, Islamic banks have lower implicit interest income and expense rates than conventional banks. Interestingly, the structure of the asset portfolio of Islamic banks is significantly different from that of conventional banks. Islamic banks have a higher ratio of net loans to total earning assets possibly because they are limited in their investments in other earning assets (such as bonds) as discussed in section (2.2.e). Gross loans and total assets grow at higher rates for Islamic than conventional banks. The cost to income ratio of Islamic banks is slightly higher than that of conventional banks.

The descriptive statistics of our risk measures show that Islamic banks have lower levels of credit risk compared to conventional banks. In terms of insolvency risk the mean test results show that the Zscore and its components for Islamic banks are not significantly different from those of conventional banks, suggesting that the higher returns and capital of Islamic banks are offset by their higher asset return volatility.

Table II. Descriptive statistics

General descriptive statistics and risk measure variables for Islamic, conventional and Islamic window banks over 1999-2009.

		Islamic Banks					Conventional Banks						Islamic Window Banks				
	Variables	Number	Mean	SD	Min	Max	Number	Mean	SD	Min	Max	T-Stat.†	Number	Mean	SD	Min	Max
Credit_Risk Proxies	Loan_Loss_Reserve (%)	593	6.75	7.71	0.00	58.00	2,105	8.72	9.38	0.00	60.55	-5.23***	561	7.82	7.62	0.00	51.67
	Impaired_Loans (%)	381	8.31	10.33	0.00	66.39	1,604	11.14	12.97	0.00	76.41	-4.55***	467	10.23	10.97	0.00	67.93
	Loan_Loss_Provision (%)	574	1.35	3.10	-22.20	26.00	1,982	1.70	3.18	-22.52	30.69	-2.33**	537	1.65	3.06	-4.30	30.70
Insolvency_Risk Proxies	Zscore_rw	388	3.42	1.31	-0.74	8.59	1,349	3.48	1.30	-1.32	8.72	-0.83	392	3.54	1.36	-1.45	9.39
	Zscore_P1_rw	411	1.13	1.11	-3.28	5.33	1,42	1.25	1.32	-4.84	5.39	-1.88*	417	1.56	1.33	-5.13	5.70
	Zscore_P2_rw	389	3.28	1.37	-0.50	8.55	1,367	3.31	1.36	-1.31	8.70	-0.42	395	3.37	1.36	-0.44	9.25
	Zscore	75	2.87	0.93	0.05	5.22	251	2.87	1.02	-0.77	6.31	0.02	67	2.85	1.08	-0.15	5.13
	Zscore_P1	70	0.53	0.75	-2.40	2.04	226	0.65	0.91	-2.53	2.62	-1.15	60	0.95	0.92	-1.60	2.86
	Zscore_P2	75	2.77	0.92	0.70	5.20	252	2.76	1.00	0.09	6.28	0.09	67	2.73	1.08	-0.04	5.03
Bank_Interest_Rate Proxies	Net_Interest_Margin (%)	684	4.19	3.39	-9.42	24.09	2,46	4.17	3.09	-12.58	24.83	0.19	673	3.47	2.43	-10.45	23.45
	Interest_Income_Rate (%)	623	8.02	4.38	0.01	38.70	2,351	9.81	4.84	0.09	39.07	-8.87***	650	8.05	3.43	1.11	31.81
	Interest_Expense_Rate (%)	544	4.39	3.39	0.08	26.40	2,355	5.84	3.67	0.06	26.55	-8.80***	649	4.65	2.59	0.30	19.41
	Loan_Rate (%)	228	9.60	4.70	0.30	23.80	629	9.97	4.46	0.60	29.60	-1.03	209	8.90	4.44	1.70	28.64
	Deposit_Rate (%)	188	5.02	3.75	0.10	16.50	588	4.81	3.07	0.10	15.30	0.68	180	4.27	2.46	0.80	11.80
General Descriptive Statistics	Total Assets (mil. $)	782	3,732	7,284	530	48,1	2,448	4,041	8,664	132	87,9	-1	640	5,188	8,576	4,478	63
	Market_Share (%)	782	0.07	0.13	0.00	1.00	2,448	0.06	0.12	0.00	1.00	2.26**	640	0.07	0.11	0.00	0.56
	Capital_Asset_Ratio (%)	750	17.10	16.12	0.43	87.01	2,403	13.38	11.07	0.01	86.93	5.90***	626	11.78	9.28	1.48	70.12
	ROAA (%)	715	1.48	2.46	-12.29	13.20	2,458	1.23	2.26	-16.48	13.89	2.40**	672	1.28	2.04	-17.82	8.93
	ROAE (%)	715	12.93	17.43	-118.28	123.65	2,429	12.26	18.17	-124.83	133.30	0.90	668	15.55	17.42	-118.25	119.92
	Loan_Total_Earning_Asset_Ratio (%)	767	58.00	26.01	0.02	100.00	2,431	53.58	22.78	0.00	100.00	4.22***	637	57.12	20.43	0.00	100.00
	Loan_Growth (%)	685	29.59	51.33	-100.00	351.73	2,047	21.67	40.31	-100.00	325.28	3.68***	573	19.90	38.83	-96.60	326.93
	Asset_Growth (%)	709	26.27	33.45	-74.95	207.08	2,265	19.16	30.22	-73.80	211.08	5.06***	596	18.68	27.97	-62.00	177.60
	Noninterest_Income (%)	689	42.14	29.34	-70.23	158.92	2,405	33.60	23.17	-115.15	158.45	7.03***	668	33.33	19.89	-20.96	149.22
	Cost_Inefficiency (%)	658	59.80	34.03	3.04	268.53	2,382	57.12	31.56	1.88	287.87	1.82*	661	48.08	21.69	3.93	180.00

† T-Stat.of mean equality test between Islamic and conventional banks. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table AI for variable definitions.

A correlation matrix is presented in Table AIV which does not suggest any major collinearity problems among our independent variables, except for the logarithm of total assets and market share variables. As a result, we orthogonalize the logarithm of market share on the logarithm of total assets.

5. Empirical Results

5.1. CREDIT RISK

Table III presents the results for credit risk (Equation (1)) where we first use *Loan_Loss_Reserve* as the credit risk proxy. The Equation is estimated using random effects[27]. In column (1), the credit risk proxy is regressed simply on our Islamic bank and Islamic window dummy variables (*Islamic_Bank* & *Islamic_Window_Bank*). Different classes of control variables, including financial structure, ownership structure, age, macroeconomic indicators, year and country dummies, are included in columns (2) to (6). These improve the explanatory power of our model with R-squared increasing from 0.007 to 0.182[28]. In all specifications, Islamic banks, on average, exhibit lower credit risk than conventional banks. The results remain unchanged when we use *Impaired_Loans* and *Loan_Loss_Provision* as the credit risk proxies in lieu of *Loan_Loss_Reserve*. As a further robustness check, we assume within country correlation of standard errors, using clustered standard errors, and find similar results[29]. Islamic banks, on average, hold 3.037% less reserves for their loans than conventional banks. The average loan-loss reserves on gross loans for conventional banks is 8.72% (Table II) so Islamic banks hold

[27] We have several dummy variables that rarely change over time, namely, *Islamic_Bank, Islamic_Window_Bank, State_Bank, Foreign_Bank* and *Subsidiary* and so these variables have limited within variation. We also have time invariant variables (*Muslim_Share,* for instance). Fixed effects estimation is inefficient at estimating variables with limited within variance and cannot be used with time invariant variables. As such we employ the random effects technique in our estimation.

[28] The explanatory power of our models is close to similar studies, for instance Beck et al., 2013 and Čihák and Hesse, 2010.

[29] The results are available from the authors upon request.

34.8% ($100 \times \frac{3.037}{8.72}$) less than the average *Loan_Loss_Reserve* that conventional banks hold. Interestingly, the figure is close to Baele et al's (2010) finding that the hazard rate of Islamic loans is, on average, 33% lower than the hazard rate of conventional loans.

The results show a negative relationship between size and credit risk, which is consistent with possible diversification and scale economies benefits. Loan growth is associated with lower credit risk in the following year as also identified by Clair (1992). We also find that higher domestic interest rates have a positive influence on credit risk (loans are more difficult to repay if rates are higher).

Islamic banks may have lower credit risk compared to conventional banks due to the religiosity of clients that enhances loyalty and mitigates default and/or due to their special relationship with their depositors. To investigate the former we include an interaction term for the Islamic bank dummy and Muslim share in population (*Islamic_Bank* × *Muslim_Share*) reported in column (7). The result shows that there is a negative relationship between the credit risk of Islamic banks and the share of Muslims in the population. We find similar results (reported in column (8)) when we use *Legal_System* in lieu of *Muslim_Share* as the religiosity proxy. In column (9) the model now includes the Islamic bank/domestic interest rate interaction term (*Islamic_Bank* × *Domestic_Interest_Rate*) and here we find that the credit risk of Islamic banks is not significantly sensitive to domestic interest rates, while a one percent increase in domestic rates (on average) is associated with 0.232 percent increase in the *Loan_Loss_Reserve* of conventional banks. To analyze whether the relationship between Islamic banks and their depositors can explain the higher loan quality of Islamic banks we include the interaction term of the Islamic bank dummy and capital to asset ratio (*Islamic_Bank* × *Capital_Asset_Ratio)* and report the estimation in column (10). The result shows that higher leverage is associated with lower credit risk for Islamic compared to conventional banks.

Table III. Credit risk model

This table presents the estimation of the credit risk model and the dependent variable is the ratio of loan loss reserves to gross loans. In columns (1) to (6) we investigate whether credit risk of Islamic banks is, on average, higher or lower than conventional banks. The final five columns investigate various interaction variables highlighting whether religious factors influence credit risk. In columns (1) to (6) credit risk of Islamic banks is compared to conventional banks with different control variables. In column (7), the interaction term of *Islamic_Bank* and *Muslim_Share* (*Islamic_Bank* × *Muslim_Share*) is included to analyze the possible impact of clients' religiosity on the credit risk of Islamic banks. In column (8), we replace *Muslim_Share* and *Islamic_Bank* × *Muslim_Share* with *Legal_System* and *Islamic_Bank* × *Legal_System* respectively for further analysis of the possible impact of clients' religiosity on credit risk of Islamic banks. In column (9), we investigate whether credit risk of Islamic banks is more or less sensitive to domestic interest rates compared to conventional banks, by adding the interaction term of *Islamic_Bank* and *Domestic_Interest_Rate* (*Islamic_Bank* × *Domestic_Interest_Rate*). In column (10), we add the interaction of *Islamic_Bank* and *Capital_Asset_Ratio* (*Islamic_Bank* × *Capital_Asset_Ratio*) to understand whether leverage can discipline Islamic banks more effectively than conventional banks. In order to investigate whether size has different effect on credit risk of Islamic banks compared to conventional banks, in column (11) the interaction of *Islamic_Bank* and *Size* (*Islamic_Bank* × *Size*) is added to the model.We apply random effect technique with robust standard errors for our estimations. All the accounting and macro level variables are lagged one period

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Islamic_Bank (α_1)	-2.300***	-1.627*	-2.088**	-2.135**	-1.971**	-3.037***	8.200	0.985	-0.449	-5.734***	-14.560**
	(-2.98)	(-1.83)	(-2.23)	(-2.28)	(-2.03)	(-2.79)	(1.55)	(0.67)	(-0.29)	(-3.69)	(-2.24)
Islamic_Window_Bank (α_2)	-2.035**	-0.791	-0.894	-0.890	-0.441	-1.213	-0.579	-1.541*	-0.973	-1.349	-1.071
	(-2.01)	(-1.00)	(-1.12)	(-1.11)	(-0.54)	(-1.35)	(-0.71)	(-1.84)	(-1.08)	(-1.49)	(-1.18)
Size (α_3)		-0.917***	-0.896***	-0.887***	-0.860***	-0.728**	-0.750***	-0.764***	-0.769**	-0.823***	-0.872**
		(-3.84)	(-3.72)	(-3.59)	(-3.29)	(-2.15)	(-2.66)	(-2.73)	(-2.28)	(-2.63)	(-2.42)
Islamic_Bank × Size (α_{IS})											0.839*
											(1.86)
Market_Share (α_4)		0.373	0.390	0.378	0.454	-0.277	0.077	-0.140	-0.142	-0.108	-0.104
		(1.25)	(1.31)	(1.25)	(1.40)	(-0.46)	(0.20)	(-0.37)	(-0.23)	(-0.20)	(-0.17)
Capital_Asset_Ratio (α_5)		-0.023	-0.023	-0.023	-0.017	-0.014	-0.006	-0.010	-0.017	-0.076	-0.010
		(-0.51)	(-0.50)	(-0.51)	(-0.37)	(-0.30)	(-0.14)	(-0.21)	(-0.37)	(-1.53)	(-0.22)
Islamic_Bank × Capital_Asset_Ratio (α_{IC})										0.175**	
										(2.33)	
Loan_Growth (α_6)		-0.030***	-0.030***	-0.030***	-0.029***	-0.028***	-0.028***	-0.028***	-0.027***	-0.027***	-0.027***
		(-5.28)	(-5.22)	(-5.25)	(-5.05)	(-4.86)	(-4.93)	(-4.96)	(-4.80)	(-4.83)	(-4.79)
Noninterest_Income (α_7)		-0.011	-0.011	-0.011	-0.007	-0.011	-0.006	-0.009	-0.009	-0.010	-0.011
		(-0.79)	(-0.80)	(-0.78)	(-0.55)	(-0.81)	(-0.46)	(-0.67)	(-0.69)	(-0.76)	(-0.80)
Cost_Inefficiency (α_8)		0.005	0.005	0.005	0.003	0.004	0.003	0.004	0.006	0.005	0.005
		(0.57)	(0.58)	(0.55)	(0.34)	(0.47)	(0.31)	(0.40)	(0.65)	(0.53)	(0.56)
State_Bank (α_9)			-0.441	-0.410	-0.236	-0.813	-0.259	-0.703	-0.874	-0.807	-0.922
			(-0.48)	(-0.45)	(-0.25)	(-0.86)	(-0.27)	(-0.78)	(-0.92)	(-0.85)	(-0.98)
Foreign_Bank (α_{10})			2.408**	2.422**	2.685**	1.787	2.877**	2.068*	1.736	1.649	1.799
			(1.97)	(1.97)	(2.17)	(1.47)	(2.36)	(1.73)	(1.43)	(1.36)	(1.48)
Subsidiary (α_{11})			-0.971	-0.976	-0.794	-0.276	-0.646	-0.549	-0.207	-0.342	-0.333
			(-1.02)	(-1.03)	(-0.83)	(-0.29)	(-0.68)	(-0.59)	(-0.22)	(-0.36)	(-0.35)
Young_Bank (α_{12})				0.366	0.311	-0.092	-0.038	-0.205	-0.152	-0.397	0.262
				(0.21)	(0.18)	(-0.05)	(-0.02)	(-0.12)	(-0.09)	(-0.22)	(0.16)
Middle_Aged_Bank (α_{13})				0.187	0.202	0.180	-0.040	-0.048	0.101	0.149	0.146
				(0.23)	(0.25)	(0.22)	(-0.05)	(-0.06)	(0.12)	(0.18)	(0.18)

Muslim_Share ($\alpha_{14,1}$)					-0.036		-0.005				
					(-1.39)		(-0.17)				
Islamic_Bank × Muslim_Share (α_{IM})							-0.120**				
							(-2.00)				
Legal_System ($\alpha_{14,2}$)								3.627***			
								(4.22)			
Islamic_Bank × Legal_System (α_{IL})								-4.701***			
								(-3.46)			
Domestic_Interest_Rate (α_{15})					0.112*	0.210**	0.088	0.127**	0.232**	0.229**	0.209**
					(1.96)	(2.26)	(1.50)	(2.11)	(2.39)	(2.47)	(2.25)
Islamic_Bank × Domestic_Interest_Rate (α_{ID})									-0.399**		
									(-2.19)		
HHI (α_{16})					-2.515	-3.727	0.193	-2.771	-4.037	-4.749	-3.878
					(-0.82)	(-0.98)	(0.06)	(-0.82)	(-1.07)	(-1.30)	(-1.03)
GDP_Per_Capita (α_{17})					0.013	0.069	0.017	-0.003	0.073	0.031	0.065
					(0.45)	(0.63)	(0.59)	(-0.11)	(0.68)	(0.28)	(0.60)
GDP_Per_Capita_Growth (α_{18})					-0.006	0.004	0.002	0.006	0.008	0.019	0.008
					(-0.10)	(0.06)	(0.03)	(0.10)	(0.13)	(0.29)	(0.13)
Constant (α_0)	9.119***	22.543***	22.337***	22.193***	23.896***	20.123***	20.189***	18.516***	20.169***	22.796***	22.011***
	(21.45)	(5.80)	(5.70)	(5.56)	(5.79)	(3.58)	(4.43)	(4.51)	(3.64)	(4.42)	(3.77)
Year Dummies	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	No	No	No	No	No	Yes	No	No	Yes	Yes	Yes
Number of Obs	3,259	1,897	1,897	1,897	1,897	1,897	1,897	1,897	1,897	1,897	1,897
R-squared	0.007	0.076	0.085	0.085	0.084	0.182	0.093	0.123	0.186	0.186	0.182
H_0: $\alpha_{14,1} = \alpha_{IM} = 0$ (F-stat.)							5.17*				
H_0: $\alpha_{14,1} + \alpha_{IM} = 0$ (F-stat.)							5.17**				
H_0: $\alpha_{14,2} = \alpha_{IL} = 0$ (F-stat.)								19.75***			
H_0: $\alpha_{14,2} + \alpha_{IL} = 0$ (F-stat.)								0.87			
H_0: $\alpha_{15} = \alpha_{ID} = 0$ (F-stat.)									9.07**		
H_0: $\alpha_{15} + \alpha_{ID} = 0$ (F-stat.)									0.76		
H_0: $\alpha_5 = \alpha_{IC} = 0$ (F-stat.)										5.49*	
H_0: $\alpha_5 + \alpha_{IC} = 0$ (F-stat.)										2.62	
H_0: $\alpha_3 = \alpha_{IS} = 0$ (F-stat.)											6.43**
H_0: $\alpha_3 + \alpha_{IS} = 0$ (F-stat.)											0.01

Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table AI for variable definitions.

We find a negative relationship between leverage and credit risk and also see that size and leverage are linked in a similar manner. As we expect, there is a negative relationship between bank assets size and clients' religiosity (larger Islamic banks may move toward bigger clients less sensitive to religious concerns). Moreover, Čihák and Hesse (2010) attribute the negative size effect on Islamic bank stability to risk management limitations. In order to investigate this issue further we include an interacted Islamic bank dummy with bank asset size (*Islamic_Bank* × *Size*) and report findings in column (11). The result shows that size has a negative impact on credit risk of Islamic banks, although the coefficient is significant only at the 10% level (possibly due to the negative relationship between size and leverage).

5.2. INSOLVENCY RISK

Table IV reports the insolvency risk Equation again estimated using random effects. In columns (1) to (6), we regress the insolvency risk proxy[30] on our Islamic bank and Islamic window bank dummy variables (*Islamic_Bank* & *Islamic_Window_Bank*), while adding different classes of control variables in each step. Overall, we find no significant difference between Islamic and conventional banks in terms of insolvency risk[31]. The results also show that higher levels of non-interest income, cost inefficiency, share of Muslims in population, domestic interest rates and GDP per capita are associated with lower bank stability. In terms of ownership structure, we find that subsidiaries are less stable than domestic privately-owned banks. The results also show that young banks are less stable than their more mature counterparts.

[30] We use the logarithm of Zscore "*Zscore*" as the insolvency risk proxy; we find similar results when we employ the absolute value of Zscore in our analysis, except that in one specification (when we control for all other factors) Islamic banks exhibit higher stability than conventional banks at the 10% significance level, which is due to their higher capitalization. Results are not presented here; they are available from the authors upon request.

[31] We find similar results when we use clustered standard errors, assuming within country correlation of standard errors. The results are available from the authors upon request.

Table IV. Insolvency risk model

This table presents the estimation of the insolvency risk model. In columns (1) to (8), we investigate whether insolvency risk of Islamic banks is, on average, higher or lower than conventional banks using a rolling-window Z-score as the dependent variable. In the last four columns we include various interaction variables highlighting whether religious factors influence insolvency risk. In columns (1) to (6) insolvency risk of Islamic banks is compared to conventional banks, using a variety of control variables. In columns (7) and (8) our insolvency risk proxy is replaced by alternatives *Zscore_P1_rw* and *Zscore_P2_rw*, respectively. In column (9), the interaction term of *Islamic_Bank* and *Muslim_Share* (*Islamic_Bank* × *Muslim_Share*) is added to analyze the possible impact of clients' religiosity on insolvency risk of Islamic banks. In column (10), we investigate whether insolvency risk of Islamic banks is more or less sensitive to domestic interest rate compared to conventional banks, by adding the interaction term of *Islamic_Bank* and *Domestic_Interest_Rate* (*Islamic_Bank* × *Domestic_Interest_Rate*). In order to understand whether size has different effect on insolvency risk of Islamic banks compared to conventional banks, in column (11) the interaction of *Islamic_Bank* and *Size* (*Islamic_Bank* × *Size*) is added to the model. We add the interaction term of *Islamic_Bank* and *Loan_Total_Earning_Asset_Ratio* (*Islamic_Bank* × *Loan_Total_Earning_Asset_Ratio*) in column (12) to investigate whether the composition of total earning assets can have a significantly different effect on Islamic banks' stability compared to conventional banks.We apply random effect technique with robust standard errors for our estimations. All the accounting and macro level variables are lagged for one period.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Variables	Zscore_rw	Zscore_rw	Zscore_rw	Zscore_rw	Zscore_rw	Zscore_rw	Zscore_P1_rw	Zscore_P2_rw	Zscore_rw	Zscore_rw	Zscore_rw	Zscore_rw
Islamic_Bank (β_1)	-0.115	-0.070	-0.102	-0.059	-0.114	0.088	0.054	0.118	-0.791	0.153	0.514	0.263
	(-0.89)	(-0.58)	(-0.82)	(-0.47)	(-0.92)	(0.57)	(0.46)	(0.74)	(-1.07)	(0.65)	(0.62)	(0.88)
Islamic_Window_Bank (β_2)	0.200	0.140	0.107	0.113	-0.039	0.198	0.310**	0.244	-0.043	0.201	0.193	0.196
	(1.37)	(1.01)	(0.76)	(0.81)	(-0.27)	(1.16)	(2.12)	(1.42)	(-0.30)	(1.17)	(1.13)	(1.15)
Size (β_3)		-0.019	-0.020	-0.030	-0.032	-0.050	0.064**	-0.069**	-0.038	-0.051*	-0.044	-0.049
		(-0.74)	(-0.76)	(-1.09)	(-1.23)	(-1.63)	(2.41)	(-2.21)	(-1.41)	(-1.65)	(-1.27)	(-1.61)
Islamic_Bank × Size (β_{IS})											-0.031	
											(-0.53)	
Market_Share (β_4)		-0.028	-0.032	-0.024	-0.017	-0.045	-0.045	-0.050	-0.005	-0.042	-0.051	-0.049
		(-0.77)	(-0.87)	(-0.65)	(-0.45)	(-0.64)	(-0.65)	(-0.66)	(-0.12)	(-0.57)	(-0.70)	(-0.69)
Loan_Total_Earning_Asset_Ratio (β_5)		0.002	0.002	0.002	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.002
		(1.03)	(0.99)	(0.91)	(0.68)	(0.49)	(0.87)	(0.36)	(0.60)	(0.50)	(0.48)	(0.72)
Islamic_Bank × Loan_Total_Earning_Asset_Ratio (β_{IL})												-0.003
												(-0.68)
Asset_Growth (β_6)		-0.000	-0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.001	0.001
		(-0.17)	(-0.22)	(0.02)	(0.32)	(0.67)	(0.12)	(0.77)	(0.27)	(0.68)	(0.66)	(0.72)
Noninterest_Income (β_7)		-0.005**	-0.005**	-0.005**	-0.006***	-0.005**	-0.006***	-0.005**	-0.006***	-0.005**	-0.005**	-0.005**
		(-2.49)	(-2.43)	(-2.45)	(-2.91)	(-2.23)	(-2.74)	(-2.35)	(-2.87)	(-2.20)	(-2.23)	(-2.22)
Cost_Inefficiency (β_8)		-0.010***	-0.010***	-0.010***	-0.009***	-0.009***	-0.018***	-0.008***	-0.009***	-0.009***	-0.009***	-0.009***
		(-6.81)	(-6.78)	(-6.72)	(-5.78)	(-5.69)	(-8.00)	(-5.30)	(-5.83)	(-5.69)	(-5.63)	(-5.68)
State_Bank (β_9)			-0.041	-0.063	-0.006	0.156	0.062	0.175	-0.005	0.154	0.162	0.157
			(-0.30)	(-0.45)	(-0.04)	(1.26)	(0.51)	(1.31)	(-0.03)	(1.25)	(1.30)	(1.27)
Foreign_Bank (β_{10})			-0.058	-0.076	-0.087	-0.158	-0.114	-0.128	-0.111	-0.157	-0.157	-0.149
			(-0.37)	(-0.50)	(-0.57)	(-1.03)	(-0.78)	(-0.81)	(-0.72)	(-1.03)	(-1.03)	(-0.97)
Subsidiary (β_{11})			-0.299***	-0.298***	-0.357***	-0.318***	-0.205	-0.329**	-0.366***	-0.316***	-0.315***	-0.317***
			(-2.69)	(-2.66)	(-3.27)	(-2.63)	(-1.50)	(-2.50)	(-3.35)	(-2.60)	(-2.60)	(-2.62)
Young_Bank (β_{12})				-0.393**	-0.389**	-0.348*	-0.771***	-0.246	-0.404**	-0.347*	-0.358*	-0.353*
				(-2.03)	(-1.97)	(-1.65)	(-3.04)	(-1.21)	(-1.98)	(-1.65)	(-1.68)	(-1.69)
Middle_Aged_Bank (β_{13})				-0.209	-0.203	-0.160	0.009	-0.177	-0.203	-0.162	-0.157	-0.161

				(-1.58)	(-1.60)	(-1.23)	(0.07)	(-1.41)	(-1.60)	(-1.24)	(-1.21)	(-1.24)
Muslim_Share (β_{14})					-0.011***				-0.013***			
					(-3.11)				(-3.34)			
Islamic_Bank × Muslim_Share (β_{IM})									0.008			
									(0.91)			
Domestic_Interest_Rate (β_{15})					-0.042***	-0.048***	-0.037***	-0.048***	-0.043***	-0.047***	-0.048***	-0.047***
					(-7.55)	(-4.97)	(-3.79)	(-5.86)	(-7.22)	(-4.94)	(-4.97)	(-4.98)
Islamic_Bank × Domestic_Interest_Rate (β_{ID})										-0.012		
										(-0.35)		
HHI (β_{16})					-0.563	-0.949*	-0.796	-1.144**	-0.502	-0.956*	-0.936*	-0.935*
					(-1.45)	(-1.75)	(-1.44)	(-2.02)	(-1.23)	(-1.75)	(-1.73)	(-1.72)
GDP_Per_Capita (β_{17})					-0.005*	-0.066***	-0.049***	-0.075***	-0.006*	-0.065***	-0.066***	-0.065***
					(-1.66)	(-2.81)	(-2.78)	(-3.08)	(-1.86)	(-2.80)	(-2.80)	(-2.79)
GDP_Per_Capita_Growth (β_{18})					-0.015*	-0.006	0.002	-0.009	-0.014	-0.006	-0.006	-0.006
					(-1.71)	(-0.59)	(0.13)	(-0.86)	(-1.57)	(-0.58)	(-0.59)	(-0.63)
Constant (β_0)	3.399***	4.315***	4.400***	4.560***	6.112***	5.943***	2.080***	6.191***	6.343***	5.943***	5.866***	5.882***
	(61.32)	(10.89)	(11.00)	(10.99)	(13.55)	(9.96)	(3.86)	(10.14)	(13.40)	(9.96)	(9.09)	(9.72)
Year Dummies	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	No	No	No	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Number of Obs	2,129	1,910	1,910	1,910	1,910	1,910	1,813	1,931	1,910	1,910	1,910	1,910
R-squared	0.001	0.040	0.043	0.047	0.097	0.161	0.226	0.176	0.103	0.161	0.161	0.161
H_0: $\beta_{14} = \beta_{IM} = 0$ (F-stat.)									11.4***			
H_0: $\beta_{14} + \beta_{IM} = 0$ (F-stat.)									0.41			
H_0: $\beta_{15} = \beta_{ID} = 0$ (F-stat.)										24.78***		
H_0: $\beta_{15} + \beta_{ID} = 0$ (F-stat.)										2.87*		
H_0: $\beta_3 = \beta_{IS} = 0$ (F-stat.)											3.6	
H_0: $\beta_3 + \beta_{IS} = 0$ (F-stat.)											2.23	
H_0: $\beta_5 = \beta_{IS} = 0$ (F-stat.)												0.67
H_0: $\beta_5 + \beta_{IS} = 0$ (F-stat.)												0.14

Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table AI for variable definitions.

In columns 7 and 8 we report results where we replace the Zscore by the logarithm of its first and second components and find no significant difference between Islamic and conventional banks. To investigate the possible impact of the religiosity of Islamic banks' clients on stability, in column (9), we add the interaction terms of Islamic bank dummy variable and Muslim share in population (*Islamic_Bank* × *Muslim_Share*). The result shows no significant difference between Islamic and conventional banks[32]. In columns (10), the interaction term of Islamic bank dummy variable and interest rate (*Islamic_Bank* × *Domestic_Interest_Rate*) is included and we find no significant difference between Islamic and conventional banks in terms of sensitivity to interest rate changes. In column (11), we add the interaction term of Islamic bank dummy variable and size (*Islamic_Bank* × *Size*), to investigate the size effect on insolvency risk of Islamic banks. The result shows no significant difference between Islamic and conventional banks and again this is supported in column (12), where we include the Islamic bank dummy and share of loans in total earning assets interaction variable (*Islamic_Bank* × *Loan_Total_Earning_Asset_Ratio*). The composition of total earning assets does not appear to have a significantly different impact on Islamic banks' stability compared to conventional banks.

5.3. BANK INTEREST RATES

Table V illustrates estimates of Equation (3) using random effects. Column (1) shows net interest margin (*Net_Interest_Margin*) regressed on the Islamic bank and Islamic window dummy variables (*Islamic_Bank* & *Islamic_Window_Bank*) and a range of controls that include various financial variables, ownership structure, age dummies, macroeconomic indicators, year and country dummies. The result shows no significant difference between Islamic and conventional banks.

[32] We get similar results when we use *Legal_System* variable in lieu of *Muslim_Share* as the religiosity proxy, which is not reported here, but is available upon request.

Table V. Bank interest rate model

This table presents the results of the bank interest rate model. In the first five columns, we investigate whether interest rate proxies of Islamic banks are, on average, higher or lower than conventional banks. In columns (6) to (10), the sensitivity of interest income and expense of Islamic banks to domestic interest rate are analysed. In columns (1) to (5), interest rate proxies (*Net_Interest_Margin*, *Interest_Income_Rate*, *Interest_Expense_Rate*, *Loan_Rate* and *Deposit_Rate*) of Islamic banks are compared to those of conventional banks. In columns (6) to (10), we add the interaction term of *Islamic_Bank* and *Domestic_Interest_Rate* (*Islamic_Bank* × *Domestic_Interest_Rate*) to investigate whether interest income and expense of Islamic banks are more or less sensitive to domestic interest rate compared to conventional banks. We apply random effect technique with robust standard errors for our estimations. All the accounting and macro level variables are lagged for one period. Year and country dummies are included in the model, but not reported in the table.

Variables	(1) Net_Interest_Margin (A)	(2) Interest_Income_Rate (B)	(3) Interest_Expense_Rate (C)	(4) Loan_Rate (D)	(5) Deposit_Rate (E)	(6) A	(7) B	(8) C	(9) D	(10) E
Islamic_Bank (γ_1)	0.249	-0.487	-0.125	-0.479	-0.228	0.346	0.752*	0.723*	0.317	0.129
	(0.97)	(-1.44)	(-0.47)	(-0.87)	(-0.60)	(1.03)	(1.77)	(1.88)	(0.44)	(0.31)
Islamic_Window_Bank (γ_2)	0.189	0.036	-0.132	0.235	-0.007	0.198	0.128	-0.072	0.312	0.025
	(0.86)	(0.12)	(-0.72)	(0.41)	(-0.02)	(0.89)	(0.42)	(-0.40)	(0.54)	(0.07)
Size (γ_3)	-0.051	-0.097	0.064	-0.047	-0.056	-0.052	-0.115*	0.052	-0.062	-0.063
	(-1.08)	(-1.40)	(0.98)	(-0.38)	(-0.65)	(-1.11)	(-1.66)	(0.83)	(-0.52)	(-0.76)
Market_Share (γ_4)	0.051	0.201	-0.317	-0.769	-0.193	0.055	0.251	-0.285	-0.713	-0.165
	(0.41)	(1.24)	(-1.42)	(-1.47)	(-0.64)	(0.45)	(1.55)	(-1.34)	(-1.44)	(-0.56)
Capital_Asset_Ratio (γ_5)	0.016***	-0.001	-0.005	-0.015	-0.012	0.016***	-0.002	-0.006	-0.016	-0.013
	(3.15)	(-0.13)	(-0.98)	(-1.38)	(-1.47)	(3.14)	(-0.26)	(-1.09)	(-1.51)	(-1.57)
Noninterest_Income (γ_6)	-0.033***	-0.021***	0.007*	0.005	0.001	-0.033***	-0.021***	0.007*	0.006	0.002
	(-6.80)	(-3.54)	(1.65)	(0.66)	(0.19)	(-6.80)	(-3.46)	(1.76)	(0.78)	(0.24)
Cost_Inefficiency (γ_7)	-0.013***	-0.008***	-0.000	0.002	0.004	-0.013***	-0.008***	0.000	0.002	0.004
	(-4.63)	(-2.79)	(-0.09)	(0.30)	(0.76)	(-4.65)	(-2.63)	(0.11)	(0.26)	(0.76)
Loan_Loss_Reserve (γ_8)	-0.003	-0.010	-0.003	-0.010	0.009	-0.003	-0.011	-0.003	-0.011	0.008
	(-0.45)	(-1.08)	(-0.49)	(-0.76)	(0.89)	(-0.46)	(-1.19)	(-0.57)	(-0.83)	(0.86)
State_Bank (γ_9)	-0.227	-0.085	0.187	0.087	-0.274	-0.229	-0.116	0.172	0.059	-0.286
	(-0.98)	(-0.23)	(0.51)	(0.15)	(-0.56)	(-0.98)	(-0.31)	(0.47)	(0.10)	(-0.58)
Foreign_Bank (γ_{10})	-0.484*	-1.237***	-0.308	-0.647	0.312	-0.483*	-1.245***	-0.323	-0.598	0.312
	(-1.89)	(-3.26)	(-0.97)	(-0.52)	(0.70)	(-1.89)	(-3.35)	(-1.00)	(-0.49)	(0.69)
Subsidiary (γ_{11})	0.264	-0.737**	-0.745***	-0.751	-0.740**	0.269	-0.712**	-0.726***	-0.700	-0.715**
	(1.24)	(-2.39)	(-3.65)	(-1.37)	(-2.33)	(1.26)	(-2.31)	(-3.57)	(-1.28)	(-2.26)
Young_Bank (γ_{12})	0.537	-0.348	-0.466	1.530	1.412*	0.539	-0.332	-0.459	1.490	1.391*
	(1.50)	(-0.79)	(-1.52)	(0.86)	(1.76)	(1.50)	(-0.74)	(-1.47)	(0.84)	(1.74)
Middle_Aged_Bank (γ_{13})	0.408**	0.280	-0.130	0.780*	0.607*	0.407*	0.261	-0.154	0.739	0.595*
	(1.96)	(0.97)	(-0.60)	(1.72)	(1.95)	(1.95)	(0.89)	(-0.71)	(1.62)	(1.91)

Domestic_Interest_Rate (γ_{15})	0.055***	0.176***	0.101***	0.071	0.180***	0.054***	0.176***	0.101***	0.076	0.181***
	(2.77)	(8.12)	(8.97)	(1.09)	(4.13)	(2.77)	(8.12)	(8.93)	(1.16)	(4.14)
Islamic_Bank × Domestic_Interest_Rate (γ_{ID})						-0.016	-0.198***	-0.138***	-0.139	-0.058
						(-0.32)	(-3.03)	(-2.65)	(-1.50)	(-1.10)
HHI (γ_{16})	-0.327	-2.373**	-0.129	-0.655	-4.143**	-0.340	-2.464**	-0.171	-0.670	-4.193**
	(-0.38)	(-2.20)	(-0.14)	(-0.19)	(-2.23)	(-0.40)	(-2.29)	(-0.19)	(-0.19)	(-2.27)
GDP_Per_Capita (γ_{17})	-0.016	-0.009	0.014	0.002	-0.032	-0.016	-0.006	0.016	0.006	-0.032
	(-0.87)	(-0.35)	(0.68)	(0.05)	(-1.12)	(-0.87)	(-0.24)	(0.75)	(0.13)	(-1.09)
GDP_Per_Capita_Growth (γ_{18})	-0.002	0.030	0.048*	-0.009	0.048*	-0.002	0.031	0.049*	-0.009	0.048*
	(-0.10)	(1.16)	(1.85)	(-0.24)	(1.78)	(-0.09)	(1.19)	(1.87)	(-0.24)	(1.76)
Constant (γ_0)	4.651***	9.035***	2.540**	6.164***	2.001	4.657***	9.085***	2.563**	6.144***	2.005
	(5.64)	(7.36)	(2.14)	(2.84)	(1.33)	(5.64)	(7.52)	(2.23)	(2.93)	(1.38)
Number of Obs	2,269	2,258	2,220	715	643	2,269	2,258	2,220	715	643
R-squared	0.506	0.611	0.534	0.557	0.656	0.506	0.614	0.535	0.559	0.658
H_0: $\gamma_{15} = \gamma_{ID} = 0$ (F-stat.)						7.67**	71.39***	86.82***	3.20	18.34***
H_0: $\gamma_{15} + \gamma_{ID} = 0$ (F-stat.)						0.58	0.11	0.48	0.35	3.20*

Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table AI for variable definitions.

In columns (2) to (5), we replace net interest margin with the implicit interest income rate (*Interest_Income_Rate*), implicit interest expense rate (*Interest_Expense_Rate*), implicit interest rate on loans (*Loan_Rate*) and implicit interest rate on deposits (*Deposit_Rate*) respectively. Overall, we find little evidence that Islamic banks charge any special rent to their clients for offering *Sharia*-compliant products[33]. We also find a positive impact of domestic interest rates on net interest margins, implicit interest income and expense rates as well as on implicit interest rate on deposits.

In columns (6) to (10), we include the interaction term of domestic interest rate and the Islamic bank dummy (*Islamic_Bank* × *Domestic_Interest_Rate*) to investigate the sensitivity of Islamic banks' earnings and expenses to domestic interest rates compared to conventional banks. The results show no significant difference between Islamic and conventional banks in terms of the sensitivity of net interest margin, implicit interest rate on loans and implicit interest rate on deposits to domestic interest rates. We do find, however, that implicit interest income and implicit interest expense rates of Islamic banks are less sensitive to domestic interest rate levels than for conventional counterparts.

5.4. ROBUSTNESS CHECKS and FURTHER ISSUES

5.4.a. CREDIT RISK

In order to confirm our findings, we undertake a number of robustness checks. We find that Islamic banks operating in countries with greater shares of Muslims in the population are less exposed to credit risk than conventional banks. For further analysis, we re-estimate our credit risk model for country sub-samples that have more than 90% Muslim populations (Muslim+90) and those with smaller populations (Muslim-90) illustrated in Table A5 columns

[33] As a robustness check, we assume within country correlation of standard errors, using clustered standard errors, and find similar results. The results are available from authors upon request.

(1) and (2) respectively[34]. The results show that Islamic banks are less exposed to credit risk only in Muslim+90 countries, possibly because the clients of Islamic banks in those countries are, on average, more concerned about their religious beliefs and hence are more risk averse than conventional banks' clients. We also find that the domestic interest rate coefficient is significant only in the Muslim-90 sub-sample (where the share of domestic credit provided by the banking system in GDP is 68% compared to 39% in Muslim+90 countries -implying sensitivity of loan risk to interest rates in more leveraged economies).

In Table AV columns (3) and (4), the interaction term of Islamic bank dummy variable and domestic interest rate (*Islamic_Bank* × *Domestic_Interest_Rate*) is added to the Muslim+90 and Muslim-90 sub-samples respectively. Using the Muslim-90 sub-sample, we find that credit risk of Islamic banks is less sensitive to interest rates compared to conventional banks. The results imply that loan takers from Islamic banks have, on average, lower income gearing (the ratio of interest payment to disposable income) so that they have lower sensitivity to interest rate changes[35]. For the countries classified as the Muslim+90, no significant difference between Islamic and conventional banks in terms of interest rate sensitivity is observed.

We also observe a positive relationship between leverage and loan quality of Islamic banks. To disentangle the impact of greater market discipline associated with higher leverage, from clients' religiosity and investigate whether they cancel out each other, (as the religious beliefs of clients may induce greater loyalty and thus reduce deposit withdrawal risk) we split

[34] The sample is sorted based on the Muslim population. Observations above the median are those with at least 90% Muslims in their population (Muslim+90) and the remainder is placed in another category ("Muslim-90"). Countries in the Muslim+90 category generally have legal systems primarily based on *Sharia* law, they have lower GDP per capita and growth rates, but higher domestic interest rates compared to countries in the Muslim-90. Panel B of Table AIII presents the macroeconomic and banking indicators for these two groups of countries.

[35] Higher risk aversion of more religious individuals and possibly limited access to the credit market due to religious restrictions can explain lower income gearing of loan takers of Islamic banks.

our sample in the two groups of countries into high and low leveraged banks[36]. The estimates are given in columns (5) to (8) in Table AV. Interestingly, highly leveraged Islamic banks have less risky loans even in the Muslim-90 countries. The Islamic bank dummy coefficient is larger (in absolute value) for the Muslim+90 sub-sample. The Islamic bank dummy for lowly leveraged banks in the Muslim+90 countries is significantly negative only at the 10% level. These results suggest that although Islamic banks try to lower withdrawal risk of investment account depositors by paying market returns, leverage seems to discipline Islamic banks more effectively than their conventional counterparts.

The previously reported results also show a negative impact of size on the loan quality for Islamic banks. To further analyze size effects taking into account the impact of leverage, in columns (9) to (12), we estimate our model using the following four sub-samples: small and highly leveraged banks, small and lowly leveraged banks, large and highly leveraged banks, large and lowly leveraged banks[37]. The results show no significant difference between low leveraged Islamic banks and their conventional counterparts, irrespective of whether they are classified as large or small banks. For more highly leveraged banks, we find that credit risk of small and high leveraged bank are significantly lower than their conventional counterparts. For large and high leveraged banks, the coefficient on the Islamic bank dummy is significantly negative only at the 10% level, which implies an inverse relationship between size and the credit risk of Islamic banks[38].

[36] We classify banks as high or low leveraged, based on the median value of *Capital_Asset_Ratio* in each of the two groups of countries.

[37] Banks with total assets less than one billion US$ are classified as small. De Young, et al. (2004) claim that small and large banks operate differently - small banks generally deal with small companies, which are relatively opaque. Large banks, however, can benefit from economies of scale, standardized products and are more transaction (as opposed to relationship) based. They mostly analyze hard information obtained from transparent firms. Hence, empirical investigation of the sub-samples might show the possible impact of different customer relationships on the credit risk of Islamic versus conventional banks.

[38] We use *Impaired_Loans* and *Loan_Loss_Provision* as the credit risk proxy in lieu of *Loan_Loss_Reserve* and find almost similar results.

To investigate whether the credit risk feature of Islamic banks differs during the recent financial crisis, we estimate the model, using the two sub-periods: the pre-crisis period, i.e. 2003-2007, and the crisis period, i.e. 2008-2009[39]. The estimations are presented in columns (13) and (14) of Table AV. In both periods, Islamic banks exhibit lower credit risk than conventional banks.

5.4.b. INSOLVENCY RISK

We find little evidence that Islamic banks' stability is affected differently from conventional banks by the share of Muslim in population. For further investigation, we estimate the insolvency risk model using the sub-samples of Muslim+90 and Muslim-90 and report the results in columns (1) and (2) in Table AVI. We observe no significant difference between Islamic and conventional banks in any of the two sub-samples. The estimations also suggest a positive relationship between interest rate and insolvency risk only for Muslim+90 countries, possibly because domestic interest rates in these countries are, on average, higher than the other groups of countries.

In columns (3) and (4) of Table AVI, the Islamic bank dummy and domestic interest rate interaction term (*Islamic_Bank* × *Domestic_Interest_Rate*) is included in the model, using the Muslim+90 and Muslim-90 sub-samples. The results show no significant difference between Islamic and conventional banks in terms of sensitivity to interest rate changes.

In order to compare the stability of small and large Islamic and conventional banks, we split the sample into small and large banks. Column (5) presents the estimations using the small banks sub-sample. The results show that small Islamic banks are more stable than similar sized

[39] Bank for International Settlements (2010) identify the pre-crisis period from January 2003 to June 2007 and the acute-crisis as July 2007 to March 2009. Since quarterly data are not available, we consider 2003-2007 and 2008-2009 as the pre-crisis and the crisis periods respectively.

conventional banks. The absolute value of the Zscore is on average, 1.47 ($1.47 = e^{0.388}$) higher for small Islamic banks than for similar-sized conventional banks, (or to put another way, is 4.67% ($4.67 = 100 \times \frac{1.47}{e^{3.45}}$) higher than the average Zscore of small conventional banks.) In columns (6) and (7), we replace the insolvency risk proxy with the logarithm of its first and second components respectively and find that the stability of small Islamic banks is due to their higher capitalization. In columns (8) to (10), we estimate the model using the large banks sub-sample, including the stability proxy and the logarithm of its first and second components. The estimations show no significant difference between large Islamic and conventional banks.

Column (11) presents the estimation for the pre-crisis period (2003-2007) and also shows no significant difference between Islamic and conventional banks. In column (12) we use the crisis period (2008-2009) sub-sample and find that Islamic banks are less stable than conventional banks[40]. In columns (13) and (14), we estimate the model for small and large bank sub-samples during the crisis period. The results show that only large Islamic banks are less stable than similar sized conventional banks, while no significant difference is observed between small banks.

5.4.c. BANK (IMPLICIT) INTEREST RATES

In order to investigate whether our bank interest rate findings are robust across different specifications, we re-estimate the models reported in Table V, using the Muslim+90 / Muslim-90 sub-samples and small / large banks sub-samples. The results (not reported here) support our previous finding that Islamic banks charge no special rent to their clients for offering *Sharia*-compliant products. We also find that the positive relationship between domestic interest rates

[40] For the crisis period, we consider the Zscore calculated from 2006-2008 and 2007-2009 windows. We also estimate the model using the Zscore calculated based on the 2007-2009 window and find qualitatively similar results.

and net interest margin, implicit interest income and expense rates, and implicit interest rate on deposits holds for the Muslim+90 and large banks sub-samples. Our results also show that the lower sensitivity of implicit interest income and expense rates of Islamic banks compared to those of their conventional counterparts are in line with previous results, when we use the Muslim+90 and large bank sub-samples.

We also investigate these relationships before and during the recent financial crisis. The results are presented in Table AVII. In columns (1) to (5), we estimate the model for the pre-crisis period (2003-2007) and the estimations on the crisis period (2008-2009) are illustrated in columns (6) to (10). For the pre-crisis period, we find no significant difference between Islamic and conventional banks, except for the implicit interest rate on deposits, wherein Islamic banks exhibit lower sensitivity to interest rate changes than conventional banks.

In the crisis period, the results are different. We find higher sensitivity of Islamic banks' net interest margin to interest rate movements than for conventional banks. Columns (7) and (8) can explain this result. While the implicit interest income rate of Islamic banks is less sensitive to interest rate changes than for conventional banks, we find no significant difference for the implicit interest expense rate. Finally, both implicit interest rates on loans and deposits of Islamic banks exhibit lower sensitivity to interest rate changes, than those of conventional banks.

5.4.d. OTHER CHECKS

As further robustness checks we exclude banking systems that are entirely Islamic - Iran and Sudan - from the sample and re-estimate models (1) to (3), the results remain significantly unchanged[41]. Turkey experienced particularly high levels of domestic interest rates especially at

[41] In response to the referee's comment we investigate whether the performance of conventional and Islamic banks are linked to the market share of Islamic banking in countries with dual banking systems. To do this we include Islamic bank assets market share (per country per year) into our three models and re-estimate our models using sub-

the beginning of the previous decade and this may have influenced our interest rate findings. We therefore estimate our three models excluding information on Turkey and re-examine the sensitivity of Islamic banks to interest rates. The results are mainly in-line with our previous findings[42]. However, here we do find that, for our *Muslim+90* sub-sample, insolvency risk is higher for conventional banks at the five percent significance level. The absolute value of Zscore is on average 1.52 ($1.52 = e^{0.420}$) higher for Islamic than conventional banks, which is equivalent to 4.84% ($4.84 = 100 \times \frac{1.52}{e^{3.448}}$) of the average Zscore of conventional banks operating in *Muslim+90* countries. However, contrary to our previous findings, no significant sensitivity of insolvency risk and net interest margin to domestic interest rates is observed. As a final robustness check, we estimate the model using the logarithm of the Zscore where return volatility is calculated over the whole period (for banks with at least four consecutive observations). On the right hand side of the Equation, we use the mean value of the explanatory variables over the sample period. This approach provides us with between group estimation and reduces noise although we have to use a cross-sectional (rather than panel) estimation approach. Similar to our previous findings, smaller Islamic banks exhibit lower insolvency risk than similar-sized conventional banks and we find no difference between larger banks.

6. Summary and Concluding Remarks

This chapter analyzes the risk and stability features of Islamic banks. The obligations of Islamic banks towards depositors (investment account holders) are different from those of conventional banks and hence they face different risks. Conventional banks have to fulfill their

samples for Islamic and conventional banks. The results show that higher Islamic banks' assets market share is associated with more stable conventional banks (at the 1% significance level) but less stability for Islamic banks (at the 10% level). This latter outcome is driven by the capital variable in the Zscore. We also find a negative correlation between the assets market share of Islamic banks and their *Interest_Expense_Rate* at the 5% significance level. These results are available from the authors on request.

[42] Results are available from the authors upon request.

obligations towards depositors irrespective of their profits or losses whereas Islamic banks are supposed to share the realized profit or loss with investment account holders. This special relationship may discipline Islamic banks more effectively by imposing higher withdrawal risk. In practice, to avoid withdrawal risk, Islamic banks tend to partly deviate from the PLS principles of Islamic finance. They pay a relatively competitive rate of return to investment account holders, regardless of their realized performance. On the asset side, it appears that Islamic banks mainly apply non-PLS modes of Islamic finance which are in nature closer to conventional finance. Nevertheless, Islamic banks still may face extra risks because of the complexity of Islamic modes of finance and limitations in their funding, investment and risk management activities. On the other hand, customers of Islamic banks are expected to be more concerned about their religious beliefs. Taking into account the positive relationship between religiosity and an individual's risk aversion, Islamic banks may face less risk (credit risk) than conventional banks.

We attempt to investigate the credit risk and stability features of Islamic commercial banks using a sample of 553 conventional and Islamic banks from 24 countries between 1999 and 2009. This research also explores whether Islamic banks charge extra cost to their clients for offering *Sharia* compliant financial products. After controlling for various factors we find that Islamic banks have lower credit risk than conventional banks, and this is specifically the case for small highly leveraged banks, or operating in predominantly Muslim countries (those where Muslims exceed 90% Muslims of the population). In terms of insolvency risk, small Islamic banks also appear to exhibit greater stability than conventional banks, as they are more capitalized; however, no significant difference between large Islamic and conventional banks is observed. Loan quality, (implicit) interest income and (implicit) interest expense of Islamic banks are less sensitive to domestic interest rates compared to conventional counterparts;

however, the sensitivity of Islamic banks' solvency position to interest rates is not significantly different from that of their conventional counterparts. Finally, we find little evidence that Islamic banks charge rents to their customers for offering *Sharia* compliant financial products. The fact that Islamic banks do not appear to emulate the risk and stability characteristics of their conventional counterparts has implications for policymakers (in terms of whether there should be a different legislation for the two types of banks), regulators (should they be regulated differently) and market participants (can traditional risk management tools be used to gauge and control these risks?)

Appendices

TABLE AI. Variable description

This appendix describes the variables used in this study.

Variables	Description
Islamic_Bank	Islamic bank dummy
Islamic_Window_Bank	Islamic window bank dummy
Credit Risk Proxies	
Loan_Loss_Reserve	The ratio of loan loss reserves to gross loans. Loan loss reserve is considered for the whole loans portfolio, and not only for impaired loans. The managers assess the quality of the loans portfolio and determine the required reserves. Then the current level of Loan loss reserve will be adjusted to reach the required level. The adjustment will be reflected in the loan loss provision stipulated in the income statement. When a bank decides to write off a loan, the loan amount would be deducted from the Loan loss reserve.
Impaired_Loans	The ratio of impaired loans to gross loans. Impaired loans increase when a bank classifies a specific loan or a part of a loan portfolio as bad. It decreases when either a bank re-assesses a problem loan or part of a portfolio or when a bank writes off a loan or a part of loan portfolio.
Loan_Loss_Provision	The ratio of loan loss provision to average gross loans. Loan loss provision is the incurred cost to banks of adjusting the loan loss reserve or writing off a loan. Hence, *Loan_Loss_Reserve* and *Impaired_Loans* are stocks while *Loan_Loss_Provision* is a flow and is stipulated in the income statement. It is possible to have a negative loan loss provision in one period, when the required loan loss reserve is lower than the current reserve.
Insolvency Risk Proxies	
Zscore_rw	Logarithm of rolling-window Zscore which is equal to (ROAA+CAR)/SDROAA_rw, SDROAA_rw = Standard deviation of ROAA over 3 years (current year and two previous consecutive years). Banks need to have three consecutive observations. Acquiring banks are excluded from the sample, since the volatility on their assets returns can be due to the acquisition.
Zscore_P1_rw	Logarithm of ROAA/SDROAA3_rw.
Zscore_P2_rw	Logarithm of Capital_Asset_Ratio/SDROAA3_rw.
Zscore	Logarithm of (M_ROAA+M_Capital_Asset_Ratio)/SDROAA, M_ROAA = Mean of ROAA over the sample period, M_Capital_Asset_Ratio =Mean of Capital_Asset_Ratio over the sample period, SDROAA= standard deviation of ROAA over the sample period (banks needs to have at least four consecutive observations).
Zscore_P1	Logarithm of M_ROAA/SDROAA.
Zscore_P2	Logarithm of M_ETA/SDROAA.
Bank Interest Rate Proxies	
Net_Interest_Margin	(Interest Income – Interest Expense) / Average Earning assets.
Interest_Income_Rate	Interest income divided by average earning assets for conventional banks and mark-up income over average earning assets for Islamic banks.
Interest_Expense_Rate	Interest expense divided by average interest bearing liabilities and profit payouts over average profit bearing liabilities for Islamic banks.
Loan_Rate	Interest income on loans divided by average gross lending for conventional banks and mark-up income on lending divided by average gross loans for Islamic banks.
Deposit_Rate	Interest expense on customer deposit divided by average customer deposits for conventional banks and profit payouts on customer deposits divided by average customer deposits for Islamic banks.
Financial Ratio	
Size	Logarithm of total assets.
Market_Share	Logarithm of market share of total assets.
Capital_Asset_Ratio	Equity capital to asset ratio.
ROAA	Return on average assets.
ROAE	Return on average equity.
Loan_Total_Earning_Asset_Ratio	Share of net loans in total earning assets.
Loan_Growth	Annual growth rate of gross loans.
Asset_Growth	Annual growth rate of total assets.

Noninterest_Income	Share of non-interest income in total operating income.
Cost_Inefficiency	Cost to income ratio.
Ownership Structure	
State_Bank	State-owned bank dummy that takes the value of one if the bank is state-owned, and zero otherwise.
Foreign_Bank	Foreign-owned bank dummy that takes the value of one if the bank is Foreign-owned, and zero otherwise.
Subsidiary	Subsidiary dummy that takes the value of one if the bank is subsidiary, and zero otherwise.
Banks Age or Experience Level	
Young_ Bank	Young bank dummy that takes the value of one, if the bank has been operating for at most three years, and zero otherwise.
Middle-Aged_Bank	Middle-aged bank dummy that takes the value of one if the bank has operated from three to seven years, and zero otherwise.
Country Level Variables	
Muslim_Share	Share of the Muslim population in the total population of each country.
Muslim+90	Countries with more than 90% of Muslims in their population
Muslim-90	Countries with less than 90% of Muslims in their population
Legal_System	Takes the value of zero, if the country does not use *Sharia* law to define its legal system, the value one for countries which consider *Sharia* together with other legal systems, and has the value two if the legal system is based exclusively on *Sharia* law.
Domestic_Credit	Domestic credit provided by banking system as a percentage of GDP
Domestic_Interest_Rate	Deposit Interest Rate provided by the World Bank website; for years and countries with missing observations, the data is obtained from the central bank web-sites.
HHI	Hirschman-Herfindahl index (HHI) is a proxy for market concentration: $HHI_{c,t} = \sum_{i=1}^{n}\left(Total\_Assets_{i,t,c}/\sum_{i=1}^{n} Total\_Assets_{i,t,c}\right)^2$. It has a value between zero and one. Higher values show that the market is more concentrated.
GDP_Per_Capita	GDP per capita in US$.
GDP_Per_Capita_Growth	Annual growth rate of GDP per capita.

TABLE AII. Sample features

State-owned banks: state ownership > 50%. Foreign-owned banks: foreign ownership > 50%. Subsidiaries: parent ownership = 100%. Private-owned banks: domestic private ownership > 50%. Young banks: operating less than 3 years. Middle aged banks: operating between 3 to 7 years. Matured banks: operating more than 7 years. The information is obtained from Bankscope database and web-sites of banks.

Panel A. Number of Islamic, conventional and Islamic window banks across 24 countries, over 1999-2009

Country	Islamic bank		Islamic Window Bank		Conventional Bank		Total	
	Banks	Observations	Banks	Observations	Banks	Observations	Banks	Observations
Algeria	3	19	1	9	11	73	15	101
Bahrain	6	44	6	47	1	8	13	99
Bangladesh	5	42	9	71	19	175	33	288
Brunei	4	19	0	0	1	8	5	27
Egypt	3	20	6	57	25	183	34	260
Gambia	1	4	0	0	7	38	8	42
Indonesia	2	21	12	73	70	472	84	566
Iran	12	95	0	0	0	0	12	95
Iraq	4	13	0	0	8	42	12	55
Jordan	3	21	0	0	10	97	13	118
Kuwait	3	21	1	5	5	46	9	72
Lebanon	1	7	3	23	49	334	53	364
Malaysia	17	92	12	104	24	123	53	319
Mauritania	1	9	3	21	5	36	9	66
Pakistan	6	26	12	105	14	84	32	215
Qatar	4	34	3	17	3	34	10	85
Saudi Arabia	3	28	7	72	0	0	10	100
Senegal	1	6	0	0	12	88	13	94
Sudan	20	135	0	0	2	7	22	142
Syria	2	5	0	0	11	61	13	66
Tunisia	1	10	1	9	13	90	15	109
Turkey	4	15	0	0	42	246	46	261
UAE	8	62	5	27	16	153	29	242
Yemen	4	34	0	0	6	50	10	84
Total	118	782	81	640	354	2448	553	3870

Panel B. Ownership structure and age of banks

	Islamic bank		Islamic Window Bank		Conventional Bank		Total	
	Banks	Observations	Banks	Observations	Banks	Observations	Banks	Observations
State-owned Banks	16	125	8	59	38	316	62	500
Foreign-owned Banks	26	165	5	39	32	198	63	402
Subsidiaries	14	73	15	87	99	624	128	784
Private-owned Banks	62	419	53	455	185	1310	300	2184
Total	118	782	81	640	354	2448	553	3870
Young Banks	47	115	11	28	51	118	109	261
Middle-Aged Banks	13	142	9	40	37	220	59	402
Matured Banks	58	525	61	572	266	2110	385	3207
Total	118	782	81	640	354	2448	553	3870

TABLE AIII. Macroeconomic and banking indicators across countries

PANEL A. Across 24 Countries – Full Sample

This panel shows the mean value of macroeconomic and banking indicators across 24 countries, over the 1999-2009 period.

Countries	Muslim_Share (%)	Legal_System	Domestic Interest_Rate (%)	HHI	GDP_Per_Capita ($)	GDP_Per_Capita Growth (%)	Domestic_Credit (%)
Algeria	98	1	4.1	0.26	6,796	2.1	17
Bahrain	81	1	3.0	0.26	27,275	3.7	51
Bangladesh	89.6	0	8.5	0.16	1,047	4.0	51
Brunei	67.2	1	1.9	0.64	47,490	-0.5	26
Egypt	94.6	1	7.8	0.18	4,383	3.3	92
Gambia	95	1	14.5	0.41	1,156	1.0	25
Indonesia	88.2	0	12.0	0.11	3,152	3.4	48
Iran	99.4	2	12.6	0.30	9,024	3.3	37
Iraq	99	1	7.5	0.57	3,396	0.3	0
Jordan	98.2	1	5.0	0.51	4,227	3.5	94
Kuwait	95	1	4.2	0.38	39,922	2.3	74
Lebanon	59.3	0	9.2	0.17	9,558	2.9	176
Malaysia	60.4	0	3.2	0.10	11,393	2.9	132
Mauritania	99.1	1	8.2	0.36	1,679	1.4	-3
Pakistan	96.3	1	4.8	0.17	2,114	2.2	44
Qatar	77.5	1	3.6	0.38	67,840	3.5	53
Saudi Arabia	97	2	4.0	0.26	20,451	0.7	28
Senegal	96	0	3.5	0.19	1,558	1.5	23
Sudan	71.3	1	13.1	0.18	1,633	3.9	13
Syria	92.2	0	6.2	0.46	3,974	1.2	33
Tunisia	99.5	1	3.4	0.30	6,309	3.7	72
Turkey	98	0	38.0	0.11	10,332	1.7	47
UAE	76.2	1	3.3	0.14	47,863	1.3	62
Yemen	99.1	1	13.4	0.19	2,148	0.9	9

PANEL B. Across Two Groups of Countries

This panel presents the mean value of macroeconomic and banking system indicators across two groups of countries (*Muslim+90* & *Muslim-90*), over the 1999-2009 period.

	Domestic_Interest_Rate (%)	HHI	GDP_Per_Capita ($)	GDP_Per_Capita_Growth (%)	Domestic_Credit (%)
Muslim+90	9.1	0.31	7,831	1.9	39
Muslim-90	6.4	0.24	24,139	2.8	68

See Table AI for variable definition.

TABLE AIV. Correlation matrix

This table presents the pair-wise correlation between the variables used in our analysis.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1) Loan_Loss_ Reserve	1																													
2) Impaired_Loans	0.79	1																												
3) Loan_ Loss_Provision	0.26	0.26	1																											
4) Zscore_rw	-0.08	-0.13	-0.07	1																										
5) Net_Interest_Margin	-0.09	-0.13	0.06	-0.08	1																									
6) Interest_Income_Rate	-0.01	-0.01	0.02	-0.13	0.60	1																								
7) Interest_Expense_Rate	0.01	0.05	-0.01	-0.12	0.09	0.73	1																							
8) Loan_Rate	-0.05	-0.13	0.01	-0.08	0.55	0.80	0.65	1																						
9) Deposit_Rate	-0.02	-0.05	0.01	-0.12	0.09	0.70	0.89	0.65	1																					
10) Islamic_Bank	-0.08	-0.08	-0.04	-0.03	0.02	-0.12	-0.12	-0.01	0.04	1																				
11) Islamic_Window_Bank	-0.02	-0.01	0.00	0.03	-0.09	-0.11	-0.10	-0.09	-0.07	-0.22	1																			
12) Size	-0.17	-0.21	-0.08	0.01	-0.12	-0.09	-0.02	-0.02	0.10	-0.04	0.12	1																		
13) Market_Share	-0.10	-0.13	0.01	0.00	-0.07	-0.16	-0.16	-0.09	-0.04	0.04	0.07	0.72	1																	
14) Capital_Asset_Ratio	0.05	0.01	0.00	0.17	0.14	-0.03	-0.12	0.00	-0.10	0.13	-0.08	-0.34	-0.37	1																
15) Loan_Total_Earning_Asset_Ratio	-0.30	-0.23	-0.02	0.07	-0.01	-0.06	-0.09	0.10	0.11	0.06	0.04	0.08	0.06	-0.09	1															
16) Loan_Growth	-0.27	-0.33	-0.03	-0.01	0.11	0.05	0.00	0.06	0.00	0.08	-0.03	-0.06	-0.04	0.00	0.17	1														
17) Asset_Growth	-0.20	-0.24	-0.03	-0.01	0.05	0.05	0.03	0.04	0.04	0.10	-0.03	-0.05	-0.06	-0.01	0.04	0.60	1													
18) Noninterest_Income	0.05	0.06	0.05	-0.07	-0.42	-0.28	-0.09	-0.14	-0.04	0.14	-0.04	-0.06	0.10	-0.01	0.06	-0.01	-0.02	1												
19) Cost_Inefficiency	0.05	0.17	-0.02	-0.15	-0.10	0.10	0.21	0.13	0.18	0.06	-0.12	-0.11	-0.06	-0.09	-0.01	0.01	0.00	0.09	1											
20) State_Bank	0.01	-0.03	0.00	0.01	-0.08	-0.05	0.00	-0.05	0.00	0.06	-0.04	0.11	0.16	-0.07	0.04	-0.01	-0.02	0.08	-0.02	1										
21) Foreign_Bank	0.05	0.06	0.02	-0.02	-0.05	-0.06	-0.03	-0.10	-0.02	0.15	-0.05	-0.11	-0.09	0.03	-0.02	-0.01	0.01	0.06	0.06	-0.13	1									
22) Subsidiary	-0.01	0.01	-0.02	-0.06	0.08	-0.04	-0.13	0.03	-0.14	-0.14	-0.05	-0.03	-0.07	0.04	-0.03	-0.05	-0.05	0.00	0.01	-0.19	-0.18	1								
23) Young_ Bank	-0.03	-0.03	-0.02	-0.07	0.02	-0.03	-0.04	0.05	-0.05	0.16	-0.03	-0.17	-0.09	0.13	-0.07	0.15	0.15	0.05	0.09	-0.08	-0.03	0.06	1							
24) Middle_Aged_Bank	0.01	-0.01	0.02	-0.04	0.04	0.03	0.01	0.08	-0.02	0.12	-0.04	-0.08	-0.02	0.04	-0.04	-0.01	0.02	0.04	0.01	-0.06	-0.01	0.05	-0.10	1						
25) Muslim_Share	-0.03	-0.06	0.04	-0.16	0.14	0.12	0.13	0.31	0.21	-0.06	-0.01	0.00	0.13	0.01	0.09	0.05	0.01	0.09	0.04	0.10	0.04	-0.03	0.06	0.04	1					
26) Legal_System	0.05	-0.02	0.05	-0.01	-0.07	-0.30	-0.30	-0.19	-0.13	0.34	0.10	0.05	0.26	0.09	0.03	0.03	0.03	0.15	-0.10	0.20	0.06	-0.12	0.08	0.02	0.38	1				
27) Domestic_Interest_Rate	0.00	0.02	0.06	-0.23	0.37	0.70	0.66	0.58	0.67	-0.09	-0.16	-0.01	-0.08	-0.02	-0.13	-0.01	-0.02	-0.15	0.19	-0.02	-0.03	-0.01	-0.07	-0.03	0.22	-0.26	1			
28) HHI	0.01	0.01	0.03	0.02	-0.04	-0.21	-0.24	-0.24	-0.20	0.14	-0.05	-0.05	0.23	0.10	0.03	0.02	0.04	0.10	-0.10	0.08	0.00	-0.10	0.11	0.02	0.25	0.44	-0.18	1		
29) GDP_Per_Capita	-0.04	-0.08	-0.03	0.10	-0.08	-0.26	-0.25	-0.25	-0.20	0.13	0.05	0.15	0.09	0.15	0.01	-0.01	0.00	-0.11	-0.24	0.07	-0.13	-0.10	0.02	-0.03	-0.25	0.28	-0.18	0.18	1	
30) GDP_Per_Capita_Growth	-0.10	-0.12	-0.03	0.02	-0.05	-0.07	-0.10	0.02	0.13	0.03	0.01	0.00	-0.07	0.04	0.10	0.11	0.10	0.09	-0.02	-0.04	0.01	-0.01	0.03	0.00	-0.02	-0.04	-0.19	-0.05	-0.04	1

See Table AI for variable definition.

TABLE AV. Credit risk model

This table presents the estimation of credit risk model, where the dependent variable is the ratio of loan loss reserves to gross loans. Estimates are obtained from different sub-samples. In columns (1) and (2), we split the sample into two groups: Observations in countries with at least 90% Muslims in their population are classified as one group ("Muslim+90") and the rest are placed in the other group ("Muslim-90"). Muslim+90 and Muslim-90 are the upper half and lower half of the observations sorted based on the Muslim population. In columns (3) and (4), we investigate whether credit risk of Islamic banks is more or less sensitive to interest rate compared conventional banks, by adding the interaction term of *Islamic_Bank* and *Domestic_Interest_Rate* (*Islamic_Bank* × *Domestic_Interest_Rate*) to the Muslim+90 and Muslim-90 sub-samples. In columns (5) to (8), we split the full sample into four sub-samples: high leveraged banks in Muslim+90, low leveraged banks in Muslim+90, high leveraged banks in Muslim-90 and low leveraged banks in Muslim-90. In columns (9) to (12), we split the sample into four sub-samples: high leveraged small banks, low leveraged small banks, high leveraged large banks and low leveraged large banks. In columns (13) and (14), we estimate the model, using the pre-crisis period (2003-2007) and the crisis period (2008-2009) sub-samples. We apply random effect technique with robust standard errors for our estimations. All the accounting and macro level variables are lagged for one period. Year and country dummies are included in the model, but not reported in the table.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
					Muslim+90		Muslim-90		Small Banks		Large Banks			
Variables	Muslim+90	Muslim-90	Muslim+90	Muslim-90	Highly Leveraged	Lowly Leveraged	Highly Leveraged	Lowly Leveraged	Highly Leveraged	Lowly Leveraged	Highly Leveraged	Lowly Leveraged	Pre-Crisis Period	Crisis Period
Islamic_Bank (α_1)	-6.364***	-1.080	-4.658	0.773	-10.112***	-3.796*	-2.947**	-1.186	-7.564**	-2.698	-2.137*	-0.626	-4.731***	-4.077**
	(-3.44)	(-0.83)	(-1.38)	(0.47)	(-3.89)	(-1.67)	(-2.11)	(-0.55)	(-2.52)	(-0.91)	(-1.81)	(-0.41)	(-3.82)	(-2.08)
Islamic_Window_Bank (α_2)	-1.649	-0.719	-1.469	-0.590	-1.159	-3.340	-1.159	-0.265	-0.543	-0.673	-0.488	-1.428	-1.147	-1.070
	(-0.98)	(-0.72)	(-0.86)	(-0.59)	(-0.63)	(-1.24)	(-0.91)	(-0.14)	(-0.32)	(-0.26)	(-0.40)	(-0.71)	(-0.95)	(-0.55)
Size (α_3)	-1.606***	-0.285	-1.608***	-0.362	-1.415	-1.419	-0.018	-0.410	-0.343	-1.028**	-0.227	-0.325	-0.495	-0.849
	(-2.82)	(-0.79)	(-2.83)	(-0.97)	(-1.62)	(-1.62)	(-0.06)	(-0.68)	(-0.64)	(-2.50)	(-0.56)	(-0.91)	(-1.56)	(-0.88)
Market_Share (α_4)	0.213	-0.496	0.209	-0.190	-0.319	0.072	-0.602	-1.485	-0.834	-0.190	-1.450**	0.163	-1.082**	-1.009
	(0.29)	(-0.61)	(0.29)	(-0.22)	(-0.15)	(0.09)	(-1.09)	(-1.21)	(-0.60)	(-0.41)	(-2.06)	(0.23)	(-2.02)	(-0.29)
Capital_Asset_Ratio (α_5)	-0.081	0.001	-0.082	0.001	-0.062	-0.088	-0.050	-0.083	-0.446*	-0.092***	-0.054	-0.130	-0.046	-0.051
	(-1.02)	(0.03)	(-1.04)	(0.02)	(-0.38)	(-1.61)	(-1.39)	(-1.17)	(-1.70)	(-3.04)	(-1.17)	(-1.63)	(-1.01)	(-0.84)
Loan_Growth (α_6)	-0.032***	-0.024***	-0.032***	-0.024***	-0.035***	-0.022*	-0.017***	-0.024***	-0.027**	-0.023***	-0.018**	-0.011	-0.019**	-0.009
	(-3.11)	(-3.92)	(-3.09)	(-3.91)	(-2.80)	(-1.92)	(-3.16)	(-3.58)	(-2.26)	(-4.40)	(-2.01)	(-0.85)	(-2.31)	(-1.07)
Noninterest_Income (α_7)	0.002	-0.026	0.003	-0.026	0.028	0.001	-0.010	-0.012	0.015	-0.020	0.015	-0.021	0.007	-0.020
	(0.12)	(-1.44)	(0.15)	(-1.40)	(0.86)	(0.04)	(-0.54)	(-0.57)	(0.71)	(-1.03)	(0.96)	(-1.03)	(0.30)	(-0.84)
Cost_Inefficiency (α_8)	0.034**	-0.008	0.034**	-0.006	0.025*	0.023	0.013	-0.023*	0.005	-0.030**	0.023	0.001	-0.006	-0.001
	(2.43)	(-0.83)	(2.44)	(-0.59)	(1.77)	(1.49)	(1.38)	(-1.78)	(0.38)	(-2.07)	(1.63)	(0.05)	(-0.46)	(-0.04)
State_Bank (α_9)	2.450	-2.637**	2.387	-2.687**	3.637*	-0.096	-1.263	-2.933*	0.501	-2.517	0.274	-0.649	-1.705	-1.087
	(1.55)	(-2.35)	(1.50)	(-2.39)	(1.83)	(-0.05)	(-1.29)	(-1.78)	(0.26)	(-0.83)	(0.22)	(-0.44)	(-1.42)	(-0.63)
Foreign_Bank (α_{10})	3.009*	0.895	2.832	1.029	4.104**	2.099	3.062	-0.419	4.046**	2.747	-1.673	-0.783	3.482**	0.135
	(1.69)	(0.57)	(1.55)	(0.66)	(1.98)	(0.93)	(1.17)	(-0.14)	(1.99)	(0.89)	(-1.23)	(-0.49)	(1.99)	(0.06)
Subsidiary (α_{11})	-1.844	0.930	-1.775	0.948	0.355	-4.859***	1.606	-0.734	4.709***	-1.729	0.488	-1.763	-0.777	-1.195
	(-1.31)	(0.83)	(-1.26)	(0.85)	(0.21)	(-3.03)	(1.07)	(-0.46)	(2.77)	(-0.82)	(0.39)	(-1.59)	(-0.76)	(-0.80)
Young_Bank (α_{12})	-0.728	0.379	-0.765	0.422	3.111	0.562	-0.786	2.951	-2.567	3.597	1.565	1.012	0.718	27.655***
	(-0.30)	(0.17)	(-0.31)	(0.19)	(0.74)	(0.20)	(-0.79)	(0.71)	(-1.32)	(1.02)	(0.59)	(0.50)	(0.42)	(7.45)
Middle_Aged_Bank (α_{13})	1.213	-0.678	1.210	-0.771	-0.570	3.097*	-1.351**	-0.576	-1.362	0.992	-0.619	-0.629	0.427	0.149
	(0.91)	(-0.68)	(0.92)	(-0.76)	(-0.28)	(1.82)	(-2.13)	(-0.47)	(-1.03)	(0.66)	(-0.67)	(-0.73)	(0.32)	(0.13)
Domestic_Interest_Rate (α_{15})	-0.013	0.311***	-0.008	0.335***	0.148	-0.043	0.165	0.178	0.271	0.175	0.257	-0.146*	0.170	-0.133
	(-0.18)	(2.66)	(-0.10)	(2.77)	(0.60)	(-0.45)	(1.34)	(1.21)	(1.60)	(1.23)	(1.37)	(-1.71)	(1.31)	(-0.35)
Islamic_Bank × Domestic_Interest_Rate (α_{ID})			-0.209	-0.355**										
			(-0.59)	(-2.25)										

HHI (α_{16})	-13.046***	4.679	-13.143***	4.621	-10.477	-5.938	8.099	5.854	1.319	-3.810	5.343	4.374	-1.571	-8.379
	(-2.61)	(0.72)	(-2.62)	(0.71)	(-0.95)	(-1.19)	(0.80)	(0.79)	(0.18)	(-0.93)	(0.82)	(0.79)	(-0.43)	(-0.52)
GDP_Per_Capita (α_{17})	0.082	0.156	0.086	0.166	0.023	-0.271	-0.051	0.110	-0.381	0.070	0.095	0.174	0.240	-0.093
	(0.28)	(1.44)	(0.29)	(1.53)	(0.04)	(-0.59)	(-0.25)	(0.76)	(-1.06)	(0.15)	(0.35)	(1.32)	(1.37)	(-0.30)
GDP_Per_Capita_Growth(α_{18})	0.095	-0.193**	0.092	-0.181**	0.271	0.059	0.027	-0.338**	0.010	0.058	0.024	-0.146	0.000	0.001
	(1.31)	(-2.12)	(1.28)	(-2.03)	(1.34)	(0.65)	(0.26)	(-2.12)	(0.06)	(0.64)	(0.28)	(-1.49)	(0.00)	(0.02)
Constant (α_0)	29.786***	11.485*	29.928***	12.181*	29.423	0.000	8.172*	19.755*	19.677*	33.249***	6.286	16.851**	12.695**	29.487
	(4.71)	(1.86)	(4.73)	(1.95)	(1.24)	(.)	(1.75)	(1.76)	(1.84)	(3.43)	(0.87)	(2.44)	(2.22)	(1.36)
Number of Obs	798	1,099	798	1,099	397	401	544	556	463	468	478	489	863	428
R-squared	0.254	0.150	0.257	0.150	0.359	0.252	0.245	0.132	0.433	0.174	0.193	0.169	0.192	0.219
H_0: $\alpha_{15} = \alpha_{ID} = 0$ (F-stat.)			0.35	9.25***										
H_0: $\alpha_{15} + \alpha_{ID} = 0$ (F-stat.)			0.34	0.01										

See Table AI for variable definition. Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

TABLE AVI. Insolvency risk model

This table presents the estimation of the insolvency risk model, using different sub-samples: Muslim+90/Muslim-90, small/large banks and pre-crisis/the crisis periods. In columns (1) and (2), we split the sample into two groups: Observations in countries with at least 90% Muslims in their population are classified as one group ("Muslim+90") and the rest are placed in the other group ("Muslim-90"). Muslim+90 and Muslim-90 are the upper half and lower half of the observations sorted based on the Muslim population. In columns (3) to (4), we investigate whether insolvency risk of Islamic banks is more or less sensitive to interest rate compared conventional banks, by adding the interaction term of *Islamic_Bank* and *Domestic_Interest_Rate* (*Islamic_Bank* × *Domestic_Interest_Rate*) to the Muslim+90 and Muslim-90 sub-samples. In columns (5) to (7), we estimate insolvency risk model on the small banks sub-sample, using *Zscore_rw*, *Zscore_P1_rw* and *Zscore_P2_rw* as the dependent variables, respectively. In columns (8) to (10), we estimate insolvency risk model on the large banks sub-sample, using *Zscore_rw*, *Zscore_P1_rw* and *Zscore_P2_rw* as the dependent variables, respectively. In columns (11) and (12), we estimate the model, using *Zscore_rw* as the dependent variable and the pre-crisis period (2003-2007) and the crisis period (2008-2009) sub-samples. In columns (13) and (14), we estimate the model, using the small and large banks sub-samples during the crisis period (2008-2009). We apply random effect technique with robust standard errors for our estimations. All the accounting and macro level variables are lagged for one period. Year and country dummies are included in the model, but not reported in the table.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Muslim+90	Muslim-90	Muslim+90	Muslim-90	Small Banks			Large Banks			Pre-Crisis Period	Crisis Period		
												Full Sample	Small Banks	Large Banks
Variables	Zscore_rw	Zscore_rw	Zscore_rw	Zscore_rw	Zscore_rw	Zscore_P1_rw	Zscore_P2_rw	Zscore_rw	Zscore_P1_rw	Zscore_P2_rw	Zscore_rw	Zscore_rw	Zscore_rw	Zscore_rw
Islamic_Bank (β_1)	0.317	-0.080	0.516	0.001	0.388**	0.193	0.352*	-0.131	-0.072	-0.023	0.175	-0.426*	0.345	-0.677**
	(1.51)	(-0.35)	(1.48)	(0.00)	(2.12)	(1.23)	(1.84)	(-0.62)	(-0.43)	(-0.11)	(1.00)	(-1.69)	(0.70)	(-2.15)
Islamic_Window_Bank (β_2)	0.248	0.193	0.258	0.197	0.206	0.339	0.218	0.154	0.232	0.287	0.100	0.365	0.018	0.483*
	(1.04)	(0.77)	(1.08)	(0.78)	(0.86)	(1.63)	(0.88)	(0.83)	(1.33)	(1.52)	(0.57)	(1.54)	(0.04)	(1.66)
Size (β_3)	-0.071*	-0.045	-0.069	-0.049	-0.052	0.155***	-0.068	-0.126***	-0.014	-0.141***	-0.042	0.162	-0.726**	0.229
	(-1.67)	(-0.91)	(-1.63)	(-0.93)	(-0.84)	(2.68)	(-1.05)	(-2.74)	(-0.34)	(-3.00)	(-1.30)	(0.89)	(-2.10)	(0.99)
Market_Share (β_4)	-0.120	0.006	-0.121	0.020	-0.161*	-0.067	-0.169*	0.120	0.015	0.107	-0.055	-1.146	0.612	-1.540
	(-1.23)	(0.05)	(-1.26)	(0.16)	(-1.82)	(-0.73)	(-1.77)	(0.85)	(0.13)	(0.71)	(-0.68)	(-1.58)	(0.48)	(-1.64)
Loan_Total_Earning_Asset_Ratio(β_5)	0.001	0.000	0.002	0.000	0.002	0.002	0.002	0.001	0.002	0.001	0.002	-0.003	-0.007	-0.001
	(0.55)	(0.00)	(0.57)	(0.03)	(0.93)	(0.86)	(0.87)	(0.27)	(0.72)	(0.23)	(0.87)	(-0.85)	(-1.43)	(-0.26)
Asset_Growth (β_6)	0.000	0.001	0.000	0.001	-0.000	-0.001	-0.000	0.002	0.001	0.002	-0.001	0.001	0.001	0.002
	(0.17)	(0.62)	(0.19)	(0.64)	(-0.18)	(-0.80)	(-0.04)	(1.26)	(0.90)	(1.15)	(-0.33)	(0.58)	(0.45)	(0.81)
Noninterest_Income (β_7)	-0.004*	-0.006	-0.004	-0.006	-0.005	-0.006	-0.003	-0.004	-0.007**	-0.007**	-0.003	0.004	0.004	0.003
	(-1.66)	(-1.51)	(-1.59)	(-1.51)	(-1.39)	(-1.49)	(-0.82)	(-1.40)	(-2.45)	(-2.11)	(-1.14)	(0.93)	(0.69)	(0.50)
Cost_Inefficiency (β_8)	-0.010***	-0.008***	-0.010***	-0.008***	-0.011***	-0.019***	-0.010***	-0.007***	-0.017***	-0.007***	-0.011***	-0.004	0.002	-0.007*
	(-4.39)	(-3.72)	(-4.38)	(-3.72)	(-5.49)	(-6.02)	(-5.13)	(-2.70)	(-4.98)	(-3.10)	(-4.38)	(-1.14)	(0.33)	(-1.91)
State_Bank (β_9)	0.007	0.237	-0.003	0.233	0.356*	0.193	0.362*	0.173	0.035	0.207	0.235	-0.190	0.120	-0.435
	(0.03)	(1.32)	(-0.01)	(1.30)	(1.76)	(1.07)	(1.69)	(0.96)	(0.23)	(1.08)	(1.47)	(-0.78)	(0.24)	(-1.49)
Foreign_Bank (β_{10})	-0.308	0.018	-0.314	0.022	-0.357**	-0.212	-0.333*	0.074	-0.141	0.138	-0.109	0.127	-0.356	0.334
	(-1.32)	(0.09)	(-1.34)	(0.10)	(-1.99)	(-1.14)	(-1.84)	(0.32)	(-0.72)	(0.59)	(-0.55)	(0.41)	(-0.87)	(0.86)
Subsidiary (β_{11})	-0.189	-0.371**	-0.180	-0.371**	-0.392**	-0.308	-0.442**	-0.131	-0.035	-0.067	-0.191	-0.586***	-0.898***	-0.592**
	(-1.18)	(-2.12)	(-1.12)	(-2.12)	(-2.12)	(-1.36)	(-2.11)	(-0.89)	(-0.25)	(-0.46)	(-1.23)	(-3.15)	(-2.73)	(-2.53)
Young_Bank (β_{12})	-0.672**	-0.101	-0.673**	-0.093	-0.107	-0.688**	-0.003	-0.509	-0.619*	-0.323	-0.486	-0.456	0.000	-0.351
	(-2.35)	(-0.33)	(-2.35)	(-0.31)	(-0.44)	(-2.24)	(-0.01)	(-1.32)	(-1.74)	(-0.91)	(-1.61)	(-1.23)	(.)	(-0.68)
Middle_Aged_Bank (β_{13})	-0.378*	-0.002	-0.374*	-0.006	-0.096	0.231	-0.146	-0.078	-0.207	-0.020	-0.233	0.093	0.023	0.037
	(-1.89)	(-0.01)	(-1.87)	(-0.04)	(-0.63)	(1.29)	(-0.96)	(-0.34)	(-0.96)	(-0.10)	(-1.34)	(0.37)	(0.05)	(0.11)
Domestic_Interest_Rate (β_{15})	-0.054***	-0.007	-0.054***	-0.005	-0.014	0.009	-0.008	-0.060***	-0.047***	-0.060***	-0.052***	0.051	-0.077	0.098
	(-4.96)	(-0.18)	(-4.98)	(-0.13)	(-0.53)	(0.34)	(-0.31)	(-4.70)	(-3.42)	(-5.84)	(-3.36)	(0.49)	(-0.51)	(0.67)
Islamic_Bank × Domestic_Interest_Rate (β_{ID})			-0.032	-0.017										
			(-0.81)	(-0.29)										

HHI (β_{16})	-0.785	-2.149**	-0.780	-2.152**	0.068	0.037	-0.212	-1.915**	-1.802**	-2.135**	-0.816	-0.343	-6.343	-1.624
	(-1.08)	(-2.41)	(-1.07)	(-2.41)	(0.10)	(0.03)	(-0.31)	(-2.00)	(-2.35)	(-2.09)	(-1.09)	(-0.08)	(-0.90)	(-0.27)
GDP_Per_Capita (β_{17})	-0.042	-0.099***	-0.042	-0.099***	-0.034	-0.048*	-0.040	-0.072**	-0.041	-0.080**	-0.067*	-0.138	-0.261	-0.128
	(-1.19)	(-2.72)	(-1.17)	(-2.70)	(-0.86)	(-1.72)	(-1.01)	(-2.39)	(-1.64)	(-2.55)	(-1.68)	(-1.22)	(-1.22)	(-0.90)
GDP_Per_Capita_Growth (β_{18})	-0.013	0.003	-0.014	0.003	-0.009	0.001	-0.014	0.002	0.003	0.002	-0.016	0.054	0.009	0.073
	(-1.11)	(0.15)	(-1.13)	(0.14)	(-0.75)	(0.07)	(-1.16)	(0.11)	(0.14)	(0.13)	(-1.38)	(0.95)	(0.19)	(0.81)
Constant (β_0)	0.000	5.983***	7.529***	6.028***	5.235***	0.504	5.254***	7.395***	3.350***	7.586***	0.000	2.069	18.794***	0.696
	(.)	(7.05)	(5.04)	(6.88)	(4.97)	(0.52)	(4.75)	(8.57)	(4.24)	(8.69)	(.)	(0.48)	(2.66)	(0.13)
Number of Obs	839	1,071	839	1,071	896	841	902	1,014	972	1,029	984	441	145	296
R-squared	0.205	0.141	0.204	0.141	0.206	0.251	0.207	0.191	0.252	0.215	0.174	0.242	0.379	0.315
H_0: $\beta_{15} = \beta_{ID} = 0$ (F-stat.)			26.22***	0.12										
H_0: $\beta_{15} + \beta_{ID} = 0$ (F-stat.)			4.62**	0.12										

See Table AI for variable definition. Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

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TABLE AVII. Bank interest rate model

This table presents the estimation of bank interest rate model. We investigate the sensitivity of interest income and expense of Islamic banks to domestic interest rate during the pre-crisis period (columns 1-5) and the crisis-period (columns 6-10). In columns (1) to (5), we estimate the model using *Net_Interest_Margin*, *Interest_Income_Rate*, *Interest_Expense_Rate*, *Loan_Rate* and *Deposit_Rate* as the dependent variables respectively for the pre-crisis period (2003-2007). In columns (6) to (10), we estimate the model for the crisis period (2008-2009). We apply random effect technique with robust standard errors for our estimations. All the accounting and macro level variables are lagged for one period. Year and country dummies are included in the model, but not reported in the table.

	Pre-Crisis Period (2003-2007)					Crisis Period (2008-2009)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variables	Net_Interest_Margin (A)	Interest_Income_Rate (B)	Interest_Expense_Rate (C)	Loan_Rate (D)	Deposit_Rate (E)	A	B	C	D	E
Islamic_Bank (γ_1)	0.159	0.009	-0.216	0.361	0.451	2.141***	1.776**	0.563	2.399***	0.908
	(0.46)	(0.02)	(-0.61)	(0.33)	(0.68)	(3.52)	(2.27)	(0.93)	(2.75)	(1.59)
Islamic_Window_Bank (γ_2)	0.128	0.115	0.043	0.500	0.034	0.760**	0.645	0.312	0.669	-0.038
	(0.51)	(0.34)	(0.19)	(0.62)	(0.07)	(2.13)	(1.29)	(0.84)	(1.03)	(-0.10)
Size (γ_3)	-0.039	-0.091	0.019	-0.113	-0.052	0.151	1.226***	1.166**	0.766*	1.142***
	(-0.76)	(-1.35)	(0.39)	(-0.87)	(-0.60)	(0.81)	(2.93)	(2.49)	(1.80)	(2.68)
Market_Share (γ_4)	0.033	0.268	-0.067	-0.624	-0.092	-0.510	-5.549***	-5.204***	-3.610**	-5.098***
	(0.19)	(1.21)	(-0.51)	(-1.21)	(-0.33)	(-0.74)	(-3.45)	(-2.69)	(-2.13)	(-3.01)
Capital_Asset_Ratio (γ_5)	0.009	-0.007	-0.008	-0.011	-0.005	0.004	-0.022*	-0.030***	-0.015	-0.023***
	(1.38)	(-0.88)	(-1.07)	(-0.74)	(-0.42)	(0.49)	(-1.68)	(-2.98)	(-0.87)	(-2.64)
Noninterest_Income (γ_6)	-0.018***	-0.010**	0.012***	0.005	-0.003	-0.007	0.000	0.017	0.008	0.008
	(-4.86)	(-2.29)	(3.22)	(0.60)	(-0.39)	(-1.34)	(0.01)	(1.06)	(0.65)	(1.05)
Cost_Inefficiency (γ_7)	-0.017***	-0.013***	0.000	-0.013**	-0.003	-0.007*	0.003	0.010***	0.014**	0.017***
	(-6.13)	(-3.75)	(0.13)	(-2.09)	(-0.48)	(-1.86)	(0.72)	(2.69)	(2.35)	(3.30)
Loan_Loss_Reserve (γ_8)	0.002	0.004	0.004	-0.027	-0.001	0.014	0.010	0.003	0.005	0.005
	(0.24)	(0.39)	(0.59)	(-1.20)	(-0.04)	(1.49)	(0.85)	(0.28)	(0.28)	(0.51)
State_Bank (γ_9)	-0.131	-0.279	0.013	0.514	-0.381	0.176	-0.228	0.296	-0.373	-0.149
	(-0.48)	(-0.72)	(0.03)	(0.76)	(-0.60)	(0.41)	(-0.46)	(0.43)	(-0.64)	(-0.31)
Foreign_Bank (γ_{10})	-0.515**	-0.823**	-0.448	1.792	0.156	-0.010	-0.670	-0.436	-1.767***	0.150
	(-2.27)	(-1.99)	(-1.10)	(1.33)	(0.18)	(-0.03)	(-1.32)	(-0.96)	(-2.85)	(0.34)
Subsidiary (γ_{11})	0.045	-1.102***	-1.037***	1.637*	-0.462	0.624*	-0.408	-0.665**	-1.280**	-0.837***
	(0.22)	(-3.74)	(-4.91)	(1.79)	(-0.89)	(1.84)	(-0.81)	(-2.20)	(-2.41)	(-2.69)
Young_Bank (γ_{12})	0.393	0.399	0.646*	1.561	1.333	-0.436	-0.789	0.982	-0.684	1.933
	(0.59)	(0.56)	(1.67)	(1.22)	(1.63)	(-0.78)	(-1.07)	(0.93)	(-0.45)	(1.24)
Middle_Aged_Bank (γ_{13})	0.559	0.835*	0.605*	1.617**	1.184***	0.364	1.347	0.083	0.296	0.386
	(1.50)	(1.86)	(1.95)	(2.41)	(3.05)	(0.80)	(1.55)	(0.22)	(0.55)	(0.96)
Domestic_Interest_Rate (γ_{15})	0.027	0.162***	0.098***	0.120*	0.101**	-0.010	0.676***	0.625***	0.389*	0.636***
	(1.16)	(6.92)	(5.65)	(1.70)	(2.17)	(-0.10)	(4.33)	(4.23)	(1.91)	(3.01)
Islamic_Bank × Domestic_Interest_Rate (γ_{ID})	-0.014	-0.076	-0.016	-0.127	-0.141**	-0.211**	-0.345***	-0.094	-0.377**	-0.271**
	(-0.32)	(-1.21)	(-0.29)	(-1.26)	(-2.29)	(-2.07)	(-2.61)	(-0.63)	(-2.29)	(-2.03)
HHI (γ_{16})	-0.726	-1.951	0.122	0.756	-2.154	0.245	10.855*	9.682*	-5.170	0.772
	(-0.60)	(-1.22)	(0.12)	(0.20)	(-1.17)	(0.08)	(1.83)	(1.74)	(-0.48)	(0.11)
GDP_Per_Capita (γ_{17})	0.012	0.106***	0.118***	0.180*	0.237***	-0.005	0.190	0.142	-0.136	-0.046
	(0.37)	(2.88)	(2.65)	(1.80)	(2.84)	(-0.06)	(1.57)	(1.40)	(-0.53)	(-0.28)
GDP_Per_Capita_Growth (γ_{18})	-0.026	0.013	0.071	-0.017	-0.025	0.026	0.109	0.106	0.188**	0.196*
	(-1.09)	(0.36)	(1.45)	(-0.40)	(-0.99)	(0.81)	(1.53)	(1.27)	(2.00)	(1.91)

Constant (γ_0)	4.760*** (4.68)	7.877*** (5.77)	0.000 (.)	5.835** (1.97)	0.613 (0.35)	-0.204 (-0.05)	-23.974** (-2.55)	0.000 (.)	-9.910 (-1.03)	-22.785** (-2.35)
Number of Obs	1,036	1,030	1,014	333	290	471	471	463	382	353
R-squared	0.524	0.640	0.530	0.583	0.751	0.421	0.538	0.573	0.621	0.672
H_0: $\gamma_{15} = \gamma_{ID} = 0$ (F-stat.)	1.44	49.53***	34.14***	4.06	10.72***	4.78*	22.88***	17.93***	7.75**	13.37***
H_0: $\gamma_{15} + \gamma_{ID} = 0$ (F-stat.)	0.07	1.65	1.67	0.00	0.25	3.44*	3.00*	7.55***	0.00	2.10

See Table AI for variable definitions. Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

Chapter 2

Non-interest Income Activities and Bank Lending

Abstract. This chapter investigates the impact of seven non-interest income businesses on bank lending. Using quarterly data of 7,578 U.S. community banks between 2003 and 2010 we find that for banks with total assets above $100 million non-interest income activities influence credit risk and loan portfolio compositions. Banks which emphasize fiduciary and life insurance businesses appear to have a lower credit risk. Moreover, we find that a greater reliance on loan servicing is associated with lower lending-deposit spreads. The results also show that greater income share of fiduciary is associated with higher returns per unit of risk for banks with total assets above $100 million before and after the crisis. Finally, we explore whether cost complementarity can explain the joint production of non-interest income and lending. The findings provide us with little evidence to support this hypothesis.

JEL Classifications: G21

Keywords: Scope Expansion, Non-interest Income, Credit Risk, Spread, Loan Composition, Risk-Adjusted Return, Cost Complementarities

1. Introduction

A substantial empirical literature finds that bank diversification into non-interest income areas leads to banking sector instability (Stiroh, 2004; Stiroh and Rumble, 2006; De Jonghe, 2010; Demirguc-Kunt and Huizinga, 2010; Moshirian et al. (2011) and Brunnermeier et al., 2011). The link between riskier investment banking revenue and the 2007-8 crisis has also prompted a series of reforms in the US and Europe (Dodd Frank Act, 2010; Liikanen Report, 2012 and the Independent Commission on Banking – Vickers Report, 2011) that recommend restrictions on various banks' non-interest income-based activities (International Monetary Fund, 2011).

While the academic literature on bank diversification has focused on performance and stability issues associated with non-traditional banking activities, little attention has been paid to the potential consequences for lending of income diversity. This is somewhat surprising given that bank/borrower relationships lead to cross-selling of certain fee and commission-based services based on loan products. Hellmann et al. (2008) find that prior relationships with early stage venture capital firms increase the chances of bank loan origination. Firms may also benefit from established bank relationships by signaling their quality to benefit from lower loan rates. In addition, incentives to cross-sell fee and non-interest based products are higher when margins on traditional intermediation are narrower. Carbo and Rodriguez (2007) show that income from non-traditional activities influence net interest margins through possible cross-subsidization effects. Lepetit et al. (2008b) also find that banks may charge lower interest rates on loans and hence under-price credit risk if they expect to gain additional fees from borrowers. Such a behavior could undermine banks' major role in the financial system. Sound monitoring of borrowers and accurate loan-pricing are essential for the banking industry and the economy as a whole. Banks are expected to produce and convey information on the quality of borrowers which could be biased if non-interest activities provide incentives for weaker loan screening

and monitoring. Alternatively, banks might have the ability to monitor borrowers that are tied by non-interest activities, more closely and efficiently. A closer look at how credit risk is affected by combining both traditional lending activities and non-interest businesses is therefore an important question.

Relationships between banks and clients guide credit and non-interest income activities. Banks can collect customer-specific information (beyond that available publicly) over time via multiple interactions with the same customer (Berger, 1999; Boot, 2000). Boot (2000) also emphasizes that relationship banking is not limited to lending and can cover other financial services. Hence, expanding the scope and scale of client relationships may improve a bank's lending position, as it can provide banks with the opportunity to reach a wider array of potential borrowers and can offer more information on client quality. Information obtained from offering multiple products can therefore build new, as well as enhance, existing relationships. Boot (2003) argues that scale and scope expansion leads to a form of strategic positioning that drives industry consolidation. He points out that distribution channels are essential and that technological developments that make it more effective to interrogate business-line databases encourages scope expansion. The building of relationships can mitigate risk, as illustrated by Puri et al. (2011) who show that borrowers with prior credit relationships (with German savings banks) default less. By examining 18,000 bank loans to small Belgian firms, Degryse and Van Cayseele (2000) also show that interest rates tend to fall as the scope of the relationship expands.

Alternatively, a greater reliance on non-interest activities may increase credit risk due to agency problems or/and a loss of focus. Several studies show that agency problems stemming from activity diversification outweigh the benefits from scope economies (Laeven and Levine, 2007; Elyasiani and Wang, 2009; Akhigbe and Stevenson 2010). Others, such as Peterson and Rajan (1995) note that banks extend credit subsidies to young firms and expect to offset the

expected loss through future long-run rents. In a similar vein, a diversified commercial bank may decide to grant loss-making loans to cross-sell profit-making fee and commission-based services. Banks expanding into non-interest income activities may also lose their focus on lending. Moreover, lower credit exposure may encourage managers to be less conservative in their loan-granting activities.

In this chapter, we investigate the impact on lending of banks' diversification into seven major business lines[43] which we identify as playing an important role among a broader array of non-interest income items. They range from traditional activities such as fiduciary and life insurance to securities brokerage and investment banking. These business lines provide banks with the opportunity to have access to more private information, and can enable them to reach a wider array of potential borrowers and depositors. Moreover, they are also likely to expand the scope of relationship with clients beyond merely lending-deposit activities. We investigate the influence of these activities on banks' lending in terms of loan quality, interest spread and loan portfolio composition. We also explore whether risk-return cross subsidization and cost complementarities can explain their joint production with lending.

Because our aim is to focus on traditional intermediation and relationship banking which is rather more prevalent in smaller institutions, we use quarterly data on 7,578 U.S. community banks - defined as institutions with less than $ 1 billion of assets or larger if they are deposit and loan oriented (with core deposits representing more than half of their liabilities and at least a third of their assets allocated to loans, (FDIC, 2012)). Our data span from 2003 to 2010 and cover the period before and after the 2007-2008 financial crises. The sample also includes 3,206 community banks with less than $100 million in total assets *('micro'* community banks) that are studied separately from the rest of our sample. This is to see if the smallest banks differ from larger institutions that are likely to be more transaction-focused.

[43] Fiduciary activities, life insurance, other insurance services, loan servicing, annuity sales, securities brokerage and investment banking.

Our credit risk analysis for community banks with total assets above $100 million indicates that an increase in income from fiduciary activities lowers credit risk, especially during the pre and post-crisis periods. Banks that have a larger share of income from *life insurance* business also appear to have lower credit risk before the crisis; the relationship, however, becomes positive during the crisis period and disappears thereafter.

We also observe that non-interest income activities are also connected to loan portfolio compositions. For instance, greater reliance of total operating income on fiduciary business is linked to a smaller share of commercial and industrial (*C&I*) loans in total loans (during and after the banking crisis), and a larger share of loans to financial institutions in total loans during the post-crisis period. In the same period, however, income from life insurance is negatively associated to lending to financial institutions. We find little evidence to support evidence of income or price cross-subsidies between traditional intermediation and non-interest income activities except in the case of loan servicing (after the crisis) where we observe higher income shares from this activity is associated with lower lending-deposit spreads.

The results also show that some non-interest income activities contribute differently to risk-adjusted returns. Fiduciary, for instance, increases risk-adjusted returns in the pre- and post-crisis periods, whereas during the crisis income from securities brokerage activities appears also to increase returns per unit of risk (unexpectedly, investment banking business seems to lower risk-adjusted returns). Loan servicing is negatively linked to risk-adjusted return after the crisis. Life insurance, other (not life) '*other*' insurance services and annuity sales display little relationship with risk-adjusted return before, during and after the crisis.

Our analysis of *micro* community banks (those with assets under $100 million) provides us with little evidence to support any link between non-interest income activities and credit risk, loan composition and price cross-subsidization. However, we find some evidence that an increase in income from *other* insurance services and fiduciary activities is associated with

higher lending-deposit spreads. We do find, however, that that various non-interest income businesses contribute differently to risk-adjusted return. Fiduciary business lowers risk-adjusted returns before and after the credit-crisis which contrasts with our findings for larger community banks. *Micro* community banks that have a higher share of *other* insurance services have higher risk adjusted returns. A greater dependence of total operating income on loan servicing is associated with lower risk-adjusted return before and during the crisis. (Table A1 of appendix provides the summary of our results).

Finally, we investigate whether a pair-wise cost complementarity exists between lending (both secured and unsecured) and non-interest income activities that explains possible joint production. The results provide us with little evidence to support this hypothesis.

The remainder of the chapter is organized as follows: Section 2 outlines our methodology and econometric specifications. Section 3 describes the data and summary statistics. Section 4 discusses the results and finally section 5 concludes.

2. Econometric Specification and Methodology

We are interested in investigating the impact of bank expansion into non-interest income activities from three aspects: risk, pricing and loan portfolio composition. To investigate these issues we estimate the following models:

$$\begin{aligned}\text{Credit\_Risk}_{i,t} = {} & \beta_0 + \sum_{k=1}^{7} \beta_{1,k} \times \text{Non-interest\_Income\_Activities}_{k,i,t-1} + \\ & \beta_2 \times \text{Unused\_Commitment}_{i,t-1} + \beta_3 \times \text{Loans\_Sale}_{i,t-1} + \\ & \beta_4 \times \text{Unsecured\_Loans}_{i,t-1} + \beta_5 \times \text{Loan\_Growth}_{i,t-1} + \\ & \beta_6 \times \text{Capital}_{i,t-1} + \beta_7 \times \text{Spread}_{i,t-1} + \beta_8 \times \text{Inefficiency}_{i,t-1} + \beta_9 \times \text{Size}_{i,t-1} + \beta_{10} \times \text{Log(Age)}_{i,t-1} + \\ & \beta_{11} \times \text{Interest\_Rate}_{t-1} + \beta_{12} \times \text{Home\_Price\_Growth}_{j,t-1} + \beta_{13} \times \text{Income\_Growth}_{j,t-1} + \\ & \sum_{k=1}^{4} \beta_{14,k} \times \text{Year\_Dummies}_k + \varepsilon_{i,t} \end{aligned} \quad (1)$$

$$\begin{aligned}\text{Spread}_{i,t} = {} & \alpha_0 + \sum_{k=1}^{7} \alpha_{1,k} \times \text{Non-interest\_Income\_Activities}_{k,i,t-1} + \\ & \alpha_2 \times \text{Unused\_Commitment}_{i,t-1} + \alpha_3 \times \text{Loans\_Sale}_{i,t-1} + \\ & \alpha_4 \times \text{Loan\_Asset\_Ratio}_{i,t-1} + \alpha_5 \times \text{Unsecured\_Loans}_{i,t-1} + \alpha_6 \times \text{Non-Performing\_Loans}_{i,t-1} + \\ & \alpha_7 \times \text{Core\_Deposit}_{i,t-1} + \alpha_8 \times \text{Capital}_{i,t-1} + \alpha_9 \times \text{Size}_{i,t-1} + \alpha_{10} \times \text{Log(Age)}_{i,t-1} + \\ & \alpha_{11} \times \text{Interest\_Rate}_{t-1} + \alpha_{12} \times \text{Home\_Price\_Growth}_{j,t-1} + \alpha_{13} \times \text{Income\_Growth}_{j,t-1} + \\ & \sum_{k=1}^{4} \alpha_{14,k} \times \text{Year\_Dummies}_k + \eta_{i,t} \end{aligned} \quad (2)$$

$$\begin{aligned}\text{Loan\_Composition}_{i,t} = {} & \delta_0 + \sum_{k=1}^{7} \delta_{1,k} \times \text{Non-interest\_Income\_Activities}_{k,i,t-1} + \\ & \delta_2 \times \text{Core\_Deposit}_{i,t-1} + \delta_3 \times \text{Capital}_{i,t-1} + \delta_4 \times \text{Size}_{i,t-1} + \delta_5 \times \text{Log(Age)}_{i,t-1} + \\ & \delta_6 \times \text{Interest\_Rate}_{t-1} + \delta_7 \times \text{Home\_Price\_Growth}_{j,t-1} + \delta_8 \times \text{Income\_Growth}_{j,t-1} + \\ & \sum_{k=1}^{4} \delta_{9,k} \times \text{Year\_Dummies}_k + \xi_{i,t} \end{aligned} \quad (3)$$

where individual banks, time dimension and states in which they operate are represented by i, t and j subscripts, respectively. Variation in credit risk (*Credit Risk*), lending-borrowing spread (*Spread*) and loan composition (*Loan Composition*) are modeled in Equations (1) to (3) as a function of (income share from) non-interest income activities including fiduciary activities, life insurance, other insurance services, loan servicing, annuity sales, securities brokerage and investment banking that would be expected to increase the scope of relationship with borrowers and/or investors (see section 2.2.) and a set of bank-level, state-level, macroeconomic and time control variables. We estimate the equations using fixed effects, as suggested by the Hausman test.

2.1. DEPENDENT VARIABLES

We use the ratio of non-performing loans to gross loans (*Non-performing Loans*) as the proxy for *Credit Risk*. Non-performing loans consist of non-accrual loans and loans which are past due for 90 days or more and still accruing. This proxy is widely used in the literature (for instance Kwan and Eisenbeis, 1997; Gonzalez, 2005; Carbo and Rodriguez, 2007; Fiordelisi, et al., 2011; Delis and Kouretas, 2011).

For the lending-borrowing spread analysis, we use the net interest spread defined as $\frac{\text{total interest income}}{\text{average total earning assets}} - \frac{\text{total interest expense}}{\text{average total interest-bearing liabilities}}$ (*Spread*) following Carbo and Rodriguez (2007) and Lepetit et al. (2008b). Finally, we use the share of loans unsecured on real estate in the total loan portfolio (*Unsecured Loans*) as the dependent variable to investigate the relationship between non-interest income activities and total loan composition.

2.2. VARIABLES OF INTEREST

On the basis of the breakdown provided in the Federal Financial Institutions Examination Council (FFIEC) 031 Reports of Income and Condition (Call Reports), we identify seven major non-interest income business lines that may have an impact on customer credit relationships[44]:

1) Income from fiduciary activities (*Fiduciary Activities*).

   Clients of the fiduciary services have entrusted assets to the bank for management or safekeeping, and hence are expected to be relatively more risk-averse with low probability of default. Moreover, they provide banks with moderately stable financial resources where banks do not have an unconditional obligation to pay a pre-determined interest rate. Banks simply receive a fee for the services. As such they have less incentive to target risky borrowers / investments and are expected to behave prudently and carefully in investing the entrusted funds.

2) Earnings on/increases in value of cash surrender value of life insurance policies (*Life Insurance*).

   Clients can establish a long-run relationship and provide banks with fairly stable funding by entrusting cash surrender value on their policies to the bank.

3) Underwriting income from insurance and reinsurance activities and income from other (non-life) insurance activities (*Other Insurance Services*)

   Although income is not as stable as from life insurance activity, having general insurance business with personal and corporate customers may be linked to strengthening credit relationships, property insurance for instance maybe linked to mortgages.

[44] Due to a lack of data, we are unable to take into account income from venture capital activities. There are four other items of non-interest income which are not analyzed in our study as (we believe) they do not have a focus on developing customer relationships on the lending side. These are:

- Deposit activities: Service charges on deposit accounts (*Service Charges*)
- Risk management activities: Trading revenue (*Trading*); net gains on loan sales and securitization (*Loan Sales*)
- Gains on sale of other assets (*Other Assets Sales*)

4) Net servicing fees (*Loan Servicing*) [45]

Clients having outstanding loans and are mostly individuals with relatively constrained budgets. Servicers can collect soft information and identify borrowers who regularly fulfill their repayment obligations. The information can be used by banks for future loans origination. However, to collect more late fees, servicing companies may target borrowers less likely to make timely installments (Wagner, 2009). Moreover, having loan servicers, banks may undermine loan quality and originate more mortgage loans while under-pricing risk. As such, the relationship between *Loan Servicing* and lending quality is indeterminate prior to estimation.

5) Fees and commissions from annuity sales (*Annuity Sales*)

Similar to life insurance, clients establish a long-run relationship and may provide banks with stable funding. It is also similar to fiduciary, as at the end of the contract banks must pay back to clients the investment made plus the gains earned.

6) Fees and commission from securities brokerage (*Securities Brokerage*)

Clients using securities brokerage services are expected to be relatively financially sophisticated and less risk averse than other clients. This business line provides banks with less income as compared to *Fiduciary Activities*, *Life Insurance* and *Annuity Sales*. The activity is more cyclical and prone to systematic risk.

7) Investment banking, advisory, and underwriting fees and commissions (*Investment Banking*)

Banks have access to private insider information which is not publically available. As such we expect synergy between lending and investment banking.

[45] Servicing companies typically receive a percentage of the outstanding amount of the loans they service. Normally, they do not own the loans. Services include statements, impounds, collections, tax reporting, and other requirements. Any person with a mortgage loan pays her scheduled installments to a loan servicing firm. Most of mortgages are backed by Federal housing programs such as Fannie Mae and Freddie Mac.

Our aim is to analyze the implications for loan risk, pricing and composition resulting from variation in the aforementioned non-interest income activities. We scale bank income by total net operating income following the existing literature (Stiroh, 2004 among others). For Equation (2), however, we scale their income by total assets in lieu of total net operating income, since the latter includes net interest income (alongside non-interest income) and may cause a mechanical inverse relationship between the share of non-interest income in total operating income and *Spread*[46].

2.3. CONTROL VARIABLES

2.3.a. Loans Portfolio Structure and Characteristics

Higher unused credit lines and loan commitments (*Unused Commitment*) show that borrowers have faced lower liquidity shocks and that they have the capacity to be more leveraged. As such, we expect a negative relationship between *Unused Commitment* and *Credit Risk*. We include in our *Credit Risk* model the face value of *Unused Commitment* as a proportion of total assets. Moreover, Berg et al. (2013) show that credit lines act as an insurance for borrowers against liquidity shocks and the related fees including commitment fees smooth borrowing costs across different scenarios (namely, the presence and absence of liquidity shocks). Hence, higher *Unused Commitments* may represent greater borrowing costs smoothing and lower *Spreads*. We include the *Unused Commitment* in our *Spread* model (Equation (2)).

We add the share of net gains (losses) on sales of loans and leases and net securitization income (*Loans Sale*) in total operating income to our *Credit Risk* model (Equation (1)). A higher income share of *Loans Sale* suggests better loan quality; however, banks active in the

[46] An increase in non-interest income share might be due to a decline in net interest income caused by a decrease in *Spread*.

loan sales market may target riskier loans. As such, the relationship between *Loans Sale* and loan quality is not clear.

We include the quarterly growth rate of gross loans (*Loan Growth*) in the *Credit Risk* model, since the literature shows a negative relationship between credit expansion and loan quality (Clair, 1992; Dell'Ariccia and Marquez, 2006 and Ogura, 2006). We also control for *Loan Composition* by including *Unsecured Loans* in the Equations (1) and (2), since *Credit Risk* and *Spread* might be influenced by loan portfolio composition. *Unsecured Loans* might be more or less risky than loans secured by real estate (*Secured Loans)*. On the one hand, *Unsecured Loans* might reflect loose credit origination; on the other hand, banks may require collateral only from risky borrowers. As such, *Unsecured Loans* may suggest higher borrowers' credit quality. *Unsecured Loans* may also show different loan types (for instance mortgage loans vs. other loans) and different borrowers in terms of business models. Banks may determine their *Spread* based on the structure of the loan portfolio. *Non-performing Loans* are introduced into the *Spread* model since an increase in *Non-performing Loans* is expected to increase *Spread* (Angbazo, 1997; Carbo and Rodriguez, 2007 among others). We also include the share of total loans in total assets (*Loan Asset Ratio*) in the second Equation, as loan pricing may depend on loan quantity. Banks more focused on lending are expected to have higher expertise in loan origination and hence enjoy a higher *Spread*. Alternatively, more focused banks might enjoy greater synergy and are expected to be more competitive in lending by lowering the *Spread*.

2.3.b. Other Bank Level Heterogeneities

We control for the share of equity capital in total assets (*Capital*) in all three Equations. On the one hand, more *Capital* is associated with lower moral hazard problems and better capitalized banks have greater monitoring incentives (Diamond, 1984). On the other hand, equity capital provides banks with an enhanced capacity for risk-taking. It can represent equity-

holders' risk preferences (McShane and Sharpe, 1985 and Maudos and De Guevara, 2004) and banks with a higher capital ratio may target riskier activities to compensate for the higher cost of equity compared to debt finance. *Spread* is included in our *Credit Risk* model because a higher *Spread* should translate into greater risk due to adverse selection problems. We also control for cost inefficiency represented by the ratio of non-interest expense to total operating revenue (*Inefficiency*) in the *Credit Risk* model since less efficient banks are expected to have lower loan quality due to poorer loan monitoring. They might even have greater incentives for risk-taking (Kwan and Eisenbeis, 1997). The share of core deposits in total assets (*Core Deposits*) is included in both Equations (2) and (3), as both *Spread* and *Loan Composition* may depend on debt financing.

We also control for bank size by including the logarithm of total assets (*Size*) in all three models. This can have several impacts on *Credit Risk*, *Spread* and *Loan Composition*: Large and small banks have different business models, the former relying more heavily on non-interest generating activities given their greater capacity to benefit from diversification and scale economies (Hughes et al., 2001). Larger banks may also hold riskier loan portfolios to benefit from safety net subsidies (Kane, 2010). Moreover, bigger banks mainly deal with larger and more transparent borrowers, while small banks are more likely to lend to opaque firms suggesting that the latter may be more risky. Alternatively, large borrowers generally have easier access to financial markets as a substitute for bank lending. Hence, large banks could face higher competition resulting in greater risk-taking, lower spreads and a different loan composition. The logarithm of the bank's age (*Log(Age)*) is expected to capture the longevity /experience on the bank's *Credit Risk*, *Spread* and *Loan Composition*.

2.3.c. Macroeconomic, State-Level and Time Fixed Effect Controls

All three models include the level of interest rates (*Interest Rate*) using the average annualized U.S. 3-month T-bill rate. Previous studies show that banks' risk appetite inversely

depends on the level of interest rates (Dell' Ariccia and Marquez, 2006; Rajan, 2006; Borio and Zhu, 2008; Delis and Kouretas, 2011; Maddaloni and Peydró, 2011). Banks typically have higher risk-taking appetites when rates are low. However, at higher levels, borrower default probabilities rise as their ability to re-pay loans decreases (Jarrow and Turnbull, 2000; Carling et al., 2007; Drehmann et al., 2010 and Alessandri and Drehmann, 2010). We attempt to control for state-level heterogeneity by including an index of house price growth *(House Price Growth)* and the growth in personal income index *(Income Growth).*

Finally, year fixed effects are controlled for by introducing four, two and one year dummies for pre, acute and post-banking crisis periods (see below), respectively. Table A2 in the appendix outlines the variables used in our models.

3. Data and Descriptive Statistics

Our empirical investigation is based on a sample of 7,578 community banks domiciled in the U.S. operating between 2003 and 2010. While there is no unique definition of community banks, previous studies generally classify them as banking institutions with total assets of less than $1 billion. Following a relatively new definition (FDIC, 2012), we also include larger banks if their core deposits account for more than fifty percent of total liabilities and at least one-third of their assets are allocated to loans.[47]

The sample is constructed on a quarterly basis, providing a total of 207,468 bank-quarter observations. Bank-level data is collected from the web-site of the Federal Reserve Bank of Chicago, the annualized 3-month T-Bill rate is obtained from Datastream, state-level home price indexes and personal income data are retrieved from the Office of Federal Housing Enterprise Oversight and Bureau of Economic Analysis, respectively. We exclude banks that have been in operation for less than 3 years and banks with no loans or deposits. Outliers are

[47] See http://www.fdic.gov/regulations/resources/cbi/report/CBSI-1.pdf.

removed from the sample by winsorizing up to 2% of each tail[48]. All the variables are de-seasonalized[49] and income statement figures have been annualized. We also remove banks with negative non-interest income ratios[50]. We use the definition provided by the Bank for International Settlements (2010) to examine relationships pre-crisis (January 2003 to June 2007); over the acute-crisis (July 2007 to March 2009) and post-crisis (April 2009 to December 2010). We also study two samples of banks: 3,206 very small banks (82,807 observations) with less than $100 million in total assets (*Micro Community Banks*). The second sample consists of the remaining 4,372 community banks (*Non-Micro Community Banks*) with 124,661 observations. The reason for examining the smallest banks separately is to see if banks with a greater relationship focus differ from larger institutions that are likely to be more transactions focused.

Table I (PANELS A and B) presents the descriptive statistics for pre, acute and post crisis periods for *Micro* and *Non-Micro Community Banks*, respectively. The figures show that during the period under study, *Non-performing Loans* of *Micro Community Banks* increased from 0.50% before the crisis to 1.14% in the acute-crisis and 1.87% thereafter. The *Credit Risk* proxy of *Non-Micro Community Banks* has risen more than those of *Micro Community Banks*. While during the pre-crisis period, it is on average lower for *Non-Micro Community Banks*, we end up with a lower value of the *Credit Risk* proxy for *Micro Community Banks* in the post-crisis period. *Non-performing Loans* of *Non-Micro Community Banks* are on average 0.30% before the credit-crisis, which increased to 1.45% and 2.92% in the acute and post-crisis periods, respectively.

[48] We winsorize the data to the extent that the sample lies in the (mean ± 4×S.D., mean ± 6×S.D.) domain. Hence, each variable is winsorized based on how dispersed its distribution is and how flat the tails are.

[49] We regress bank level data and the interest rate on three quarter dummies and use the residual as the de-seasonalized value. The state-level data (*Home Price Growth* and *Personal Income Growth*) have already been de-seasonalized.

[50] Totally, 6, 90 and 65 observations on non-interest income scaled by total operating income are excluded from our samples for the pre, acute and post-crisis periods, respectively. We also scale the non-interest income components by total assets, as a robustness check, in which case we do not need to exclude these observations.

Unused Commitments are on average higher for *Non-Micro Community Banks*; however their variations across different time periods are similar for both *Micro* and *Non-Micro Community Banks*. The face value of *Unused Commitment* scaled by total assets for both *Micro* and *Non-Micro Community Banks* has increased from 1.45% and 3.52%, respectively, in the pre-crisis period to 1.65% and 3.65% in the acute crisis; then falls to 1.38% and 2.71% in the post-crisis period.

The quarterly *Loan Growth* of both *Micro* and *Non-Micro Community Banks* declines over the sample period; however, the slowdown is greater for the latter group. It drops from 2.71% in the pre-crisis to minus 0.06% during the post-crisis period for *Non-Micro Banks*, whereas the *Loan Growth* of *Micro Banks* falls to a half percent after the crisis from 1.67% before the crisis. *Unsecured Loans* have less weight in the loan portfolios of *Non-Micro Community Banks* compared to *Micro Community Banks*. The loan composition of *Micro Community Banks* remains almost stable across the sample periods with around an 18.60% share in total loans, while the weight of *Unsecured Loans* of *Non-Micro Community Banks* slightly increases from 12.12% in the pre-crisis to 12.58% in the post-crisis.

Spread is equal to 3.78% and 3.67% in the pre-crisis period for *Micro* and *Non-Micro Community Banks*, respectively; however, it shrinks during the crisis to 3.42% and 3.31% and then partly recovers post-crisis to 3.61% and 3.47%, respectively.

For both *Micro* and *Non-Micro Community Banks*, their profitability, as reflected in the mean of the return on average assets (*Return*) has dropped over the study period, whereas the volatility of the return on average assets (*Risk*) has risen. This leads to declines in risk-adjusted returns on average assets (*Risk Adjusted Return*).

Table I. Descriptive Statistics

PANEL A. U.S. Micro Community Banks

General descriptive statistics and non-interest income activities of U.S. *Micro Community Banks* for the pre-, acute- and post-crisis periods. *Micro Community Banks* are defined as banks with less than $100 million in total assets.

		Pre-Crisis Period					Acute-Crisis Period					Post-Crisis Period				
	Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
General Descriptive Statistics	Total Assets (mil. $)	52,567	54	25	7	100	15,881	56	25	9	100	14,359	57	24	11	100
	Loan Loss Reserve (%)	52,520	1.52	0.81	0.00	5.19	15,860	1.46	0.82	0.00	5.21	14,338	1.67	1.01	0.00	6.82
	Non-performing Loans (%)	52,520	0.50	0.85	0.00	4.50	15,860	1.14	1.89	0.00	12.28	14,338	1.87	2.78	0.00	20.90
	Unused Commitment (%)	52,567	1.45	2.79	0.00	25.56	15,881	1.65	2.98	0.00	25.73	14,359	1.38	2.41	0.00	19.74
	Loan Growth (%)	52,553	1.67	6.14	-23.91	32.77	15,877	1.21	6.25	-22.92	30.15	14,359	0.50	5.83	-23.2	25.88
	Unsecured Loans (%)	52,496	18.69	21.13	0.00	100	15,860	19.04	21.31	0.00	100	14,335	18.60	21.11	0.00	100
	Loan Asset Ratio (%)	52,567	60.00	16.33	0.00	96.91	15,881	61.07	16.78	0.01	97.36	14,359	59.51	16.53	0.03	96.58
	Spread (%)	52,559	3.78	0.85	0.69	7.51	15,880	3.42	0.83	0.36	6.94	14,358	3.61	0.82	0.46	7.40
	Capital (%)	52,567	11.32	3.85	4.89	29.91	15,881	11.85	4.21	2.47	30.64	14,359	11.56	4.12	0.76	30.59
	Core Deposits (%)	52,567	70.23	11.66	0.01	91.12	15,881	66.73	12.45	0.00	89.33	14,359	66.48	12.75	0.00	89.86
	Inefficiency (%)	52,562	69.17	16.34	12.34	139.21	15,867	74.87	22.46	9.88	186.64	14,339	79.66	27.94	12.90	225.49
	Asset Growth (%)	52,567	1.20	5.04	-19.85	27.36	15,881	1.51	5.44	-18.57	31.47	14,359	0.89	4.98	-19.5	23.94
	Age	52,567	73.10	37.64	3.00	168.50	15,881	76.89	37.73	3.00	170.25	14,359	77.39	38.87	3.00	171.75
	Return (%)	3,092	0.50	0.36	-1.00	2.36	2,256	0.38	0.51	-2.60	2.10	2,050	0.20	0.65	-3.45	1.75
	Risk (%)	3,092	0.19	0.19	0.01	1.15	2,256	0.23	0.33	0.01	2.42	2,050	0.24	0.31	0.01	1.92
	Risk Adjusted Return	3,092	4.55	3.86	-1.99	31.57	2,256	4.62	5.26	-3.88	34.98	2,050	4.37	5.98	-6.93	37.73
	Non-interest Income (%)	52,562	14.57	8.94	-1.23	70.26	15,867	14.22	9.56	-40.64	73.02	14,339	12.95	10.92	-38.4	79.44
Non-interest Income Activities	Fiduciary Activities (%)	52,567	0.14	0.92	0.00	11.14	15,880	0.16	1.11	0.00	12.21	14,358	0.12	0.89	0.00	10.51
	Life Insurance (%)	52,561	0.38	0.94	0.00	4.83	15,867	0.39	1.00	0.00	5.89	14,339	0.39	1.00	0.00	5.69
	Insurance Services (%)	52,562	0.49	1.33	-0.20	8.39	15,867	0.48	1.47	-0.12	8.86	14,338	0.40	1.29	-0.11	7.89
	Loans Servicing (%)	52,562	0.22	0.87	-1.03	6.33	15,866	0.22	0.87	-0.60	6.30	14,339	0.25	0.99	-1.08	7.02
	Annuity Sales (%)	4,960	0.02	0.15	0.00	1.78	15,881	0.02	0.14	0.00	1.82	14,359	0.01	0.12	0.00	1.56
	Securities Brokerage (%)	4,960	0.07	0.40	0.00	3.58	15,881	0.06	0.35	0.00	3.40	14,359	0.05	0.27	0.00	2.82
	Investment Banking (%)	4,960	0.02	0.16	0.00	1.60	15,881	0.02	0.16	-0.01	1.67	14,359	0.01	0.11	0.00	1.21
Other Non-interest Income Activities	Venture Capital (%)	52,567	0.00	0.00	0.00	0.00	15,881	0.00	0.00	0.00	0.00	14,359	0.00	0.00	0.00	0.00
	Service Charges (%)	52,562	8.71	5.22	0.00	35.21	15,867	8.68	5.44	0.00	41.37	14,339	8.20	5.42	0.00	36.31
	Loan Sales (%)	52,567	0.48	2.11	-1.55	17.40	15,878	0.37	1.77	-4.65	15.03	14,353	0.67	2.88	-3.96	23.34
	Trading (%)	52,567	0.00	0.00	0.00	0.00	15,881	0.00	0.01	-0.06	0.13	14,359	0.00	0.01	-0.18	0.24
	Other Assets Sales (%)	52,565	0.11	0.97	-4.42	5.67	15,875	0.03	1.40	-8.98	8.46	14,344	-0.67	3.98	-27.53	9.84
	Other Activities (%)	52,562	3.40	4.17	-0.17	30.58	15,867	3.05	3.84	-2.79	28.26	14,339	2.94	3.84	-4.96	26.32
Unsecured Loans Breakdown	Agricultural Loans (%)	52,496	16.51	20.34	0.00	100	15,860	16.85	20.38	0.00	100	14,335	16.61	20.31	0.00	100
	C&I Loans (%)	52,496	0.09	1.51	0.00	52.15	15,860	0.04	1.20	0.00	55.66	14,335	0.06	1.43	0.00	51.76
	Consumer Loans (%)	52,496	0.31	0.77	0.00	5.28	15,860	0.26	0.70	0.00	4.62	14,335	0.24	0.62	0.00	4.00
	Financial Institutions Loans (%)	52,496	0.44	1.14	0.00	8.37	15,860	0.45	1.23	0.00	8.67	10,271	0.42	1.27	0.00	9.67
	Other Unsecured Loans (%)	52,496	0.84	1.71	0.00	9.70	15,860	0.83	1.77	0.00	11.26	10,271	0.88	1.95	0.00	12.00

See Table A2 for variable definitions.

PANEL B. U.S. Non-Micro Community Banks

General descriptive statistics and non-interest income activities of U.S. *Non-Micro Community Banks* for the pre-, acute- and post-crisis periods. *Non-Micro Community Banks* are defined as community banks with total assets above $100 million.

		Pre-Crisis Period					Acute-Crisis Period					Post-Crisis Period				
	Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
General Descriptive Statistics	Total Assets (mil. $)	68,600	861	4,461	100	73,100	27,684	853	4,343	100	67,300	28,377	992	5,470	100	83,800
	Loan Loss Reserve (%)	68,596	1.31	0.57	0.00	5.19	27,680	1.33	0.63	0.00	5.21	28,370	1.83	1.01	0.00	6.82
	Non-performing Loans (%)	68,596	0.30	0.52	0.00	4.50	27,680	1.45	2.03	0.00	12.28	28,370	2.92	3.56	0.00	20.90
	Unused Commitment (%)	68,600	3.52	4.57	0.00	25.56	27,684	3.65	4.46	0.00	25.73	28,377	2.71	3.32	0.00	19.74
	Letter of Credit (%)	68,605	0.70	0.93	0.00	5.60	27,685	0.65	0.86	0.00	5.50	28,391	0.50	0.68	0.00	4.23
	Recourse (%)	68,605	0.04	0.18	0.00	0.99	27,685	0.07	0.28	0.00	1.52	28,391	0.09	0.32	0.00	1.73
	Loan Growth (%)	68,589	2.71	5.32	-23.91	32.77	27,681	2.02	5.17	-22.92	30.15	28,373	-0.06	4.63	-23.2	25.88
	Unsecured Loans (%)	68,583	12.12	14.83	0.00	100	27,669	12.49	14.50	0.00	100	28,358	12.58	14.60	0.00	100
	Loan Asset Ratio (%)	68,600	66.13	14.40	0.00	98.25	27,684	69.12	13.62	0.00	99.30	28,377	65.89	13.16	0.00	96.71
	Spread (%)	68,600	3.67	0.84	0.69	7.51	27,684	3.31	0.78	0.36	6.94	28,377	3.47	0.76	0.46	7.40
	Capital (%)	68,600	9.99	3.04	4.89	29.91	27,684	10.17	3.07	2.47	30.64	28,377	10.01	2.98	0.76	30.59
	Core Deposits (%)	68,600	65.11	13.49	0.01	91.12	27,684	59.86	13.48	0.00	89.33	28,377	61.12	13.00	0.00	89.86
	Inefficiency (%)	68,599	63.03	13.64	12.34	139.21	27,608	70.60	21.14	9.88	186.64	28,332	74.98	26.71	12.90	225.49
	Asset Growth (%)	68,600	2.30	5.03	-19.85	27.36	27,684	2.18	5.40	-18.57	31.47	28,377	0.80	4.79	-19.5	23.94
	Age	68,605	66.72	43.89	3.00	207.50	27,685	66.53	44.77	3.00	208.25	28,391	66.53	45.43	3.00	198.50
	Risk (%)	4,201	0.57	0.29	-0.87	2.36	3,969	0.34	0.48	-2.60	2.10	4,076	0.10	0.69	-3.45	1.75
	Return (%)	4,201	0.14	0.14	0.00	1.15	3,969	0.26	0.37	0.01	2.42	4,076	0.26	0.35	0.00	1.92
	Risk Adjusted Return	4,201	6.70	5.27	-1.75	31.57	3,969	4.89	5.96	-3.88	34.98	4,076	4.69	7.00	-6.93	37.73
	Non-interest Income (%)	68,599	17.68	10.08	-1.23	70.26	27,608	17.18	10.79	-40.64	73.02	28,332	15.83	12.68	-38.4	79.44
Non-interest Income Activities	Fiduciary Activities (%)	68,601	0.85	2.14	0.00	11.14	27,670	0.85	2.26	0.00	12.21	28,369	0.73	1.97	0.00	10.51
	Life Insurance (%)	68,599	0.47	0.91	0.00	4.83	27,608	0.69	1.07	0.00	5.89	28,332	0.74	1.03	0.00	5.69
	Insurance Services (%)	68,599	0.48	1.32	-0.20	8.39	27,607	0.46	1.40	-0.12	8.86	28,331	0.39	1.25	-0.11	7.89
	Loans Servicing (%)	68,599	0.39	1.07	-1.03	6.33	27,608	0.39	1.04	-0.60	6.30	28,332	0.45	1.20	-1.08	7.02
	Annuity Sales (%)	7,811	0.12	0.34	0.00	1.78	27,671	0.13	0.35	0.00	1.82	28,370	0.10	0.30	0.00	1.56
	Securities Brokerage (%)	7,811	0.30	0.68	0.00	3.58	27,664	0.28	0.65	0.00	3.40	28,364	0.22	0.54	0.00	2.82
	Investment Banking (%)	7,811	0.08	0.30	0.00	1.60	27,678	0.08	0.31	-0.01	1.67	28,376	0.06	0.23	0.00	1.21
Other Non-interest Income Activities	Venture Capital (%)	68,600	0.00	0.00	0.00	0.00	27,682	0.00	0.00	0.00	0.00	28,374	0.00	0.00	0.00	0.00
	Service Charges (%)	68,600	8.23	5.10	0.00	35.21	27,612	8.92	5.69	0.00	41.37	28,336	8.72	5.63	0.00	36.31
	Loan Sales (%)	68,600	1.37	3.16	-1.55	17.40	27,659	1.10	2.62	-4.65	15.03	28,350	1.77	4.07	-3.96	23.34
	Trading (%)	68,601	0.00	0.00	0.00	0.00	27,666	0.00	0.02	-0.06	0.13	28,371	0.00	0.04	-0.18	0.24
	Other Assets Sales (%)	68,600	0.12	0.90	-4.42	5.67	27,627	-0.11	1.65	-8.98	8.46	28,334	-1.34	4.71	-27.5	9.84
	Other Activities (%)	68,599	4.94	4.75	-0.17	30.58	27,608	3.66	4.14	-2.79	28.26	28,332	3.09	4.09	-4.96	26.32
Unsecured Loans Breakdown	Agricultural Loans (%)	68,583	3.96	8.88	0.00	86.61	27,669	4.30	9.52	0.00	87.48	28,358	4.49	9.87	0.00	89.30
	C&I Loans (%)	68,583	5.59	9.81	0.00	52.15	27,669	5.80	9.51	0.00	55.66	28,358	5.75	9.20	0.00	51.76
	Consumer Loans (%)	68,583	0.47	0.85	0.00	5.28	27,669	0.38	0.73	0.00	4.62	28,358	0.35	0.66	0.00	4.00
	Financial Institutions Loans (%)	68,583	0.58	1.34	0.00	8.37	27,669	0.57	1.34	0.00	8.67	23,672	0.62	1.52	0.00	9.67
	Other Unsecured Loans (%)	68,583	0.80	1.57	0.00	9.70	27,669	0.92	1.82	0.00	11.26	23,672	0.98	1.92	0.00	12.00

See Table A2 for variable definitions.

PANEL C. Macroeconomic and State-level indicators

This panel shows the summary statistics of interest rate and the growth rate of home price index and personal income across 51 U.S. states during pre, acute and post-crisis periods.

	Pre-Crisis Period					Acute-Crisis Period					Post-Crisis Period				
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Interest Rate (%)	18	2.82	1.66	0.92	4.98	7	1.92	1.52	0.21	4.32	7	0.13	0.04	0.06	0.17
Home Price Index Growth (%)	918	1.79	1.69	-2.72	11.1	357	-1.25	2.17	-12.94	4.10	357	-0.84	2.01	-11.34	8.19
Income Growth (%)	918	1.47	1.03	-8.05	11.14	357	0.37	2.01	-5.12	8.52	357	0.72	0.99	-4.27	3.88

See Table A2 for variable definitions.

The figures also show that community banks' reliance on non-interest income falls slightly over time. *Non-interest Income* share in total operating income is on average 14.57, 14.22 and 12.95 percent during the pre-, acute- and post-crisis periods, respectively for *Micro Community Banks*, whereas it stands at 17.68, 17.18 and 15.83 percent for *Non-Micro Community Banks* over the same periods.

In the second part of *PANELS A* & *B* the income shares of non-interest income activities (*Fiduciary Activities, Life Insurance, Other Insurance Services, Loan Servicing, Annuity Sales, Securities Brokerage* and *Investment Banking*) in total net operating income are presented for *Micro* and *Non-Micro Community Banks*. The descriptive statistics show that the income share for *Fiduciary Activities* reaches its highest value during the credit crisis at 0.16% and 0.85% for *Micro* and *Non-Micro Community Banks*, respectively and then it falls to 0.12% and 0.73% after the crisis. *Life Insurance* has a stable income share in total operating income for *Micro Community Banks* at around 0.39%, whereas *Non-Micro Community Banks* have experienced an up-ward trend in the contribution of *Life Insurance*'s income in total operating income reaching 0.74% after the crisis. The income share of *Other Insurance Services* in total operating income for both *Micro* and *Non-Micro Community Banks* declined during the post crisis period standing, at 0.40% and 0.39%, respectively. *Loan Servicing's* income contribution to total operating income for both *Micro* and *Non-Micro Community Banks* remains stable before and during the crisis, and increased thereafter to 0.25% and 0.45%. We have insufficient observations on the income share of *Annuity Sales*, *Securities Brokerage* and *Investment*

Banking before the crisis. For acute and post-crisis periods, however, the data show that they have a tiny weight in total operating income of *Micro Community Banks* and their share declined - during the post-crisis period - to 0.01%, 0.05% and 0.01%, respectively. *Non-Micro Community Banks* have also experienced a decline in the income share of these three businesses to 0.10%, 0.22% and 0.06%, respectively, after the crisis.

The third part of PANELS A & B also exhibits other elements of non-interest income businesses. *Venture Capital*'s income has a tiny weight in total operating income of both *Micro* and *Non-Micro Community Banks* during all three periods of study. *Service Charges* have an almost similar weight in total net operating income for both groups of banks in the pre-crisis period; however, the weight is slightly lower in the acute and post-crisis period for *Micro Community Banks* (from 8.71 to 8.68 and 8.20%, respectively), whereas its income share moderately increased for *Non-Micro Community Banks* in the acute-crisis from 8.23% to 8.92% and then fell to 8.72% in the post-crisis period. Income share of *Loan Sales* in total net operating income declined during the acute-crisis period and increased thereafter standing at 0.67% and 1.77% for *Micro* and *Non-Micro Community Banks*, respectively. *Trading* income makes a small contribution to total net operating income for both *Micro* and *Non-Micro Community Banks*. *Other Assets Sale*, on average, has a negative weight in total net operating income of *Micro Community Banks* during the post-crisis period. It also appears with a negative sign for *Non-Micro Community Banks* in both the acute and post-crisis periods.

Finally, the fourth part of PANELS A & B display the descriptive statistics for the *Unsecured Loans* breakdown for *Micro* and *Non-Micro Community Banks*, respectively. *Unsecured Loans* are classified into five main categories as follows: loans to finance agricultural production and other loans to farmers (*Agricultural Loans*), commercial and industrial loans (*C&I Loans*), consumer loans (*Consumer Loans*), loans to depository and non-depository financial institutions (*Financial Institution Loans*) and other loans not secured by

real estate (*Other Unsecured Loans*). All are scaled by total loans. For *Micro Community Banks*, *Agricultural Loans* are the major component of *Unsecured Loans* and others have a small weight in total loan portfolios. *Non-Micro Community Banks* have a different loan composition: *Agricultural Loans* after *C&I Loans* are the major type of *Unsecured Loans*. We also observe that the loan composition remains relatively stable across different study periods for both groups of community banks.

PANEL C shows that interest rates have fallen from 2.82% in the pre-crisis period to 1.92% and 0.13% during the acute and post crisis periods, respectively. The home price index, on average, has experienced a negative quarterly growth since the acute- and post- crisis periods, whereas it increased by 1.79% (on average across different U.S. states) before the crisis (January 2003 to June 2007). The quarterly growth rate of personal income has also fallen since the onset of the crisis but has increased modestly to 0.72% in the post-crisis period.

4. Empirical Results

4.1. CREDIT RISK MODEL

We estimate the *Credit Risk* model (Equation (1)) using our quarterly panel data and the fixed effects technique to investigate whether non-interest income activities have any significant impact on banks' loan quality. Table II presents the estimation results for 4,092 *Non-Micro Community Banks* and 3,293 *Micro Community Banks* during the study periods.

The first four columns present the results for *Non-Micro Community Banks* in the pre-crisis period. Column (1) illustrates the estimation where we regress the *Credit Risk* proxy on *Non-interest Income Activities*, namely, *Fiduciary Activities, Life Insurance, Other Insurance Services* and *Loan Servicing*[51] while controlling for macroeconomic, state-level and year fixed effect controls, (*Interest Rate*, *Home Price Growth*, *Income Growth* and year dummies). In

[51] We exclude Annuity, Brokerage and Investment Banking due to insufficient data in the pre-crisis period.

column (2), we try to capture heterogeneities caused by loans portfolio structure and other characteristics by adding *Unused Commitment*, *Loans Sale*, *Loan Growth* and *Unsecured Loans* to our model. We introduce *Capital*, *Spread* and *Inefficiency* to the model in column (3). Finally, *Size* and *Log(Age)* are controlled for in the fourth column. In all specifications the results show a significant and negative coefficient for *Fiduciary Activities* and *Life Insurance* implying that income from these businesses of activity appears to lower *Credit Risk*. The result is also economically meaningful. A one percent increase, evaluated at the mean, in the income share of *Fiduciary Activities* or *Life Insurance* in total net operating income lowers *Non-performing Loans*, on average, respectively by 0.012% and 0.011%. The average *Non-performing Loans* in the pre-crisis period is 0.30%, so the effects are economically significant and equal to 4% (4%=$\frac{0.012\%}{0.30\%}$) and 3.67% (3.67%=$\frac{0.011\%}{0.30\%}$) of the average *Non-performing Loans*. *Other Insurance Services* appears with a negative coefficient only in the last two specifications and merely at a ten percent significance level. *Loan Servicing* depicts no significant relationship with *Credit Risk*.

Among the control variables, *Unused Commitments* and *Loan Growth* are associated with lower *Credit Risk* which is in line with our expectations. An increase in the proportion of *Unsecured Loans* in total loans translates into higher *Credit Risk* (at the ten percent significance level), whereas we observe no significant relationship between *Loan Sales* and *Credit Risk*. More capitalized or inefficient banks are expected to have greater *Credit Risk*. *Spread* appears to have no link with our dependent variable. Larger or older banks have higher *Credit Risk*. We find that *Interest Rate* is positively correlated with *Credit Risk*. An increase in *Home Price Growth* lowers *Credit Risk*, whereas an increase in *Income Growth* increases *Credit Risk*.

In columns (5) and (6), we estimate our model for *Non-Micro Community Banks* in the acute and post-crisis periods where we include *Annuity Sales*, *Securities Brokerage* and *Investment Banking* in our model. The results show that the negative relationship between

Fiduciary Activities and *Credit Risk* persists across acute and post-crisis periods with different economic magnitudes. A one percent increase, evaluated at the mean, in the income share from *Fiduciary Activity* in total net operating income lowers *Non-performing Loans*, on average, by 0.076% and 0.089% during the acute and post-crisis periods, respectively. The effects equal to 5.24% and 3.05% of average *Non-performing Loans* in the respective periods. However, despite our finding for the pre-crisis period, *Life Insurance* depicts a positive correlation with *Credit Risk* in the acute-crisis period and no significant relationship thereafter. The negative linkage between *Other Insurance Services* and *Credit Risk* disappears in the acute-crisis period and reappears in the post-crisis at the ten percent significance level. *Annuity Sales* also displays a negative linkage with *Credit Risk* after the crisis period only at the ten percent significance level. *Securities Brokerage* and *Investment Banking* show no significant association with *Credit Risk* during and after the crisis.

Finally, columns (7) to (9) display estimations of our model for *Micro Community Banks* in the pre, acute and post-crisis periods, respectively. During the pre-crisis period, we only observe a negative relationship between *Other Insurance Services* and *Credit Risk* at the ten percent significance level - similar to our finding for *Non-Micro Community Banks*. In the crisis period, however, we find no significant relationship between any of our variables of interest and credit risk (namely, *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Annuity Sales*, *Securities Brokerage* and *Investment Banking*) and *Credit Risk)*. After the crisis, *Securities Brokerage* has a negative link with *Credit Risk* with a relatively large economic magnitude. A one percent increase, evaluated at the mean, in the income share of *Securities Brokerage* in total net operating income lowers *Non-performing Loans* on average, by 0.515%. The impact equals to 27.5% of average *Non-performing Loans* which must be interpreted with caveat and requires closer look.

Table II. Credit Risk Model

This table reports estimations of *Credit Risk* model (Equation (1)) using quarterly data of 4,092 *Non-Micro Community Banks* and 3,293 Micro Community Banks during pre, acute and post-crisis periods. *Non-Micro Community Banks* are defined as community banks with total assets above $100 million, whereas *Micro Community Banks* are banks with less than $100 million in total assets. We use *Non-performing Loans* as our *Credit Risk* proxy and regress it on our variables of interest and a set of control variables, using fixed effect technique.

In columns (1) to (6), we estimate the model for *Non-Micro Community Banks*. The first four columns present analysis for pre-crisis period. Column (1) illustrates the estimation of *Credit Risk* model where we regress the *Credit Risk* proxy on *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services* and *Loan Servicing* while controlling for macroeconomics, state-level and year fixed effect controls, i.e. *Interest Rate*, *Home Price Growth*, *Income Growth* and year dummies. In column (2), we add loan portfolio controls, i.e. *Unused Commitment*, *Loans Sale*, *Loan Growth* and *Unsecured Loans*. *Capital*, *Spread* and *Inefficiency* are introduced to the model in column (3). *Size* and *Log(Age)* are included in the fourth column. In columns (5) and (6), we estimate our model for acute and post-crisis periods, where we include *Annuity Sales*, *Securities Brokerage* and *Investment Banking*. Finally, columns (7) to (9) display estimations of our model for *Micro Community Banks* in pre, acute and post-crisis periods, respectively.

All the right-hand-side variables are lagged for one quarter. Year dummies are included in the model, but not reported in the table. Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

	Non-Micro Community Banks						Micro Community Banks		
	Pre-Crisis				Acute-Crisis	Post-Crisis	Pre-Crisis	Acute-Crisis	Post-Crisis
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Fiduciary Activities (β_1)	-0.013**	-0.013**	-0.014***	-0.012**	-0.076**	-0.089***	-0.016	0.078	-0.087
	(-2.45)	(-2.52)	(-2.77)	(-2.46)	(-2.50)	(-2.80)	(-1.30)	(1.38)	(-1.02)
Life Insurance (β_2)	-0.010*	-0.010*	-0.012**	-0.011**	0.053**	-0.008	0.002	0.025	0.000
	(-1.91)	(-1.88)	(-2.19)	(-1.97)	(2.02)	(-0.23)	(0.13)	(0.92)	(0.01)
Other Insurance Services (β_3)	-0.008	-0.008	-0.009*	-0.009*	0.036	-0.071*	-0.013*	-0.028	0.003
	(-1.54)	(-1.54)	(-1.80)	(-1.77)	(1.16)	(-1.66)	(-1.65)	(-1.53)	(0.07)
Loans Servicing (β_4)	0.005	0.003	0.004	0.003	-0.052	-0.006	0.010	-0.079	0.010
	(0.91)	(0.64)	(0.68)	(0.61)	(-1.50)	(-0.22)	(0.72)	(-1.16)	(0.19)
Annuity Sales (β_5)					-0.014	-0.202*		-0.031	0.325
					(-0.21)	(-1.74)		(-0.15)	(1.22)
Securities Brokerage (β_6)					-0.059	-0.004		0.045	-0.515***
					(-1.11)	(-0.05)		(0.33)	(-2.87)
Investment Banking (β_7)					-0.120	0.005		0.010	0.221
					(-1.00)	(0.03)		(0.05)	(0.50)
Unused Commitment (β_8)		-0.004**	-0.004**	-0.005***	-0.072***	-0.052***	0.002	-0.045**	-0.011
		(-2.42)	(-2.24)	(-2.71)	(-5.48)	(-3.46)	(0.66)	(-2.03)	(-0.66)
Loans Sale (β_9)		-0.003*	-0.002	-0.002	0.000	0.006	-0.004	0.013	0.007
		(-1.70)	(-1.40)	(-1.39)	(0.03)	(0.64)	(-0.74)	(0.54)	(0.55)
Loan Growth (β_{10})		-0.005***	-0.005***	-0.005***	-0.019***	-0.002	-0.008***	-0.009***	-0.007**
		(-8.02)	(-8.11)	(-7.75)	(-8.17)	(-0.64)	(-10.18)	(-3.86)	(-2.27)
Unsecured Loans (β_{11})		0.003**	0.003**	0.002*	0.002	-0.014***	0.006***	-0.004	-0.005
		(2.42)	(2.50)	(1.95)	(0.52)	(-2.80)	(3.20)	(-1.05)	(-0.92)
Capital (β_{12})			0.008**	0.008***	-0.058***	-0.218***	-0.001	-0.075***	-0.040
			(2.58)	(2.71)	(-3.02)	(-6.47)	(-0.08)	(-3.50)	(-1.33)
Spread (β_{13})			-0.002	0.004	-0.265***	-0.153**	-0.024	-0.221***	-0.225***
			(-0.11)	(0.25)	(-5.09)	(-2.51)	(-1.64)	(-3.84)	(-3.11)
Inefficiency (β_{14})			0.002***	0.003***	0.013***	0.005***	0.003***	0.005**	-0.000
			(3.18)	(4.34)	(8.48)	(2.69)	(3.87)	(2.42)	(-0.04)
Size (β_{15})				0.124***	0.102	-1.223***	0.011	-1.145***	-0.099
				(3.76)	(0.46)	(-3.35)	(0.13)	(-3.55)	(-0.24)
Log(Age) (β_{16})				0.123*	5.258***	4.697***	0.322***	6.128***	2.951**
				(1.81)	(8.37)	(6.54)	(2.95)	(5.61)	(2.55)
Interest Rate (β_{17})	0.048***	0.046***	0.045***	0.035***		5.887***	0.024***		3.160***
	(17.88)	(16.79)	(15.91)	(9.93)		(7.31)	(3.78)		(3.16)
Home Price Growth (β_{18})	-0.021***	-0.019***	-0.018***	-0.017***	-0.139***	0.016**	-0.035***	-0.057***	0.012
	(-7.23)	(-6.78)	(-6.46)	(-6.41)	(-12.29)	(2.44)	(-6.29)	(-3.74)	(1.49)
Income Growth (β_{19})	0.010***	0.010***	0.010***	0.010***	-0.065***	0.006	0.012***	-0.045***	-0.008
	(5.05)	(5.09)	(4.72)	(4.89)	(-9.79)	(0.43)	(3.24)	(-5.98)	(-0.50)
Constant (β_0)	0.100***	0.116***	0.122***	0.033	0.146	1.129***	0.031	-3.216***	-1.691***
	(7.77)	(8.50)	(8.36)	(1.24)	(1.07)	(5.63)	(0.33)	(-6.00)	(-2.74)
Observations	55,947	55,942	55,942	55,942	20,478	21,000	44,988	12,274	11,111
R-squared	0.093	0.098	0.100	0.102	0.206	0.070	0.022	0.071	0.015
Number of Banks	4,092	4,092	4,092	4,092	3,742	3,788	3,293	2,274	2,045

4.2. SPREAD MODEL

We estimate the *Spread* model (Equation (2)) to investigate whether *Non-interest Income Activities*[52] have any significant effect on *Spread*, especially in the form of cross-selling. Table III presents the estimation results using fixed effects and quarterly data of 4,092 *Non-Micro Community Banks* and 3,293 *Micro Community Banks*.

Columns (1) to (3) illustrate the regression estimations for *Non-Micro Community Banks* in the pre, acute and post-crisis. In the first column, we find little evidence of a link between any components of non-interest income activities (*Fiduciary Activities*, *Life Insurance*, *Other Insurance Services* and *Loan Servicing*)[53] and *Spread* before the crisis. During the crisis (column (2)), however, an increase in income share of Other *Insurance Services* increases the *Spread*. We only observe cross-selling in the post-crisis between *Loan Servicing* and *Spread*, as banks with higher income share of *Loan Servicing* in total net operating income have, ceteris paribus, a lower *Spread* suggesting that banks may under-price risk for the sake of higher *Loan Servicing* income. The economic impact is considerable. A one percent increase, evaluated at the mean, in income share of *Loan Servicing* in total net operating income lowers *Spread* by 33 basis points, which equal to 9.75% of average *Spread*. The relationship might also be driven by different loan compositions, namely, that banks with higher income share of *Loan Servicing* might issue more mortgage loans with lower *Spreads*.

[52] Scaled by total assets in lieu of total operating income to avoid the negative mechanical relationship with *Spread*.

[53] *Annuity Sales*, *Securities Brokerage* and *Investment Banking* are included in the model for acute and post-crisis analysis.

Table III. Spread Model

This table reports estimations of the *Spread* model (Equation (2)) using quarterly data of 4,092 *Non-Micro Community Banks* and 3,293 *Micro Community Banks* during the pre, acute and post-crisis periods. *Non-Micro Community Banks* are defined as community banks with total assets above $100 million, whereas *Micro Community Banks* are banks with less than $100 million in total assets.

We use net interest spread defined as [(total interest income/average total earning assets) – (total interest expense/average total interest-bearing liabilities)] as the proxy and regress it on *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Annuity Sales*, *Securities Brokerage* and *Investment Banking* which are scaled by total assets in lieu of total operating income, while controlling for *Unused Commitment*, loan portfolio characteristics (i.e. *Loan Asset Ratio*, *Unsecured Loans* and *Non-performing Loans*), capital and liabilities structures (i.e. *Core Deposits* and *Capital*), other bank-level heterogeneities (i.e. *Size* and *Log(Age)*) and finally macroeconomics, state-level and year fixed effect controls, i.e. *Interest Rate*, *Home Price Growth*, *Income Growth* and year dummies.

In columns (1) to (3), we study the relationship between Spread and our variables of interest using *Non-Micro Community Banks* sample in the pre, acute and post-crisis periods. Columns (4) to (6) display our analysis for *Micro Community Banks* during the same study periods. We exclude *Annuity Sales*, *Brokerage* and *Investment Banking* from our pre-crisis period analysis due to lack of sufficient observations. Moreover, for the acute-crisis period, we keep out the *Interest Rate* from our model, due to its high correlation with *Income Growth*.

We estimate our model using fixed effect technique. All the right-hand-side variables are lagged for one quarter. Year dummies are included in the model, but not reported in the table. Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

	Non-Micro Community Banks			Micro Community Banks		
	Pre-Crisis	Acute-Crisis	Post-Crisis	Pre-Crisis	Acute-Crisis	Post-Crisis
Variables	(1)	(3)	(5)	(2)	(4)	(6)
Fiduciary Activities (α_1)	-0.100	-0.120	-0.089	0.098	0.597**	0.157
	(-0.74)	(-0.44)	(-0.26)	(0.58)	(2.26)	(0.51)
Life Insurance (α_2)	-0.001	0.098	0.022	0.223	-0.009	-0.046
	(-0.01)	(0.56)	(0.14)	(1.32)	(-0.04)	(-0.32)
Other Insurance Services (α_3)	0.016	0.422**	0.078	0.755**	0.174	0.055
	(0.08)	(2.26)	(0.50)	(2.18)	(1.09)	(0.36)
Loans Servicing (α_4)	0.101	0.352	-0.332**	-0.117	-0.086	-0.238
	(0.75)	(1.11)	(-2.03)	(-0.63)	(-0.32)	(-0.74)
Annuity Sales (α_5)		0.763	0.288		-1.156	0.107
		(1.56)	(0.46)		(-0.71)	(0.10)
Securities Brokerage (α_6)		0.051	-0.636		0.241	-0.525
		(0.12)	(-0.89)		(0.28)	(-0.58)
Investment Banking (α_7)		0.313	2.705		2.431	-5.238*
		(0.43)	(1.33)		(1.08)	(-1.65)
Unused Commitment (α_8)	0.002	0.010***	-0.006*	0.002	0.005	0.002
	(1.03)	(3.56)	(-1.92)	(0.82)	(1.20)	(0.36)
Loan Asset Ratio (α_9)	0.018***	0.019***	0.022***	0.019***	0.018***	0.025***
	(14.38)	(13.00)	(15.09)	(12.41)	(9.94)	(12.37)
Unsecured Loans (α_{10})	0.002	-0.004*	0.001	-0.002	0.000	-0.003
	(1.01)	(-1.96)	(0.54)	(-1.43)	(0.10)	(-0.94)
Non-performing Loans (α_{11})	-0.005	-0.064***	-0.014***	-0.018***	-0.029***	-0.010***
	(-0.34)	(-14.80)	(-4.66)	(-3.57)	(-4.10)	(-2.79)
Core Deposits (α_{12})	0.006***	0.003**	0.004***	0.008***	0.005***	0.002
	(7.55)	(2.56)	(3.46)	(4.82)	(2.65)	(0.96)
Capital (α_{13})	0.035***	0.023***	0.004	0.019***	0.018**	0.006
	(7.88)	(4.37)	(0.76)	(3.69)	(2.13)	(0.63)
Size (α_{14})	-0.191***	-0.063	-0.444***	-0.421***	-0.192	-1.016***
	(-4.56)	(-0.64)	(-4.44)	(-5.84)	(-1.39)	(-4.19)
Log(Age) (α_{15})	0.648***	-1.124***	1.897***	0.442***	-0.904***	2.211***
	(8.46)	(-7.30)	(16.07)	(4.25)	(-3.12)	(10.59)
Interest Rate (α_{16})	-0.080***		3.040***	-0.035***		3.747***
	(-21.86)		(19.54)	(-7.87)		(15.13)
Home Price Growth (α_{17})	0.027***	0.009***	0.007***	0.025***	0.008*	0.011***
	(8.71)	(3.45)	(6.03)	(5.13)	(1.68)	(6.68)
Income Growth (α_{18})	-0.010***	-0.017***	-0.010***	-0.009***	-0.014***	-0.015***
	(-6.55)	(-8.68)	(-3.05)	(-5.30)	(-5.90)	(-2.86)
Constant (α_0)	-0.112***	-0.011	0.299***	-0.665***	0.248	-1.609***
	(-3.42)	(-0.17)	(5.14)	(-7.69)	(1.21)	(-4.97)
Observations	55,945	20,517	21,024	44,989	12,277	11,122
R-squared	0.219	0.123	0.271	0.168	0.093	0.242
Number of Banks	4,092	3,742	3,788	3,293	2,272	2,046

Our controls show that an increase in the share of total loans or core deposits in total assets (*Loan Asset Ratio* and *Core Deposits*) raises the *Spread*. *Unused Commitment* depicts a significantly positive association with *Spread* during the acute-crisis period. The relationship, however, turns into negative after the crisis at the ten percent significance level. *Unsecured Loans* appears with an insignificant coefficient during the periods of study. Higher *Credit Risk* is associated with lower *Spread* during and after the crisis. More capitalized banks have, on average, a larger *Spread* in the pre and acute-crisis periods. The relationship disappears after the crisis. We obtain a negative link between *Size* and *Spread* before and after the credit crisis. Older banks have, on average, a higher *Spread* in the pre and post-crisis period, but a lower *Spread* during the crisis. Higher *Interest Rate* is associated with a lower *Spread* before the crisis but higher *Spread* after the crisis. Higher growth of home price index (*Home Price Growth*) increases the *Spread*, while greater *Income Growth* lowers the *Spread*.

Columns (4) to (6) display the results for *Micro Community Banks*. We find little evidence to support cross-subsidization across different periods of study; however, we observe that before the crisis, a higher income share of *Other Insurance Services* in total net operating income is associated with a higher *Spread*. *Fiduciary Activities* also depicts a positive relationship with *Spread* during the acute-crisis period.

4.3. LOAN COMPOSITION MODEL

In this sub-section, we explore whether the degree of reliance on non-interest income activities has any significant effect on the composition of the loan portfolio. Table IV illustrates the regression results of estimating the *Loan Composition* model (Equation (3)) using fixed effects and quarterly data on 4,092 *Non-Micro Community Banks* and 3,294 *Micro Community Banks*.

Table IV. Loan Composition Model

This table reports estimations of the *Loan Composition* model (Equation (3)) using quarterly data of 4,092 *Non-Micro Community Banks* and 3,294 *Micro Community Banks* during the pre, acute and post-crisis periods. *Non-Micro Community Banks* are defined as community banks with total assets above $100 million, whereas *Micro Community Banks* are banks with less than $100 million in total assets.

We use the share of loans not secured by real estate in total loans portfolio (*Unsecured Loans*) as the proxy and regress it on *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Annuity Sales*, *Securities Brokerage* and *Investment Banking* scaled by total operating income, while controlling for capital and liabilities structures (i.e. *Core Deposits and Capital*), other bank-level heterogeneities (i.e. *Size and Log(Age)*) and finally macroeconomics, state-level and year fixed effect controls, i.e. *Interest Rate*, *Home Price Growth*, *Income Growth* and year dummies.

In columns (1) to (3), we study the relationship between *Unsecured Loans* and our variables of interest using *Non-Micro Community Banks* sample in the pre, acute and post-crisis periods. Columns (4) to (6) display our analysis for *Micro Community Banks* during the same study periods. We exclude *Annuity Sales*, *Securities Brokerage* and *Investment Banking* from our pre-crisis period analysis due to lack of sufficient observations. We also keep out the *Interest Rate* from our model, due to its high correlation with *Income Growth* in the acute-crisis period.

We estimate our model using fixed effect technique. All the right-hand-side variables are lagged for one quarter. Year dummies are included in the model, but not reported in the table. Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

	Non-Micro Community Banks			Micro Community Banks		
	Pre-Crisis	Acute-Crisis	Post-Crisis	Pre-Crisis	Acute-Crisis	Post-Crisis
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Fiduciary Activities (δ_1)	0.221**	-0.135*	-0.082	-0.012	0.045	-0.052
	(2.09)	(-1.94)	(-1.22)	(-0.11)	(0.26)	(-0.42)
Life Insurance (δ_2)	-0.009	-0.049	0.000	0.039	-0.051	-0.013
	(-0.13)	(-1.11)	(0.00)	(0.52)	(-0.86)	(-0.23)
Other Insurance Services (δ_3)	-0.041	-0.061	0.095**	0.122	-0.068	0.039
	(-0.59)	(-0.97)	(2.14)	(1.05)	(-0.87)	(0.56)
Loans Servicing (δ_4)	0.070	0.008	-0.037	-0.038	0.046	0.054
	(0.84)	(0.09)	(-0.62)	(-0.37)	(0.41)	(0.45)
Annuity Sales (δ_5)		0.182	0.267*		-0.437	-0.202
		(1.24)	(1.69)		(-1.54)	(-0.41)
Securities Brokerage (δ_6)		-0.082	-0.065		-0.063	-0.025
		(-0.72)	(-0.46)		(-0.35)	(-0.07)
Investment Banking (δ_7)		-0.164	0.383		-0.244	0.214
		(-0.45)	(0.56)		(-0.70)	(0.40)
Core Deposits (δ_8)	-0.013	0.014	-0.002	-0.002	-0.027***	-0.001
	(-1.05)	(1.29)	(-0.23)	(-0.24)	(-2.69)	(-0.07)
Capital (δ_9)	0.177***	0.060	0.077*	-0.089	-0.121	0.137**
	(2.60)	(1.58)	(1.66)	(-1.53)	(-0.93)	(2.00)
Size (δ_{10})	3.116***	1.156*	1.333**	-3.663***	-3.722**	1.293
	(4.90)	(1.94)	(2.51)	(-4.54)	(-2.04)	(1.25)
Log(Age) (δ_{11})	4.943***	4.367***	3.230***	2.023**	3.611***	3.546**
	(4.56)	(2.83)	(3.06)	(2.57)	(3.01)	(2.37)
Interest Rate (δ_{12})	-0.284***		-6.800***	0.463***		3.067
	(-6.10)		(-4.38)	(10.36)		(1.32)
Home Price Growth (δ_{13})	-0.008	0.038*	-0.016	-0.043	-0.000	0.029*
	(-0.21)	(1.73)	(-1.47)	(-1.07)	(-0.01)	(1.65)
Income Growth (δ_{14})	0.041*	0.052***	0.012	0.024	-0.035	0.051
	(1.90)	(3.23)	(0.27)	(1.33)	(-1.54)	(0.99)
Constant (δ_0)	-4.917***	-2.675***	-2.731***	-1.511	-1.513	4.894***
	(-10.39)	(-7.87)	(-8.81)	(-1.59)	(-0.68)	(3.83)
Observations	55,947	20,483	21,006	45,014	12,283	11,119
R-squared	0.030	0.010	0.009	0.026	0.019	0.006
Number of Banks	4,092	3,742	3,789	3,294	2,275	2,046

We study *Non-Micro Community Banks* in columns (1) to (3) for the pre, acute and post-crisis periods, respectively. Column (1) shows that an increase in the income share of *Fiduciary Activities* in total net operating income increases the share of *Unsecured Loans* in

total loans. The results are not only statistically significant but also economically meaningful. A one percent increase, evaluated at the mean, in income share of *Fiduciary Activities*, increases the weight of *Unsecured Loans* by 0.221%. The effect equals to an increase of 1.82% in the average share of *Unsecured Loans* in total loans. In the second column, the positive association of *Fiduciary Activities* and *Unsecured Loans* turns into negative at the ten percent significance level. We observe no significant links between any other component of *non-interest income* and the share of *Unsecured Loans* in total loans during the acute-crisis period. The result for the post-crisis period presented in column (3) displays a positive correlation between the income share of *Other Insurance Services* in total net operating income and the weight of *Unsecured Loans* in total loans. Economically, a one percent increase, evaluated at the mean, in the income share of *Other Insurance Services* increases the share of *Unsecured loans* by 0.095%. The magnitude equals to 0.76% of the average share of *Unsecured Loans* in total loans. *Annuity Sales* also displays a positive linkage with *Unsecured Loans* at the ten percent significance level. A one standard deviation increase in the income share of *Annuity Sales* increases the weight of *Unsecured Loans* in total loans by 0.027%, which is equal to 0.21% of the average share of *Unsecured Loans* in total loans.

The results for the control variables show no significant relationship between the share of *Core Deposits* in total assets and the share of *Unsecured Loans* in total loans. *Unsecured Loans* have a greater weight in total loans of more capitalized banks during the pre and post-crisis periods. An increase in *Size* or *Age* of banks is associated with an increase in the share of *Unsecured Loans* in total loans. Higher *Interest Rate* is negatively correlated with the share of *Unsecured Loans* in total loans. *Home Price Growth* depicts little linkage with the share of *Unsecured Loans* in total loans in the pre and post-crisis periods and appears with a positive coefficient during the acute-crisis period only at the ten percent significance level. *Income*

Growth is positively correlated with the weight of *Unsecured Loans* in total loans during the pre and acute-crisis periods.

Columns (4) to (6) exhibit the estimation results for *Micro Community Banks* during the three study periods. The results provide little evidence of a significant relationship between the income share of non-interest income activities in total net operating income and the weight of *Unsecured Loans* in total loans in pre, acute and post-crisis periods.

We also observe that in spite of our findings for *Non-Micro Community Banks*, an increase in *Size* of *Micro Community Banks* lowers the share of *Unsecured Loans* in total loans, during pre and acute-crisis periods. Moreover before the crisis, an increase in *Interest Rate* is associated with a lower share of *Unsecured Loans* in total loans which is in contrast with our results for *Non-Micro Community Banks*.

4.4. FURTHER ISSUES

4.4.a. Risk Adjusted Return

In order to understand whether any cross-subsidization of risk or/and return exists between interest income and *Non-interest Income Activities*, we compare their contributions to banks' risk-adjusted return. Several papers find that new business lines of non-interest income activities are more volatile but not necessarily more profitable than interest generating activities (DeYoung and Rice, 2004; Stiroh, 2004; Stiroh and Rumble, 2006; Stiroh, 2006; Baele et al., 2007; Lepetit et al., 2008a; De Jonghe, 2010; Demirguc and Huizinga, 2010 and Brunnermeier et al., 2011). Due to a relatively high correlation between interest and non-interest income activities, diversification benefits may be limited. As such, increased exposure to non-interest income activities can be found to reduce banks' risk-adjusted returns. This may force banks to behave more conservatively in lending so as to reduce overall risk. Boot and Schmeits (2000)

argue that in a multi-divisional bank the low-risk traditional banking division will subsidize the more risky transactional business.

In the extant literature, due to the lack of detailed data, the study of non-interest income was typically classified into a few categories; hence different business lines were treated similarly despite having different risk and return attributes. Before 2001, U.S. banks' reports on non-interest income consisted of service charges on deposit accounts, fiduciary income, trading revenue, other fee income and all other non-interest income. Stiroh (2004) uses this classification and finds that income from trading activity is volatile and that it lowers profit per unit of risk, while fiduciary income is more stable and increases banks' risk-adjusted return; *Service Charges* is highly correlated with net interest income, but trading and fiduciary incomes have lower correlation[54]. He claims that empirical evidence gives us little proof that non-interest income offers large diversification benefits in the form of more stable income. He also points out that cross-selling different products to a customer may expose different businesses of a bank to the same risk and concludes that selling more services to the same clients does not imply diversification benefits, when the demands of a given client for all the products are highly correlated.

Since 2001, U.S. banks are required to report their non-interest incomes in more detail which enables us to examine the relative importance of each non-interest income business line and its contribution to overall bank performance. For instance, using more detailed data on non-interest income, DeYoung and Torna (2013) find contrasting results regarding the impact of fee-based activities on bank default risk. They show that insurance sales and securities brokerage contribute to reduce the probability of bank failure during the 2008 crisis. They find

[54] Non U.S. studies typically make a distinction between two main components of non-interest income (fee & commission income and trading income). For instance, Lepetit et al. (2008b) show that higher fee and commission (but not trading activities) are associated with greater insolvency risk. Demirguc-Kunt and Huizinga (2010) find that a higher share of trading income in total operating income increases both risk and return, while non-trading non-interest income activities significantly increase risk without raising profitability.

that deposit service charges have an insignificant impact on default risk, while investment banking and venture capital income has a positive influence.

In this section, we examine how non-interest income activities contribute to banks' risk-adjusted return using our detailed data covering pre, acute and post-crisis periods. As in Stiroh (2004), we use a cross-section model for our analysis:

$$\begin{aligned}\text{Risk\_Adjusted\_Return}_i = {} & \theta_0 + \sum_{k=1}^{7} \theta_{1,k} \times \text{Non-interest\_Income\_Activities}_{k,i} + \\ & \theta_{1,8} \times \text{Service\_Charges}_i + \theta_{1,9} \times \text{Loan\_Sales}_i + \\ & \theta_{1,10} \times \text{Other\_Asset\_Sales}_i + \theta_{1,11} \times \text{Other\_Activities}_i + \\ & \theta_2 \times \text{Asset\_Growth}_i + \theta_3 \times \text{Capital}_i + \theta_4 \times \text{Spread}_i + \theta_5 \times \text{Size}_i + \theta_6 \times \text{Log(Age)}_i + \\ & \theta_7 \times \text{Home\_Price\_Growth}_j + \theta_8 \times \text{Personal\_Income\_Growth}_j + \zeta_i \end{aligned} \quad (8)$$

where the individual banks and states in which they operate are represented by i and j subscripts, respectively. In Equation (8), *Risk Adjusted Return* of U.S community banks is defined as a function of non-interest income components which are scaled by total operating income.

Risk Adjusted Return is represented by the ratio of the mean value of the return on average assets (*Return*) to the standard deviation of the return on average return (*Risk*), namely $\frac{Return}{Risk}$, for banks with at least 4 observations (*Risk Adjusted Return*). This proxy is frequently used in the existing literature (Stiroh, 2004; Stiroh and Rumble, 2006 among others). We control for bank and state-level variables, including *Spread* to disentangle the degree of reliance on non-interest income activities from banks' policies in determining the deposit-lending spread. We also try to capture other bank-level heterogeneities by introducing the growth rate of total assets (*Asset Growth*), *Capital*, *Size* and *Log(Age)* together with state-level control variables consisting of *Home Price Growth* and *Income Growth*.

Risk Adjusted Return, the non-interest income variables and controls are calculated over the whole pre, acute or post-crisis periods for banks with at least 4 consecutive observations. As such, we estimate Equation (8) using cross-section OLS technique with robust standard errors to tackle *heteroskedasticity* issues.

The results for *Non-Micro Community Banks* are presented in Table V. Columns (1) to (4) illustrate the estimation for the pre-crisis period. In column (1) we regress *Risk Adjusted Return* on the income share of non-interest income activities in total operating income (*Non-interest Income*) and the control variables. In line with the existing literature, we find a negative relationship between *Non-interest Income* and *Risk Adjusted Return*. *Asset Growth* and *Capital* appear with insignificant coefficients, whereas *Spread* displays a positive linkage with *Risk Adjusted Return*. The results also show a positive correlation of *Size* and *Log(Age)* with *Risk Adjusted Return*. Moreover, we observe that *Risk Adjusted Return* is negatively associated with *Home Price Growth.* Finally, *Income Growth* depicts no significant effect on *Risk Adjusted Return*.

We replace *Non-interest Income* with its components namely, *Fiduciary Activities, Life Insurance, Other Insurance Services, Loan Servicing, Service Charges, Loan Sales, Other Assets Sales* and *Other Activities*) in column (2). Interestingly, the negative link between *Non-interest Income* and *Risk Adjusted Return* derives from the link between income from *Loan Sales, Other Assets Sales* and *Other Activities*. Similar to the findings of Stiroh (2004), *Fiduciary Activities* have a positive coefficient. The result is not only significant, but also economically meaningful. A one percent increase, evaluated at the mean, in the income share of *Fiduciary Activities* in total operating income increases *Risk Adjusted Return* for 0.114. The average *Risk Adjusted Return* is 6.70, hence the effect equals to 1.70% of the average *Risk Adjusted Return*. The result also shows a negative relationship between *Life Insurance* and *Risk Adjusted Return* at the ten percent significance level. *Other Insurance Services* and *Loan Servicing* depict no significant relationship with the dependent variable. In columns (3) and (4), we replace *Risk Adjusted Return* with its two components, *Return* and *Risk*, respectively. *Fiduciary Activities* depicts no significant impact on *Return*; however, we observe its negative linkage with *Risk* at the ten percent significance level. *Life Insurance* lowers both *Return* and

Risk, while *Other Insurance Services* merely lower *Risk*. *Loan Servicing* displays a positive correlation with both *Return* and *Risk*.

The results also show that *Service Charges* significantly lower *Risk*. *Loan Sales* lowers *Return* but raises *Risk*. *Other Assets Sales* increase only *Risk* and *Other Activities* increases both *Return* and *Risk*.

Columns (5) to (8) exhibit the estimation results of Equation (8) for the acute-crisis period with the specifications of columns (1) to (4). *Non-interest Income* appears insignificant in column (5) despite the result for the pre-crisis period. Column (6) illustrates the contribution of different components of non-interest income, including our variables of interest, to *Risk Adjusted Return*. The results show that the positive relationship of *Fiduciary Activities* with *Risk Adjusted Return* disappears during the credit-crisis. We also observe that *Risk Adjusted Return* increases with the increase in the income share of *Securities Brokerage* which supports the findings of DeYoung and Torna (2013) and decreases when the income share of *Investment Banking* rises. Other variables of interest (*Life Insurance*, *Other Insurance Services*, *Loan Servicing* and *Annuity Sales*) display little correlation with *Risk Adjusted Return*. Moreover, the coefficient of *Other Assets Sales* turns into positive. *Service Charges* also shows a positive relationship with *Risk Adjusted Return* at the ten percent significance level. In columns (7) and (8), we observe that *Return* is positively linked to *Fiduciary Activities* and negatively associated with *Life Insurance*. *Securities Brokerage* also depicts a positive relationship with *Return* at the ten percent significance level. Moreover, *Risk* rises with an increase in the income share of *Loan Servicing* and declines as the income share of *Annuity Sales* in total operating income increases.

In columns (9) to (12) we re-estimate Equation (8) with specifications of columns (5) to (8) using the post-crisis period sub-sample. Similar to our finding for the acute-crisis period, *Non-Interest Income* appears with an insignificant coefficient.

Table V. Risk Adjusted Return Model – Non-Micro Community Banks

This table presents the estimation of *Risk Adjusted Return* model (Equation (8)) for *Non-Micro Community Banks*. *Non-Micro Community Banks* are defined as community banks with total assets above $100 million. We analyze the contribution of different sources of non-interest revenue generating activities in bank's risk adjusted return during the pre, acute and post-crisis periods.

The first four columns illustrate regression estimations for the pre-crisis period. Column (1) reports the regression of *Risk Adjusted Return* on *Non-interest Income* and control variables (*Asset Growth*, *Capital*, *Spread*, *Size* and *Log(Age)*, *Home Price Growth* and *Income Growth*). In column (2), *Non-interest Income* is replaced by its components (i.e. *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Service Charges*, *Loan Sales*, *Other Assets Sales* and *Other Activities*). In columns (3) and (4), we replace *Risk Adjusted Return* with *Return* and *Risk*, respectively. We re-estimate our model for acute and post-crisis periods, where we include *Annuity Sales*, *Securities Brokerage* and *Investment Banking* to the model. We use the same dependent variables, controls and the technique used in columns (1) to (4). The results are reported in columns (5) to (8) and (9) to (12), respectively.

We apply cross-section OLS technique with robust standard errors for our estimations. All the explanatory variables are averaged over the sample period. Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

	Pre-Crisis Period				Acute-Crisis Period				Post-Crisis Period			
	Risk Adjusted Return	Risk Adjusted Return	Return	Risk	Risk Adjusted Return	Risk Adjusted Return	Return	Risk	Risk Adjusted Return	Risk Adjusted Return	Return	Risk
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Non-interest Income (θ_1)	-0.051***				0.003				0.011			
	(-5.82)				(0.40)				(1.31)			
Fiduciary Activities ($\theta_{1,1}$)		0.114**	0.002	-0.002*		0.068	0.010**	-0.002		0.108*	0.009**	-0.004*
		(2.40)	(1.00)	(-1.65)		(1.40)	(2.57)	(-0.71)		(1.80)	(2.15)	(-1.88)
Life Insurance ($\theta_{1,2}$)		-0.196*	-0.028***	-0.007***		-0.118	-0.032***	-0.001		-0.128	-0.016*	-0.001
		(-1.76)	(-6.43)	(-2.97)		(-1.12)	(-4.54)	(-0.20)		(-1.19)	(-1.88)	(-0.26)
Other Insurance Services ($\theta_{1,3}$)		-0.093	-0.004	-0.003***		0.078	0.003	-0.004		0.088	0.005	-0.004
		(-1.55)	(-1.55)	(-2.94)		(0.97)	(0.78)	(-1.25)		(1.06)	(0.83)	(-1.10)
Loans Servicing ($\theta_{1,4}$)		-0.123	0.016***	0.007**		0.000	0.007	0.019**		-0.250***	0.006	0.010*
		(-1.43)	(3.15)	(2.24)		(0.00)	(0.72)	(2.30)		(-3.09)	(0.75)	(1.87)
Annuity Sales ($\theta_{1,5}$)						0.371	0.006	-0.041***		0.543	0.007	-0.022
						(1.08)	(0.36)	(-3.08)		(1.22)	(0.25)	(-1.29)
Securities Brokerage ($\theta_{1,6}$)						0.398**	0.019*	-0.008		-0.099	0.000	0.005
						(2.06)	(1.95)	(-0.94)		(-0.51)	(0.01)	(0.54)
Investment Banking ($\theta_{1,7}$)						-0.724***	0.013	-0.017		-0.522	0.047	-0.047**
						(-2.85)	(0.58)	(-1.12)		(-1.26)	(1.46)	(-2.38)
Service Charges ($\theta_{1,8}$)		0.030	-0.001	-0.003***		0.040*	0.003*	-0.003**		0.067***	0.002	-0.002**
		(1.49)	(-1.21)	(-4.67)		(1.84)	(1.74)	(-2.03)		(3.20)	(0.99)	(-2.21)
Loan Sales ($\theta_{1,9}$)		-0.213***	-0.004**	0.006***		-0.080**	-0.006	0.001		-0.019	0.004*	-0.003**
		(-7.81)	(-2.05)	(4.30)		(-2.30)	(-1.42)	(0.31)		(-0.83)	(1.81)	(-2.40)
Other Assets Sales ($\theta_{1,10}$)		-0.512***	0.016	0.022***		0.441***	0.093***	-0.053***		0.282***	0.054***	-0.023***
		(-3.50)	(1.62)	(2.64)		(6.42)	(8.68)	(-5.94)		(13.10)	(14.56)	(-9.78)
Other Activities ($\theta_{1,11}$)		-0.090***	0.004***	0.006***		-0.090***	-0.002	0.005**		-0.110***	-0.005*	0.011***
		(-4.67)	(2.88)	(6.17)		(-3.60)	(-0.79)	(2.07)		(-3.74)	(-1.88)	(5.64)
Asset Growth (θ_2)	-0.060	-0.021	-0.003	-0.005*	0.044	0.037	0.022***	-0.019***	0.656***	0.546***	0.091***	-0.033***
	(-1.28)	(-0.46)	(-0.90)	(-1.95)	(1.26)	(1.07)	(3.72)	(-4.54)	(14.36)	(12.03)	(15.06)	(-7.93)
Capital (θ_3)	-0.008	0.004	0.016***	0.006***	0.094**	0.093**	0.007	0.009***	0.268***	0.229***	0.041***	-0.009***
	(-0.25)	(0.12)	(7.29)	(4.40)	(2.55)	(2.50)	(1.56)	(2.71)	(6.16)	(5.38)	(8.49)	(-3.01)
Spread (θ_4)	0.954***	0.979***	0.179***	0.023***	0.967***	0.881***	0.182***	-0.005	1.388***	1.122***	0.214***	-0.027***
	(8.50)	(8.62)	(21.36)	(5.66)	(6.35)	(5.40)	(13.64)	(-0.45)	(8.56)	(6.96)	(13.83)	(-2.87)

Size (θ_5)	1.011***	1.031***	0.028***	-0.014***	-0.355***	-0.353***	-0.042***	0.055***	-0.452***	-0.396***	-0.048***	0.021***
	(9.67)	(9.73)	(6.21)	(-5.53)	(-3.64)	(-3.57)	(-4.62)	(6.03)	(-4.14)	(-3.54)	(-4.44)	(2.95)
Log(Age) (θ_6)	0.411***	0.291***	0.032***	-0.006*	1.170***	1.006***	0.108***	-0.067***	1.611***	1.394***	0.141***	-0.058***
	(4.33)	(2.95)	(5.83)	(-1.80)	(13.50)	(11.11)	(12.52)	(-9.38)	(17.27)	(13.67)	(15.95)	(-10.58)
Home Price Growth (θ_7)	-0.022***	-0.016***	-0.000	-0.000	-0.018***	-0.016***	-0.001***	0.001***	-0.003	-0.001	0.000	0.000
	(-6.69)	(-4.85)	(-1.26)	(-1.29)	(-5.26)	(-4.66)	(-2.78)	(4.04)	(-0.60)	(-0.23)	(0.26)	(0.25)
Income Growth (θ_8)	-0.163	-0.679**	0.071***	0.038***	2.151***	1.976***	0.109***	-0.023	0.007	-0.170	0.198***	-0.088***
	(-0.60)	(-2.38)	(4.76)	(4.92)	(7.73)	(7.23)	(5.27)	(-1.52)	(0.01)	(-0.34)	(4.40)	(-3.32)
Constant (θ_0)	-5.426***	-6.149***	-0.767***	0.157***	3.823***	4.440***	-0.106	-0.459***	-3.165*	-1.443	-1.125***	0.435***
	(-3.53)	(-4.00)	(-10.50)	(4.22)	(2.62)	(3.12)	(-0.76)	(-3.58)	(-1.90)	(-0.89)	(-7.01)	(4.26)
Observations	3,613	3,613	3,613	3,613	3,453	3,453	3,453	3,453	3,537	3,537	3,537	3,537
R-squared	0.070	0.087	0.317	0.129	0.109	0.124	0.288	0.131	0.184	0.211	0.534	0.277

The result in column (10) shows that the positive relationship between (the income share of) *Fiduciary Activities* and *Risk Adjusted Return* in the pre-crisis period has partly reversed in the post-crisis through increasing *Return* and decreasing *Risk*. An increase in (income share of) *Loan Servicing* is associated with lower *Risk Adjusted Return* due to its positive association with *Risk*. The significant relationships of *Securities Brokerage* and *Investment Banking* with *Risk Adjusted Return* in the acute-crisis period disappear during the post-crisis period; although we observe a negative association between (income share of) *Investment Banking* and *Risk*. We observe little evidence of any link between other our variables of interest (*Life Insurance*, *Other Insurance Services* and *Annuity Sales*) and *Risk Adjusted Return*.

We also find that *Service Charges* increase *Risk Adjusted Return* by lowering *Risk*. *Loan Sales*, however, does not display a significant relationship with *Risk Adjusted Return*, although it decreases *Risk* and increases *Return* at the ten percent significance level. The findings on *Other Assets Sales* and *Other Activities* are similar to our results for the acute-crisis period.

We also explore the relationship between non-interest income activities and *Risk Adjusted Return* for *Micro Community Banks*. The results are presented in Table VI. The first four columns illustrate the estimation for the pre-crisis period. In the first column, similarly to *Non-Micro Community Banks*, *Non-interest Income* appears with a negative coefficient. In the second column, *Fiduciary Activities* and *Loan Servicing* appear with negative coefficients; however, we find that *Other Insurance Services* is positively correlated with *Risk Adjusted Return*.

The results also show insignificant relationship between *Service Charges* and *Risk Adjusted Return*. *Loan Sales, Other Assets Sales* and *Other Activities* display a negative linkage with *Risk Adjusted Return* which is similar to our finding for *Non-Micro Community Banks*.

Table VI. Risk Adjusted Return Model – Micro Community Banks

This table presents the estimation of *Risk Adjusted Return* model (Equation (8)) for *Micro Community Banks*. *Micro Community Banks* are defined as community banks with less than $100 million in total assets. We analyze the contribution of different sources of non-interest revenue generating activities in bank's risk adjusted return during the pre, acute and post-crisis periods.

The first four columns illustrate regression estimations for the pre-crisis period. Column (1) reports the regression of *Risk Adjusted Return* on *Non-interest Income* and control variables (*Asset Growth*, *Capital*, *Spread*, *Size* and *Log(Age)*, *Home Price Growth* and *Income Growth*). In column (2), *Non-interest Income* is replaced by its components (i.e. *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Service Charges*, *Loan Sales*, *Other Assets Sales* and *Other Activities*). The first four components are our variables of interest. In columns (3) and (4), we replace *Risk Adjusted Return* with *Return* and *Risk*, respectively. We re-estimate our model for acute and post-crisis periods, where we include *Annuity Sales*, *Securities Brokerage* and *Investment Banking* to the model. We use the same dependent variables, controls and the technique used in columns (1) to (4). The results are reported in columns (5) to (8) and (9) to (12), respectively.

We apply cross-section OLS technique with robust standard errors for our estimations. All the explanatory variables are averaged over the sample period. Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

	Pre-Crisis Period				Acute-Crisis Period				Post-Crisis Period			
	Risk Adjusted Return	Risk Adjusted Return	Return	Risk	Risk Adjusted Return	Risk Adjusted Return	Return	Risk	Risk Adjusted Return	Risk Adjusted Return	Return	Risk
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Non-interest Income (θ_1)	-0.052***				-0.017				-0.021*			
	(-6.26)				(-1.49)				(-1.93)			
Fiduciary Activities ($\theta_{1,1}$)		-0.144**	0.017	0.007		-0.083	-0.000	0.006		-0.284***	-0.012	0.031**
		(-1.98)	(1.20)	(1.20)		(-0.94)	(-0.03)	(0.66)		(-3.76)	(-0.73)	(2.17)
Life Insurance ($\theta_{1,2}$)		-0.085	-0.003	-0.003		0.076	-0.000	-0.010		-0.076	-0.009	-0.007
		(-1.10)	(-0.47)	(-0.77)		(0.63)	(-0.03)	(-1.51)		(-0.57)	(-0.92)	(-1.48)
Other Insurance Services ($\theta_{1,3}$)		0.130**	0.022***	-0.001		0.249***	0.025***	0.000		0.180**	0.028***	-0.005
		(2.54)	(4.08)	(-0.45)		(2.58)	(4.12)	(0.09)		(2.11)	(4.49)	(-1.59)
Loans Servicing ($\theta_{1,4}$)		-0.307***	-0.008	0.015***		-0.275**	0.016	0.014		-0.154	0.009	0.008
		(-3.66)	(-0.68)	(2.74)		(-2.10)	(0.80)	(1.28)		(-1.25)	(0.39)	(0.86)
Annuity Sales ($\theta_{1,5}$)						0.272	0.058	-0.062**		-0.255	-0.100	0.120
						(0.28)	(0.97)	(-2.29)		(-0.19)	(-0.93)	(1.55)
Securities Brokerage ($\theta_{1,6}$)						0.461	0.020	-0.020		-0.391	0.010	0.002
						(0.98)	(0.52)	(-1.22)		(-0.78)	(0.22)	(0.09)
Investment Banking ($\theta_{1,7}$)						0.076	-0.027	0.065		-0.137	-0.067	-0.044
						(0.10)	(-0.42)	(0.95)		(-0.10)	(-0.68)	(-1.26)
Service Charges ($\theta_{1,8}$)		-0.017	-0.002	0.001		0.000	-0.002	0.000		-0.021	-0.008***	0.001
		(-1.04)	(-1.03)	(1.18)		(0.01)	(-0.79)	(0.28)		(-0.84)	(-3.24)	(0.67)
Loan Sales ($\theta_{1,9}$)		-0.200***	-0.011*	0.009***		-0.246***	-0.030**	0.020***		-0.185***	-0.009	0.006*
		(-6.66)	(-1.93)	(3.06)		(-4.33)	(-2.39)	(2.61)		(-5.56)	(-1.43)	(1.69)
Other Assets Sales ($\theta_{1,10}$)		-0.242**	0.003	0.016		0.283***	0.081***	-0.031		0.282***	0.077***	-0.030***
		(-2.04)	(0.22)	(1.59)		(2.68)	(3.18)	(-1.54)		(8.72)	(10.62)	(-7.64)
Other Activities ($\theta_{1,11}$)		-0.104***	0.002	0.012***		-0.118***	-0.007	0.022***		-0.170***	-0.016***	0.015***
		(-4.94)	(0.67)	(6.31)		(-4.69)	(-1.03)	(5.54)		(-4.72)	(-2.59)	(4.77)
Asset Growth (θ_2)	0.009	0.028	0.007	-0.006	0.072	0.058	0.017**	-0.010*	0.298***	0.190***	0.057***	-0.029***
	(0.23)	(0.65)	(0.96)	(-1.57)	(1.56)	(1.30)	(1.99)	(-1.79)	(5.01)	(3.21)	(5.85)	(-6.27)
Capital (θ_3)	0.117***	0.115***	0.026***	0.005***	0.116***	0.115***	0.025***	0.004*	0.246***	0.227***	0.027***	-0.001
	(6.11)	(5.86)	(8.50)	(3.84)	(3.92)	(3.84)	(6.38)	(1.79)	(6.52)	(6.01)	(6.01)	(-0.34)
Spread (θ_4)	0.539***	0.524***	0.126***	0.020***	0.685***	0.632***	0.161***	-0.005	1.105***	1.001***	0.186***	-0.018

	(5.93)	(5.79)	(10.29)	(3.28)	(5.09)	(4.64)	(9.20)	(-0.56)	(6.54)	(6.08)	(8.31)	(-1.64)
Size (θ_5)	1.566***	1.662***	0.112***	-0.048***	1.698***	1.758***	0.118***	-0.038***	1.940***	2.171***	0.151***	-0.040***
	(13.02)	(13.83)	(8.24)	(-6.67)	(8.22)	(8.40)	(5.66)	(-2.62)	(8.16)	(8.82)	(6.25)	(-3.08)
Log(Age) (θ_6)	0.533***	0.477***	0.069***	-0.016***	1.088***	0.952***	0.118***	-0.047***	1.360***	1.119***	0.174***	-0.062***
	(6.00)	(5.34)	(7.56)	(-3.39)	(9.34)	(8.22)	(7.78)	(-4.66)	(11.75)	(9.22)	(10.30)	(-6.96)
Home Price Growth (θ_7)	-0.007**	-0.004	0.001***	0.000	-0.015***	-0.014***	-0.000	0.001**	-0.004	-0.003	-0.001	0.001*
	(-2.51)	(-1.49)	(2.61)	(0.45)	(-3.78)	(-3.50)	(-0.39)	(2.50)	(-0.62)	(-0.46)	(-0.77)	(1.83)
Income Growth (θ_8)	-0.666***	-1.003***	0.074***	0.058***	1.163***	0.923***	0.129***	-0.010	0.068	-0.105	0.077*	-0.045*
	(-2.58)	(-3.77)	(3.03)	(4.33)	(4.51)	(3.61)	(4.60)	(-0.55)	(0.16)	(-0.26)	(1.96)	(-1.95)
Constant (θ_0)	-14.754***	-15.674***	-1.996***	0.489***	-19.080***	-19.012***	-2.225***	0.566***	-28.169***	-28.305***	-2.942***	0.810***
	(-8.73)	(-9.31)	(-11.41)	(5.35)	(-7.01)	(-6.86)	(-7.73)	(2.87)	(-8.70)	(-8.57)	(-8.38)	(4.58)
Observations	2,849	2,849	2,849	2,849	2,085	2,085	2,085	2,085	1,885	1,885	1,885	1,885
R-squared	0.084	0.102	0.171	0.124	0.080	0.101	0.206	0.121	0.113	0.148	0.428	0.281

In columns (3) and (4), we replace *Risk Adjusted Return* with *Return* and *Risk* and find that *Fiduciary Activities* have little association with *Return* and *Risk*, despite its negative correlation with *Risk Adjusted Return* in the second column. Banks with greater (income share of) *Other Insurance Services* in total net operating income have on average, a higher *Return*, while banks with a higher income weight of *Loan Servicing* in total net operating income have, on average, a higher *Risk*.

Columns (5) to (8) report the estimation results for the acute-crisis period. In column (5), *Non-interest Income* shows an insignificant relationship with *Risk Adjusted Return*, contrary to our finding in the pre-crisis period. Column (6) provides more details on this finding: the coefficient of *Other Assets Sales* turns into positive cancelling out the negative impact of *Loan Sales* and *Other Activities*. Among our variables of interest, *Fiduciary Activities*, *Life Insurance*, *Annuity Sales*, *Securities Brokerage* and *Investment Banking* depict little association with *Risk Adjusted Return*. *Other Insurance Services* raise *Risk Adjusted Return*, while *Loan Servicing* lowers it. In columns (7) and (8), we use *Return* and *Risk* in lieu of *Risk Adjusted Return*. The results, however, show that banks with higher (income share of) *Other Insurance Services* in total net operating income have, on average, a higher *Return* and banks with greater income share of *Annuity Sales* in total operating income have on average a lower *Risk*. We observe no significant relationship of other variables of interest with *Return* and *Risk*.

Columns (9) to (12) show the results for the post-crisis period. *Non-interest Income* appears with a negative coefficient at the ten percent significance level. In column (10), we replace *Non-interest Income* with its major components. Among our variables of interest, *Fiduciary Activities* depicts a negative relationship with *Risk Adjusted Return*, while *Other Insurance Services* shows a positive linkage with the dependent variable. The other variables of interest are not significant. In columns (11) and (12), we replace *Risk Adjusted Return* with

Return and *Risk*, respectively. We find that an increase in (the income share of) *Fiduciary Activities* (in total operating income) increases *Risk* without significantly impacting *Return*. Banks with a higher (income share of) *Other Insurance Services* have on average, a higher *Return*. We observe little evidence of any link between the income share of other variables of interest with *Return* and *Risk*.

4.4.b. Distressed Banks Analysis

In this sub-section, we compare the features of the non-interest income activities of banks that failed since the crisis, to see if any lessons can be learned about risk-taking and non-traditional banking business.

We collect data on banks which failed in 2007-2010 from the web-site of the FDIC and present the descriptive statistics including features of non-interest income activities during their last 12 quarters of operation in Table VII. The sample consists of 54 *Micro Community Banks* and 216 *Non-Micro Community Banks*.

Table VII shows that *Non-performing Loans* increased considerably for both *Micro* and *Non-Micro Community Banks* (and at a greater rate for the latter group). *Non-performing Loans* of *Micro Community Banks* increased from 1.49% in the first quarter to 11.88% in the last quarter, while it increased for *Non-Micro Community Banks* from 0.83% in the first quarter to 15.98% in the last quarter of their operation. *Spreads* fell over time, while the *Inefficiency* measure experienced an up-ward trend for both types of banks. Both *Loan* and *Asset Growth* declined during the last 12 quarters. *Loan Growth* turned negative five quarters before failure, and total assets started to shrink in the last three quarters. The share of *Core Deposits* in total assets of *Micro Community Banks* remained relatively stable until the last two quarters and increased thereafter. *Non-Micro Community Banks* experienced a different trend. The share of their *Core Deposits* in total assets experienced a downward trend until the last five quarters and then slightly increased afterward. The share of loans in total assets (*Loan Asset Ratio*) fell in the

last five quarters, whereas the proportion of *Unsecured Loans* in total loans experienced a stable trend. Failed *Micro Community Banks* are on average older than *Non-Micro Community Banks*. They are, on average, 53 years old in their last quarter of operation, while the average age of failed *Non-Micro Community Banks* in their last quarter of operation is 31. *Return* sharply drops during their last three years of operation and at a higher rate for *Micro Community Banks*. Share of *Non-Interest Income* in total operating income of *Micro* and *Non-Micro Community Banks* starts to sharply decline in the last three quarter respectively to -11.25% and -2.91% in the last quarter. Such a trend, at a first glance, suggests that non-interest income activities are volatile possibly due to their low switching costs as claimed by the existing literature (for instance DeYoung and Roland, 2001).

The second part of the table illustrates trends in non-interest income components. For *Micro Community Banks*, income from *Fiduciary Activities*, *Life Insurance* and *Loan Servicing* experience an up-ward trend until the final quarter. *Other Insurance Services* experiences a different trend, with income from this source remaining almost stable until the last two quarters after which the share in total operating income falls. Other components (*Annuity Sales*, *Securities Brokerage* and *Investment Banking*) have a tiny weight in total net operating income. The analysis of *Non-Micro Community Banks* show that (the income shares of) *Fiduciary Activities*, *Loan Servicing*, *Annuity Sales* and *Securities Brokerage* (in total net operating income) all experience an increase until the last quarter. The income share of *Life Insurance* even continues to increase in the final quarter. *Other Insurance Services* and *Investment Banking*, however, experience declining trends over the final four quarters.

Table VII. Descriptive Statistics – Failed Banks

PANEL A. U.S. Micro Community Banks

General descriptive statistics and non-interest income activities in the last 12 quarters of 54 U.S. *Micro Community Banks* failed during 2007-2010. *Micro Community Banks* are defined as banks with less than $100 million in total assets.

		Last Quarter	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6	Lag 7	Lag 8	Lag 9	Lag 10	Lag 11	Average
General Descriptive Statistics	Total Assets (mil.$)	58	62	65	66	67	116	100	99	95	95	91	89	83
	Non-performing Loans (%)	11.88	9.89	8.48	7.58	6.83	4.71	4.19	3.56	2.86	2.93	2.16	1.49	5.55
	Capital (%)	1.69	5.05	6.57	7.77	8.74	9.73	10.45	11.18	11.72	11.63	11.82	11.37	8.98
	Spread (%)	2.95	2.98	2.97	3.04	3.15	3.14	3.17	3.27	3.45	3.48	3.65	3.79	3.25
	Inefficiency (%)	263	329	161	136	123	118	105	96	94	93	87	83	141
	Loan Growth (%)	-7.35	-3.47	-3.05	-1.33	-0.33	1.64	2.49	2.26	4.16	3.04	1.23	2.06	0.11
	Asset Growth (%)	-6.22	-2.77	-1.91	0.25	1.40	0.32	1.45	4.31	0.79	1.81	0.94	2.55	0.24
	Core Deposits (%)	62.42	59.72	57.41	56.76	56.74	57.86	58.63	58.57	58.41	57.63	57.22	56.43	58.15
	Loan Asset Ratio (%)	67.22	68.98	69.98	70.82	71.48	72.57	71.32	70.78	72.48	71.17	70.79	71.13	70.73
	Unsecured Loans (%)	6.96	7.33	7.82	7.67	6.89	7.25	7.36	7.88	6.82	6.90	7.19	7.34	7.28
	Age	53.46	53.23	53.00	52.76	52.54	52.33	52.19	51.97	51.74	51.60	51.44	51.08	52.28
	Return (%)	-5.27	-2.59	-1.96	-1.54	-1.24	-0.77	-0.52	-0.20	-0.18	-0.03	0.13	0.27	-1.16
	Non-interest Income (%)	-11.25	-4.79	8.65	13.76	13.88	16.55	13.81	15.35	14.41	13.46	12.00	12.12	9.83
Non-interest Income Activities	Fiduciary Activities (%)	0.00	0.15	0.14	0.11	0.12	0.09	0.09	0.17	0.16	0.14	0.08	0.08	0.11
	Life Insurance (%)	0.40	0.58	0.40	0.38	0.28	0.31	0.29	0.27	0.23	0.23	0.24	0.25	0.32
	Insurance Services (%)	0.16	0.15	0.21	0.17	0.18	0.18	0.19	0.12	0.10	0.09	0.13	0.13	0.15
	Loan Servicing (%)	0.53	0.77	0.53	0.41	0.47	0.58	0.47	0.35	0.34	0.30	0.26	0.20	0.43
	Annuity Sales (%)	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.01
	Securities Brokerage (%)	0.01	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.01
	Investment Banking (%)	0.02	0.01	0.01	0.01	0.04	0.02	0.02	0.03	0.03	0.00	0.00	0.00	0.02
Other Non-interest Income Activities	Venture Capital (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Service Charges (%)	12.21	12.96	9.35	8.70	8.10	7.78	7.09	6.55	6.90	7.19	7.24	7.20	8.44
	Trading (%)	0.00	0.00	0.00	0.00	0.00	0.14	0.16	-0.07	0.02	0.00	0.00	0.00	0.02
	Loan Sales (%)	1.54	1.16	0.85	2.04	1.94	1.87	1.29	1.19	1.16	1.22	1.24	1.71	1.43
	Other Assets (%)	-31.76	-26.93	-7.81	-2.65	-3.95	-0.25	0.18	0.63	0.20	0.01	0.02	-0.01	-6.03
	Other Activities (%)	5.44	6.39	3.61	3.51	4.08	3.54	2.93	3.82	3.23	3.29	2.46	2.77	3.76

See Table A2 for variable definitions.

PANEL B. U.S. Non-Micro Community Banks

General descriptive statistics and non-interest income activities in the last 12 quarters of 216 *Non-Micro Community Banks* failed during 2007-2010. *Non-Micro Community Banks* are defined as community banks with total assets above $100 million.

		Last Quarter	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6	Lag 7	Lag 8	Lag 9	Lag 10	Lag 11	Average
General Descriptive Statistics	Total Assets (mil.$)	538	557	566	579	579	580	575	568	548	536	534	522	557
	Non-performing Loans (%)	15.98	13.73	11.72	9.49	7.59	5.44	4.04	3.02	2.12	1.57	1.20	0.83	6.39
	Capital (%)	2.06	4.16	5.78	6.93	7.75	8.56	9.01	9.34	9.62	9.70	9.67	9.55	7.68
	Spread (%)	2.44	2.51	2.65	2.80	2.94	3.11	3.24	3.40	3.52	3.57	3.63	3.75	3.13
	Inefficiency (%)	215	237	147	120	108	90	83	77	74	72	69	68	113
	Loan Growth (%)	-5.74	-4.86	-3.14	-1.66	-0.89	0.23	1.66	2.38	3.22	3.24	4.08	4.12	0.22
	Asset Growth (%)	-4.73	-3.09	-1.49	0.04	0.23	1.41	1.80	2.88	2.91	2.41	2.87	3.35	0.72
	Core Deposits (%)	52.53	51.01	49.66	48.84	48.18	47.22	47.85	48.27	48.91	49.99	50.87	51.40	49.56
	Loan Asset Ratio (%)	69.44	70.55	72.23	73.70	75.29	76.39	77.28	77.61	78.08	77.88	77.54	77.38	75.28
	Unsecured Loans (%)	7.28	7.02	7.12	7.05	7.25	7.21	7.39	7.03	6.79	6.56	6.56	6.20	6.95
	Age	31.16	30.91	30.64	30.43	30.20	29.96	29.74	29.55	29.32	29.48	29.27	29.06	29.97
	Return (%)	-3.50	-2.65	-1.71	-1.17	-0.79	-0.27	-0.05	0.11	0.27	0.38	0.47	0.52	-0.70
	Non-interest Income (%)	-2.91	3.19	8.55	12.44	12.91	13.58	14.02	13.04	12.61	12.66	12.77	12.57	10.45
Non-interest Income Activities	Fiduciary Activities (%)	0.23	0.40	0.35	0.32	0.36	0.26	0.26	0.26	0.26	0.24	0.24	0.22	0.28
	Life Insurance (%)	1.26	1.25	0.89	0.85	0.82	0.65	0.58	0.49	0.45	0.41	0.31	0.30	0.69
	Insurance Services (%)	0.05	0.06	0.10	0.10	0.14	0.16	0.16	0.18	0.15	0.14	0.10	0.13	0.12
	Loan Servicing (%)	0.59	0.65	0.64	0.60	0.55	0.42	0.40	0.36	0.33	0.28	0.25	0.23	0.44
	Annuity Sales (%)	0.04	0.08	0.08	0.05	0.07	0.06	0.05	0.05	0.03	0.04	0.03	0.03	0.05
	Securities Brokerage (%)	0.15	0.27	0.23	0.17	0.23	0.19	0.19	0.22	0.16	0.17	0.15	0.14	0.19
	Investment Banking (%)	0.02	0.02	0.02	0.02	0.05	0.03	0.04	0.04	0.04	0.03	0.01	0.01	0.03
Other Non-interest Income Activities	Venture Capital (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Service Charges (%)	11.11	10.80	8.12	7.29	7.01	6.01	5.61	5.51	5.32	5.16	5.08	4.95	6.83
	Trading (%)	0.00	0.01	0.00	0.00	0.00	0.22	0.25	-0.11	0.05	0.00	0.00	0.00	0.03
	Loan Sales (%)	2.00	2.23	2.06	2.16	2.36	1.91	1.88	1.75	1.63	1.56	1.82	1.97	1.94
	Other Assets (%)	-26.21	-20.75	-8.83	-3.95	-3.86	-0.94	-0.23	-0.17	-0.06	0.04	0.08	0.05	-5.40
	Other Activities (%)	7.22	6.68	4.30	4.48	4.23	3.95	3.88	3.89	3.74	3.88	4.00	3.72	4.50

See Table A2 for variable definitions.

The third part of the table shows the main components of other non-interest income components, (*Venture Capital*, *Service Charges*, *Trading*, *Loan Sales*, *Other Assets Sales* and *Other Activities*). Venture Capital has a tiny weight in total net operating income for both distressed *Micro* and *Non-Micro Community Banks*. *Service Charges* have an up-ward trend for both *Micro* and N*on-Micro Community Banks*. *Trading* has a small income share in total net operating income. *Loan Sales* has almost a stable trend during the 12 quarters prior to failure. The income share of *Other Assets Sales* in total operating income has sharply dropped from -0.01 to -31.76 percent in the last quarter. We observe a similar trend for *Non-Micro Community*

Banks. The income share of their *Other Assets Sales* has dropped from 0.05 to -26.21 percent. *Other Activities* increased during the period. The figures show that only *Other Assets Sales* - which may represent fire-sale - has considerably declined during the last three years of failed banks' operation. It also explains the decline in *Non-interest Income* in the first part of the table. Overall, the figures show that while *Non-performing Loans* of distressed banks increased noticeably during their last twelve quarters of operation, the share of non-interest income activities in total operating income is rather steady with a slight up-ward trend, except for other insurance services and investment banking which experienced a relatively moderate decline in their share during the last four quarters.

4.4.c. Cost Complementarities

The linkage of *various* non-interest income activities with loan quality, composition and spreads may be due to informational and/or cost synergies. In this section, we investigate whether a pair-wise cost complementarity exists between lending and non-interest income activities that explains their joint production[55]. As such, we examine whether the marginal cost of producing loans decreases when they are generated jointly with various non-interest income activities. For this purpose, using the intermediary approach (Berger and Mester, 1997 among others), we set-up the following multi-product cost function with a trans-logarithmic functional form (Berndt and Christensen, 1973):

$$\begin{aligned} LnTC \;=\; & C_0 + \sum_{i=1}^{6} \alpha_i LnY_i \;+\; \sum_{j=1}^{3} \beta_j LnW_j + \gamma_1 LnZ + \tau_1 Trend \\ & + \frac{1}{2}\left[\sum_{i=1}^{6}\sum_{k=1}^{6} \delta_{i,k} LnY_i LnY_k + \sum_{j=1}^{3}\sum_{l=1}^{3} \theta_{j,l} LnW_j LnW_l + \gamma_2 (LnZ)^2 + \tau_2 Trend^2\right] \\ & + \sum_{i=1}^{6}\sum_{j=1}^{3} \mu_{i,j} LnY_i LnW_j + \sum_{i=1}^{6} \vartheta_i LnY_i\, LnZ \;+ \sum_{i=1}^{6} \pi_i LnY_i\, Trend \;+ \sum_{j=1}^{3} \varphi_j LnW_j\, LnZ \\ & + \sum_{j=1}^{3} \sigma_j LnW_j\, Trend + \varepsilon \end{aligned} \qquad (4-1)$$

[55] Informational synergy analysis requires detailed data on clients' relationship which is not available.

Wherein *TC* is the total costs including total interest and non-interest expenses; Y is the output vector consisting of:

Y1 = loans secured on real estate,

Y2 = loans unsecured,

Y3 = securities plus federal funds sold and securities purchased under agreements to resell,

Y4 = total nominal value of off-balance sheet items,

Y5 = non-interest income activities,

Y6 = s*ervice Charges*;

W is the input price vector comprising:

W1 = salary expenses divided by the number of full-time equivalent employees,

W2 = expenses of premises and fixed assets divided by total fixed assets,

W3 = total interest expense divided by interest-bearing liabilities.

Z is the total capital equity and is added to the model to control for unmeasured cost of equity capital. Banks with higher equity capital have lower total costs as they have less debt financing and hence interest expense, assuming all other factors equal (Hughes and Mester, 2013).Table A3 of the appendix presents the descriptive statistics of the total costs, output and input price vectors and total equity capital for *Micro* and *Non-Micro Community Banks*.

We consider the homogeneity and symmetry assumptions which require:

$$\sum_{j=1}^{3}\beta_j = 1, \sum_{j=1}^{3}\sum_{l=1}^{3}\theta_{j,l} = 0, \quad \sum_{i=1}^{6}\sum_{j=1}^{3}\mu_{i,j} = 0, \sum_{j=1}^{3}\varphi_j = 0 \tag{4-2}$$

$$\delta_{i,k} = \delta_{k,i} \; and \; \theta_{j,l} = \theta_{l,j} \; for \; all \; i,k,j \; and \; l \tag{4-3}$$

We also impose input price homogeneity restrictions (an. increase in all input prices increases the total costs by the same percentage) on the cost function parameters by dividing all input prices (W1 and W2) and total costs (TC) with one other factor price (W3).

The total cost function is estimated using a stochastic frontier approach introduced by Aigner et al. (1977) which fits the cost function to best practice banks. This approach assumes

that the error term (ε) has two components which are independently distributed: One idiosyncratic error (or random noise) term with a symmetric distribution (υ) and the inefficiency term with a strictly nonnegative distribution (u). We assume that the inefficiency component follows a time-varying decay model proposed by Battese and Coelli (1992), so $\exp\{-\eta(t-T_i)\}u_i$. T_i is the last period in the i^{th} panel and η is the parameter to be estimated.

In a multi-product firm the pair-wise cost complementarity (PCC) between two products exists when an increase in product A lowers the marginal cost of producing product B (Clark, 1988). The measure of cost complementarity is driven as follows:

$$PCC(Y_A, Y_B) = \frac{\partial^2 TC}{\partial Y_A \partial Y_B} = \left(\frac{TC}{Y_A Y_B}\right) \times \left[\frac{\partial^2 LnTC}{\partial LnY_A \partial LnY_B} + \left(\frac{\partial LnTC}{\partial LnY_A}\right) \times \left(\frac{\partial LnTC}{\partial LnY_B}\right)\right] \quad (5)$$

PCC < 0 implies the existence of cost complementarity between products A and B. The necessary condition for the existence of cost complementarity (PCC<0) is:

$$NC\_PCC = \frac{\partial^2 LnTC}{\partial LnY_A \partial LnY_B} < 0 \quad (6)$$

PCC = 0 implies the non-jointness or absence of cost complementarities. At any non-zero production level of Y_A and Y_B, $\frac{TC}{Y_A Y_B} > 0$. Hence, the non-jointness requires:

$$\left[\frac{\partial^2 LnTC}{\partial LnY_A \partial LnY_B} + \left(\frac{\partial LnTC}{\partial LnY_A}\right) \times \left(\frac{\partial LnTC}{\partial LnY_B}\right)\right] = 0 \quad (7)$$

PCC > 0 implies existence of diseconomy of joint production.

Table VIII illustrates the empirical results on cost complementarity between non-interest income activities and lending (secured and unsecured loans (Y1 & Y2)) for *Micro* and *Non-Micro Community Banks* during the pre, acute and the post-crisis periods. The first two columns display the analysis for *Non-Micro Community Banks* and columns (3) and (4) exhibit the results for *Micro Community Banks*[56]. In columns (1) and (3) the necessary condition for the existence of cost complementarity between non-interest income activities and *Secured* or

[56] We do not report the measure of cost complementarity for *Micro Community Banks* during the acute and post-crisis, where we obtain a negative elasticity of total costs to either loans *or non-interest income activities*.

Unsecured Loans is presented. The results show that the necessary condition is achieved, except for *Non-Micro Community Banks* in the acute and post-crisis periods where the necessary condition for cost complementarity of non-interest income activities and *Unsecured Loans* is not satisfied. Columns (2) and (4) exhibit the measure of cost complementarity. The findings indicate that the sufficiency condition is not fulfilled suggesting non-jointness[57].

Table VIII. Cost Complementarities Analysis

This table reports Cost Complementarities analysis (Equation (5)), between non-interest income activities and loans (secured and unsecured loans (Y1 & Y2)) for *Micro* and *Non-Micro Community Banks* across pre, acute and post-crisis periods. *Micro Community Banks* are defined as banks with less than $100 million in total assets. *Non-Micro Community Banks* are community banks with total assets above $100 million.

The first two columns present the analysis for the *Non-Micro Community Banks* and columns (3) and (4) exhibit the results for *Micro Community Banks*. Columns (1) and (3) display the necessary condition for the existence of cost complementarities between non-interest income activities and secured or unsecured loans. In columns (2) and (4) the measure of cost complementarities are illustrated. See Table A2 for variable definitions.

		Non-Micro Community Banks		Micro Community Banks	
		NC_PCC(Yi, Y5)	PCC(Yi, Y5)	NC_PCC(Yi, Y5)	PCC(Yi, Y5)
		(1)	(2)	(3)	(4)
Pre-Crisis	Secured Loans (Y1)	-0.0043	0.0000	-0.0028	0.0000
	Unsecured Loans (Y2)	-0.0014	0.0000	-0.0010	0.0000
Acute-Crisis	Secured Loans (Y1)	-0.0087	0.0000	-0.0031	---*
	Unsecured Loans (Y2)	0.0008	0.0000	-0.0010	---*
Post-Crisis	Secured Loans (Y1)	-0.0229	0.0000	-0.0001	0.0000
	Unsecured Loans (Y2)	0.0005	0.0000	-0.0018	---*

* We do not report the measure of cost complementarity, since we obtain a negative elasticity of total costs to either loans or non-interest income activities.

[57] Normally total costs is much less than the products of loans (whether *Secured* or *Unsecured*) with other financial services (in our case *non-interest income businesses*). Hence, the first component of the measure of cost complementarity, $\frac{TC}{Y_A Y_B}$, is too small such that its product with the second component makes the measure very close to zero, implying non-jointness.

As a robustness check, we also follow the production approach (Berger and DeYoung, 1997 among others) and include transaction deposits in our model as a further output. The results are similar to our previous findings. Overall, we find little evidence for the existence of cost complementarity between lending and non-interest income activities.

4.5. ROBUSTNESS CHECKS

4.5.a. Credit Risk

As a robustness check, we use a dynamic panel setting to study the effect of non-interest income activities on *Credit Risk*. This allows us to address the persistence in bank risk-taking which is pointed out by previous literature (Delis and Kouretas, 2011, among others).

Table A4 of the appendix presents the results. Columns (1) to (6) display our analysis for *Non-Micro Community Banks* during pre, acute and post-crisis periods. In the first column, we explore the relationship before the crisis. We estimate the model using the fixed effect technique, similar to Loutskiana (2011)[58] and find significant and negative coefficients for *Fiduciary Activities* and *Life Insurance* which supports our previous finding; however, the negative relationship primarily observed (at the ten percent significance level) between *Other Insurance Services* and *Credit Risk* disappears. We also scale income of non-interest income activities with total assets in lieu of total net operating income and find similar results[59].

The second column shows the results of our acute-crisis analysis. We estimate our dynamic panel model using the 2SLS approach where only Y_{it-2} is used as the instrument for

[58] In the dynamic panel specification, the lagged dependent variable becomes endogenous when the sample has a small time dimension (the literature considers the problem for the sample with less than 15 time periods.) Roodman (2009) also suggests applying difference and system GMM techniques to panels with small T and large N. He points out that with large T, dynamic panel bias becomes insignificant and the straightforward fixed effect technique can be used. In fact the number of instruments in difference and system GMM tends to explode with T.

[59] The results are not reported here but are available from the authors on request.

ΔY_{it-1} (a just-identified case) as suggested by Anderson and Hsiao (1981).[60] The estimation results provide us with little evidence to support our previous finding on the negative link between *Fiduciary Activities* and *Credit Risk*; however, the positive association of *Life Insurance* and *Credit Risk* remains unchanged. We find similar results when we scale our variables of interest with total assets.

Columns (3) to (6) present estimations for the post-crisis period. In the third column, since we have relatively small time periods in the post-crisis, we estimate our model using the two step system GMM technique introduced by Roodman (2006). This performs the Windmeijer (2005) finite-sample correction to the stated standard errors. We observe that *Fiduciary Activities* and *Other Insurance Services* appear with a negative coefficient similarly to our previous finding. We run the Arellano and Bond (A.B.) test (1991) for serial correlation in the error terms. The null hypothesis is no auto-correlation in the first-differenced residuals at the second order[61]. The A.B. test result does not reject the null hypothesis. We also carry out the Hansen and Sargan tests of over-identification, where the null hypothesis is the joint validity of moment conditions. The Hansen (1982) J test result does not reject the null hypothesis, while the Sargan (1958) test does. In column (4), we limit the instruments of system GMM estimators to the second lag of the dependent variable which reduces the number of instruments from 41 to 29. This time both Sargan and Hansen tests do not reject the null, whereas our finding in the previous column remains almost unchanged. The results persist when our variables of interest scaled by total assets in lieu of total net operating income.

Non-interest income activities might be endogenous, due to a possible contemporaneous relationship with *Credit Risk*. Diversifying into non-interest income activities may depend on a bank's position in lending. For instance clients may select banks with lower *Credit Risk* for

[60] Since we have a limited number of time periods, fixed effect techniques are not appropriate due to the correlation of lagged values of the dependent variable with the error term. Moreover, we cannot use system GMM technique since both the Hansen and Sargan tests reject the null hypothesis of instrument validity.

[61] Rejecting the null hypothesis at the first order does not imply that the moments are not valid, since the first difference of independently and identically distributed errors is serially correlated.

Fiduciary Activities. Alternatively, banks with poor performance in lending may also rely more on non-interest income activities such as *Loan Servicing*. Column (5) displays the result, where we deal with possible endogeneity issues. The result shows that the negative relationship between *Fiduciary Activities* and *Credit Risk* persists, while its negative linkage with *Other Insurance Services* disappears. The A.B. test for serial correlation in the error terms does not reject the null hypothesis. The Hansen (1982) J test of over-identification does not reject the null hypothesis, while the Sargan (1958) test does. In column (6), we limit the instruments of system GMM estimators to the second lag of the dependent variable which reduces the number of instruments from 210 to 198. Both the Sargan and Hansen tests do not reject the null, and our finding from the previous column persists.

In sub-section (4.1), we observe that a rise in the income share of Securities Brokerage in total net operating income decreases *Credit Risk* of *Micro Community Banks* during the post-crisis period. Column (7) presents a dynamic panel analysis of our model. We estimate our model using the two step system GMM technique introduced by Roodman (2006). The estimation result provides us with little evidence to support our previous finding on the relationship between *Securities Brokerage* and *Credit Risk*. *Other Insurance Services* depicts a negative association with *Credit Risk* despite our initial results which suggests a weak link. The A.B. test for serial correlation in the error terms does not reject the null hypothesis. The Hansen (1982) J test of over-identification result does not reject the null hypothesis, while the Sargan (1958) test does. In column (8), we limit the instruments of system GMM estimators to the second lag of the dependent variable which reduces the number of instruments from 41 to 29. Sargan test does reject the null only at ten percent significance level, and our finding in the previous column remains unchanged.

4.5.b. Loan Composition

We find that an increase in the income share of *Fiduciary Activities* in total operating income of *Non-Micro Community Banks* increases the share of *Unsecured Loans* in total loans in the pre-crisis period. The relationship turns into negative in the acute-crisis. During the post-crisis period, we observe that a greater income share of *Other Insurance Services* or *Annuity Sales* in total operating income is associated with a higher weight of *Unsecured Loans* in total loans.

As a further analysis, we replace the *Unsecured Loans* with its four major components - *Agricultural Loans*, *C&I Loans*, *Consumer Loans* and *Financial Institutions Loans* – in our Loan Composition model (Equation (3)). We estimate the model using fixed effect technique and quarterly data of 4,092 *Non-Micro Community Banks* during the pre, acute and post-crisis periods.

The results are presented in table A5 of the appendix. Columns (1) to (4) illustrate the estimations respectively for *Agricultural Loans*, *C&I Loans*, *Consumer Loans* and *Financial Institutions Loans* in the pre-crisis. We find that an increase in the income share of *Fiduciary Activities* in total operating income decreases the share of *Consumer Loans*, but increases the share of *Financial Institution Loans* in total loans. Both relationships are observed only at the ten percent significance level and disappear when we scale our variables of interest with total assets in lieu of total operating income.

Columns (5) to (8) exhibit the results for the acute-crisis period. We find a negative relationship between *Fiduciary Activities* and *C&I Loans*. The relationship persists even when we use total assets to scale our variables. We also observe a positive correlation between *Fiduciary Activities* and *Financial Institution Loans* only at the ten percent significance level which disappears when we scale our variables of interest with total assets. The findings also show that an increase in the income share of *Other Insurance Services* decreases the share of

Agricultural and *Consumer Loans*. Moreover, *Investment Banking* is negatively linked to *C&I Loans*. As a robustness check, we scale our variables of interest with total assets and find similar results.

The analyses of the post-crisis period for the components of *Unsecured Loans* are displayed in columns (5) to (8). Alike to our finding for the acute-crisis period, *Fiduciary Activities* depicts a negative linkage with *C&I Loans* and a positive correlation with *Financial Institution Loans*. An increase in the income share of *Life Insurance* in total operating income decreases the share of *Financial Institution Loans*. We also observe that the positive association between income share of *Other Insurance Services* in total operating income and the share of *Unsecured Loans* in total loans during the post-crisis period is mainly driven by the positive linkage between *Other Insurance Services* and *Agricultural Loans*. The findings remain unchanged when scaling by total assets is used as a robustness check. The results also show that banks with greater income share of *Securities Brokerage* have, on average, lower *Consumer Loans*. The relationship is only significant at the ten percent level and disappears when we scale our variables of interest with total assets in lieu of total operating income.

4.5.c. Risk Adjusted Return

As a robustness check, we scale the components of non-interest income activities by total assets in lieu of total operating revenue which consists of non-interest and net interest incomes. As such, the relationship between non-interest income activities and *Risk Adjusted Return* is analyzed irrespective of interest income activities. The results are presented in Tables A6 and A7 of appendix.

Table A5 shows the results for *Non-Micro Community Banks* across pre, acute and post-crisis periods. Columns (1) to (4) illustrate the estimation for the pre-crisis period. In the first column, *Non-interest Income* appears with a negative coefficient, similar to our previous finding. In columns (2) to (4), we observe that an increase in *Fiduciary Activities*' income

scaled by total assets is associated with an increase in *Risk Adjusted Return* and decrease in *Risk* and *Return* (the negative linkage with *Risk* is sufficient enough to compensate for the decline in *Return* and increase *Risk Adjusted Return*). *Life Insur*ance and *Other Insurance Services* depict a negative relationship with both *Return* and *Risk* such that *Risk Adjusted Return* remains unchanged. *Loan Servicing* has no significant correlation with *Risk Adjusted Return* as well as *Return* and *Risk*. *Service Charges* are positively linked to *Risk Adjusted Return*, while *Loan Sales*, *Other Assets Sales* and *Other Activities* show a significantly negative relationship with *Risk Adjusted Return*. Columns (5) to (8) display the estimation for the acute-crisis period. *Non-interest Income* appears with an insignificant coefficient in column (5). In columns (6) to (8), we find a positive correlation of *Fiduciary Activities* and *Securities Brokerage* income with *Risk Adjusted Return* and a negative relationship with *Risk* without any significant association to *Return*. *Investment Banking* depicts a negative linkage with *Risk Adjusted Return* although it lowers *Risk* without any significant impact on *Return*. *Life Insurance* lowers both *Return* and *Risk* without a significant impact on *Risk Adjusted Return*. An increase in *Other Insurance Services* and *Annuity Sales* income decreases *Risk*. Columns (9) to (12) report the results for post-crisis period, wherein we observe no significant relationship between *Non-interest Income* and *Risk Adjusted Return* in column (9). Columns (10) to (12) display the positive relationship between *Fiduciary Activities* and *Risk Adjusted Return* which is mainly driven by the negative impact of *Fiduciary Activities* income on *Risk*. *Life Insurance* merely reduces *Risk* without any significant impact on *Return* and *Risk Adjusted Ret*urn. *Other Insurance Service*s also increases *Risk Adjusted Return* at the ten percent significance level through a reduction in *Risk*. Banks with higher *Loan Servicing* income have on average a lower *Risk Adjusted R*eturn. We also observe a negative relationship between *Annuity Sales* and *Risk* at the ten percent significance level. Increase in *Investment Banking* income reduces *Risk*.

Table A6 presents the results for *Micro Community Banks*. We find a significant negative impact of *Non-interest Income* on *Risk Adjusted Return* during the pre and post crisis periods (Columns (1) and (9)); in the acute crisis (column (5)), however, we observe no significant relationship between them. Increases in *Fiduciary Activities* income reduces *Risk Adjusted Return* in the pre-crisis period by lowering both *Return* and *Risk* (the negative impact on *Return* is sufficient enough to compensate for the decline in *Risk* and reduce *Risk Adjusted Return*). In the acute and post-crisis periods, *Fiduciary Activities* depicts no significant relationship with *Risk Adjusted Return*, despite its negative effect on *Risk* in the acute-crisis period and *Return* during the after-crisis period. We find no link between *Life Insurance* and *Risk Adjusted Return*, although it reduces *Risk* in all three study periods. An increase in *Other Insurance Service*s income, however, increases *Risk Adjusted Return*, by reducing *Risk* during the pre, acute and post-crisis periods. An increase in *Loan Servicing* income lowers *Risk Adjusted R*eturn before the credit crisis. The result is driven by its negative impact on *Return*. We find no significant relationship between other variables - *Annuity Sales*, *Securities Brokerage* and *Investment Banking* - and *Risk Adjusted Return*.

5. Summary and Concluding Remarks

This chapter analyzes the impact of non-interest income activities on banks' lending in terms of quality, spread and loan structure. Agency problems and loss of focus associated with diversification into non-interest income areas may cause deterioration in loan quality. Alternatively, expanding the scope and scale of client relationships might improve the quality of banks' credit if banks are able to collect more soft information via multiple interactions through cross-selling non-traditional banking services. Banks with a wider scope of relationships are able to reach more potential borrowers (as well as depositors). This may result

in different loan portfolio structures. Moreover, non-interest earnings may also influence banks' loan pricing strategy through possible cross-subsidization effects.

Using quarterly data on 7,578 U.S. community banks between 2003 and 2010, we examine such relationships before, during and after the 2007/2008 financial crisis. We study the sub-sample of 3,206 community banks with less than $100 million of total assets ('*micro*' community banks) separately from larger institutions which have more extensively developed non-interest lines of businesses ('*non-micro*' community banks). Non-interest income activities of *micro* community banks have fallen from around 14.6% of total net operating income pre-crisis to just below 13% post-crisis. *Non-micro* community banks have also experienced a moderate decline in the contribution of non-interest income to total operating income from about 17.7% to approximately 15.8%. Credit risk has systematically increased over the study period for both groups of community banks. Risk adjusted return of *micro* community banks slightly increases during the crisis and decreases thereafter; *non-micro* community banks, however, have experienced a fall in their risk-adjusted returns from 6.7% before the crisis to around 4.9% during the crisis and to about 4.7% thereafter.

We examine the possible impact of seven non-interest income business lines[62] that are likely to expand the scope of relationship with clients and provide banks with a larger funding base, on a bank's credit risk, net interest spread and loan composition[63].

Overall, our analysis of *non-micro* community banks shows that an increase in the income share of fiduciary activities in total operating income lowers credit risk, especially during the pre and post-crisis periods. It increases the weight of unsecured loans in total loans

[62] Consist of fiduciary, life insurance, other insurance, loan servicing, securities brokerage, annuity sales and investment banking.

[63] We also examine the relationship between volatility of core deposits (represented by relative standard deviation of core deposits) and non-interest income activities. On results not reported we find that *non-micro* community banks with greater income share of other (not life) insurance services and annuity sales have, on average, less volatile core deposits during the acute and post-crisis periods. Our analysis for *micro* community banks show that core deposits are less volatile in banks with greater income share of life insurance in total operating income during the pre-crisis period.

during the pre-crisis period. It also reduces the proportion of commercial and industrial loans in total loans in the acute and post-crisis periods, while increasing the weight of loans to financial institutions (in total loans) post-crisis. We also find that banks with a greater income share of fiduciary business in total operating income have, on average, a higher risk adjusted return before and after the crisis.

Life insurance depicts a negative relationship with credit risk before the crisis; the relationship, however, turns positive during the crisis and disappears thereafter. It is also negatively associated with loans to financial institutions in the post-crisis period. Moreover, the results show that an increase in the income share of investment banking is associated with a lower proportion of C&I loans in total loans and risk adjusted return during the recent credit-crisis period.

We find little evidence to support the view that there is cross-subsidization between traditional intermediation and non-interest income activities except for loan servicing in the post-crisis period where we observe that a higher income share of loan servicing is associated with a lower lending-deposit spreads. The results also show that loan servicing is negatively linked risk-adjusted return.

The findings also suggest that banks with a larger income share from securities brokerage have, on average, a higher risk-adjusted return in the acute-crisis period. Life insurance, other insurance services and annuity sales depict little relationship with risk-adjusted return across all three study periods.

The analysis of *micro* community banks provides us with little evidence of any link between non-interest income variables of interest and credit risk and loan composition. However, we find that a greater income share of fiduciary activity is associated with higher lending-deposit spreads in the acute-crisis. Banks with a higher income share of fiduciary in total operating income have on average a lower risk-adjusted return before and after the credit

crisis which contrasts with our finding for *non-micro* community banks. Other insurance services also depict a positive relationship with the spread during the pre-crisis period and with risk-adjusted return in all three periods of study. Greater proportion of loan servicing income in total operating income is associated with a lower risk adjusted return during pre and acute-crisis periods.

Our analysis of 270 distressed community banks between 2007 and 2010 provides some evidence that while their loan quality was substantially deteriorated during the last twelve quarters of operation, non-interest income sources of revenue were rather stable with a slight up-ward trend, apart from investment banking and other insurance services which experienced relatively a mediocre decline in the last four quarters of operations. Finally, we investigate whether a pair-wise cost complementarity exists between lending (both secured and unsecured) and non-interest income activities that could explain their joint production. The results provide us with little evidence to support this hypothesis.

Appendices

TABLE A1. Summary of Results

This table provides a summary of our results for credit risk, spread, loan composition and risk-adjusted return analyses for *Micro* and *Non-Micro Community Banks* across the pre-, acute- and post-crisis periods. *Micro Community Banks* are defined as banks with less than $100 million in total assets. *Non-Micro Community Banks* are community banks with total assets above $100 million. See Table A2 for variable definitions.

		Credit Risk			Spread			Loan Composition			Risk Adjusted Return		
	Variables of Interest	Pre-Crisis	Acute-Crisis	Post-Crisis	Pre-Crisis	Acute-Crisis	Post-Crisis	Pre-Crisis	Acute-Crisis	Post-Crisis	Pre-Crisis	Acute-Crisis	Post-Crisis
Non-Micro Community Banks	Fiduciary Activities	--	0	---	0	0	0	++ Unsecured Loans	-- C&I Loans	- C&I Loans + Fin. Inst. Loans	++	0	+
	Life Insurance	--	++	0	0	0	0	0	0	-- Fin. Inst. Loans	0	0	0
	Other Insurance Services	0	0	0	0	++	0	0	-- Agricultural Loans -- Consumer Loans	++ Agricultural Loans	0	0	0
	Loan Servicing	0	0	0	0	0	--	0	0	0	0	0	---
	Annuity Sales	N/A	0	0	N/A	0	0	N/A	0	0	N/A	0	0
	Securities Brokerage	N/A	0	0	N/A	0	0	N/A	0	0	N/A	++	0
	Investment Banking	N/A	0	0	N/A	0	0	N/A	-- C&I Loans	0	N/A	---	0
		Credit Risk			Spread			Loan Composition			Risk Adjusted Return		
		Pre-Crisis	Acute-Crisis	Post-Crisis	Pre-Crisis	Acute-Crisis	Post-Crisis	Pre-Crisis	Acute-Crisis	Post-Crisis	Pre-Crisis	Acute-Crisis	Post-Crisis
Micro Community Banks	Fiduciary Activities	0	0	0	0	++	0	0	0	0	--	0	---
	Life Insurance	0	0	0	0	0	0	0	0	0	0	0	0
	Other Insurance Services	0	0	0	++	0	0	0	0	0	++	+++	++
	Loan Servicing	0	0	0	0	0	0	0	0	0	---	--	0
	Annuity Sales	N/A	0	0	N/A	0	0	N/A	0	0	N/A	0	0
	Securities Brokerage	N/A	0	0	N/A	0	0	N/A	0	0	N/A	0	0
	Investment Banking	N/A	0	0	N/A	0	0	N/A	0	0	N/A	0	0

+: positive relationship, significant at 10% level.
++: positive relationship, significant at 5% level.
+++: positive relationship, significant at 1% level.
-: negative relationship, significant at 10% level.
--: negative relationship, significant at 5% level.
---: negative relationship, significant at 1% level.
0: no significant relationship.
N/A: not available due to lack of data.

Table A2. Variable Description

This table presents description of variables used in this study.

Dependent Variables	**Description**
Credit Risk	The ratio of non-performing loans on gross loans (*Non-performing Loans*). *Non-performing Loans* consist of non-accrual loans and loans which are past due for 90 days or more and still accruing.
Spread	Net interest spread equals to (Interest income / average earning assets) – (interest expense / average interest-bearing liabilities).
Loan Composition	Represented by the share of loans unsecured on real estate in total loans (*Unsecured Loans*).
Return	The mean value of return on average assets for banks with at least 4 observations.
Risk	The standard deviation of return on average assets for banks with at least 4 observations.
Risk Adjusted Return	The ratio of the mean value of returns on average assets divided by its standard deviation ($\frac{Return}{Risk}$) for banks with at least 4 observations.
Variable of Interest	
Fiduciary Activities	Income from fiduciary activities.
Life Insurance	Earnings on/increase in value of cash surrender value of life insurance.
Other Insurance Services	Underwriting income from insurance and reinsurance activities and income from other insurance activities.
Loan Servicing	Net servicing fees.
Annuity Sales	Fees and commissions from annuity sales.
Securities Brokerage	Fees and commission from securities brokerage.
Investment Banking	Investment banking, advisory, and underwriting fees and commissions.
Control Variables	
Unused Commitment	The ratio of face value of unused credit lines and loans commitment to total assets.
Loan Growth	Quarterly growth rate of gross loans.
Asset Growth	Quarterly growth rate of total assets.
Inefficiency	Total non-interest expense divided by total operating revenue.
Capital	Equity capital to asset ratio.
Core Deposits	Share of core deposits in total assets.
Size	Logarithm of total assets.
Log(Age)	Logarithm of bank's age.
Interest Rate	Average annualized 3-month T-Bill rate, obtained from Datastream.
Home Price Index Growth	Quarterly growth rate of home price index per state, retrieved from the Office of Federal Housing Enterprise Oversight
Personal Income Growth	Quarterly growth rate in personal income per state, collected from Bureau of Economic Analysis.
Non-interest Income Activities	
Venture Capital	Venture capital revenue.
Service Charges	Service charges on deposit accounts in domestic offices, income and fees from the printing and sale of checks, income and fees from automated teller machines and bank card and credit card interchange fees.
Trading	Trading revenue and net change in the fair values of financial instruments accounted for under a fair value option.
Loan Sales	Net gains (losses) on sales of loans and leases and net securitization income.
Other Assets Sales	Net gains (losses) on sales of other real estate owned, net gains (losses) on sales of other assets (excluding securities), rent and other income from other real estate owned.
Other Activities	Other non-interest income.
Unsecured Loans Breakdown	
Agricultural Loans	Share of loans to finance agricultural production and other loans to farmers in total loans.
C&I Loans	Share of commercial and industrial loans in total loans.
Consumer Loans	Share of consumer loans in total loans.
Financial Institution Loans	Share of loans to depository and non-depository financial institutions in total loans.
Other Unsecured Loans	Share of other loans not secured by real estate in total loans.

TABLE A3. Cost Complementarities Analysis - Descriptive Statistics

This table presents general descriptive statistics of total costs, output vectors, input price vectors and capital equity for *Micro* and *Non-Micro Community Banks* across the pre-, acute- and post-crisis periods. *Micro Community Banks* are defined as banks with less than $100 million in total assets. *Non-Micro Community Banks* are community banks with total assets above $100 million.

	Variables	Non-Micro Community Banks					Micro Community Banks				
		Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Pre-Crisis Period	TC	50,302	47.9	238	1.66	3,628	25,270	2.99	1.30	0.34	15.3
	Y1	50,302	450.2	1,910	0.47	25,400	25,270	24.55	14.32	0.47	84.2
	Y2	50,302	160.8	1,159	0.00	19,200	25,270	4.41	5.46	0.00	49.7
	Y3	50,302	230.7	1,053	0.11	15,300	25,270	16.87	11.03	0.11	79.5
	Y4	50,302	210.8	2,408	0.00	47,900	25,270	1.38	2.32	0.00	64.4
	Y5	50,302	4.1	44	0.00	1,022	25,270	0.07	0.20	0.00	11.9
	Y6	50,302	4.8	25	0.00	322	25,270	0.26	0.20	0.00	4.3
	W1 (%)	50,302	52.61	13.93	22.95	162.5	25,270	47.32	10.92	22.95	162.5
	W2 (%)	50,302	29.17	32.42	4.12	800	25,270	36.00	41.87	4.12	800
	W3 (%)	50,302	2.44	0.82	0.50	5.12	25,270	2.33	0.72	0.50	5.12
	Z	50,302	105.6	551.8	0.9	7,917	25,270	6.44	2.93	0.86	25.67
Acute-Crisis Period	TC	21,715	50.6	238	1.18	3,418	7,591	3.48	1.45	0.50	17.5
	Y1	21,715	468.1	1,907	0.99	25,600	7,591	26.78	15.31	0.84	80.4
	Y2	21,715	160.8	1,102	0.00	16,900	7,591	4.83	6.05	0.00	52.8
	Y3	21,715	188.1	913	0.29	14,100	7,591	16.32	10.82	0.29	80.1
	Y4	21,715	154.7	1,571	0.00	29,100	7,591	1.56	2.20	0.00	20.1
	Y5	21,715	3.7	34	0.00	709	7,591	0.09	0.33	0.00	17.2
	Y6	21,715	4.9	27	0.00	355	7,591	0.27	0.21	0.00	4.3
	W1 (%)	21,715	59.19	15.55	27.21	161.43	7,591	53.28	12.95	27.21	161.4
	W2 (%)	21,715	29.44	35.33	4.49	675	7,591	38.27	52.62	4.49	675
	W3 (%)	21,715	3.15	0.72	0.78	5.34	7,591	3.12	0.67	0.78	5.34
	Z	21,715	108.9	603.4	1.5	8,895	7,591	6.93	3.14	1.12	25.64
Post-Crisis Period	TC	22,067	49.5	251	2.48	3,502	6,436	2.98	1.24	0.47	11.3
	Y1	22,067	515.4	2,161	1.01	26,800	6,436	27.13	15.30	1.01	82.8
	Y2	22,067	182.1	1,243	0.00	17,100	6,436	5.00	6.11	0.00	49.1
	Y3	22,067	222.7	1,079	0.10	14,900	6,436	15.89	10.80	0.10	68.5
	Y4	22,067	148.9	1,442	0.00	22,700	6,436	1.39	1.94	0.00	29.6
	Y5	22,067	3.9	32	0.00	532	6,436	0.08	0.18	0.00	2.6
	Y6	22,067	5.9	34	0.00	423	6,436	0.25	0.21	0.00	4.1
	W1 (%)	22,067	61.83	16.20	28.73	167	6,436	55.35	12.99	28.73	159
	W2 (%)	22,067	31.52	45.07	4.81	1,017	6,436	41.76	66.81	4.81	1,017
	W3 (%)	22,067	1.83	0.58	0.26	3.82	6,436	1.83	0.53	0.26	3.82
	Z	22,067	131.74	770.81	0.97	10,600	6,436	7.03	3.04	0.97	24.73

TC is the total costs including total interest and non-interest expenses; Y1 = Loans secured by real estate; Y2 = Loans unsecured on real estate; Y3 = Securities plus federal funds sold and securities purchased under agreements to resell; Y4 = total off-balance sheet items; Y5 = Non-interest income activities; Y6 = *Service Charges*; W1 = salary expenses divided by number of full-time equivalent employees; W2 = expenses of premises and fixed assets divided by total fixed assets; W3 = total interest expense divided by interest-bearing liabilities. Z = the total capital equity. Total costs (TC), output vectors (Ys) and capital equity (Z) are in million $ and the input prices (Ws) are in percentage.

Table A4. Credit Risk Model – Robustness Checks

This table reports estimations of *Credit Risk* model (Equation (1)) using dynamic panel setting and quarterly data on 4,092 *Non-Micro Community Banks* during pre and post-crisis periods and 2,272 *Micro Community Banks* in the acute-crisis. *Non-Micro Community Banks* are defined as community banks with total assets above $100 million, whereas *Micro Community Banks* are banks with less than $100 million in total assets. We use *Non-performing Loans* as our *Credit Risk* proxy and regress it on it lagged value, our variables of interest and a set of control variables.

In columns (1) to (6), we estimate the model for *Non-Micro Community Banks*. The first column illustrates the estimation of *Credit Risk* model for pre-crisis period where we regress the *Credit Risk* proxy on *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services* and *Loan Servicing* while controlling for loan portfolio characteristics (i.e. *Unused Commitment*, *Loans Sale*, *Loan Growth* and *Unsecured Loans*), other bank-level heterogeneities (i.e. *Capital*, *Spread*, *Inefficiency*, *Size* and *Log(Age)*) and finally macroeconomics, state-level and year fixed effect controls, i.e. *Interest Rate*, *Home Price Growth*, *Income Growth* and year dummies. We use fixed effect technique to estimate the model. In column (2) we estimate the model for acute-crisis period using 2SLS technique, where only Y_{it-2} is used as the instrument for ΔY_{it-1} (a just-identified case) as suggested by Anderson and Hsiao (1981). We add *Annuity Sales*, *Securities Brokerage* and *Investment Banking* to the model for acute and post-crisis analyses.

Columns (3) to (6) display estimation of our model for post-crisis period. In column (3) we estimate our model using two step system GMM technique introduced by Roodman (2006). We perform the Arellano and Bond (AB) test (1991) for serial correlation in the error terms and Hansen and Sargan tests of over-identification, where the null hypothesis is joint validity of moment conditions. The Hansen (1982) J test result does not reject the null hypothesis, while Sargan (1958) test does. In column (4), we limit the instruments of system GMM estimators to the second lag of dependent variable to reduce the number of instruments from 41 to 29. The results show that both Sargan and Hansen tests do not reject the null. Column (5) shows the result where we define our variables of interest, i.e. *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Annuity Sales*, *Securities Brokerage* and *Investment Banking* as endogenous. In column (7), we limit the instruments of system GMM estimators to the second lag of dependent variable which decreases the number of instruments from 210 to 198. Columns (7) and (8) illustrate analysis of our model for *Micro Community Banks* during the post-crisis period, with the same specifications and techniques used in the column (3) and (4).

Year dummies are included in the model, but not reported in the table. All the right-hand-side variables are lagged for one quarter. See Table A2 for variable definitions. Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

	Non-Micro Community Banks						Micro Community Banks	
	Pre-Crisis	Acute-Crisis	Post-Crisis				Post-Crisis	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit Risk	0.620***	0.394	0.947***	0.941***	0.942***	0.942***	0.676***	0.804***
	(50.77)	(1.05)	(64.86)	(59.90)	(66.32)	(60.78)	(16.78)	(13.78)
Fiduciary Activities (β_1)	-0.008***	-0.004	-0.012***	-0.013***	-0.029**	-0.028**	-0.019	-0.012
	(-2.93)	(-0.12)	(-3.31)	(-3.52)	(-2.29)	(-2.27)	(-0.92)	(-0.74)
Life Insurance (β_2)	-0.007**	0.060***	-0.011	-0.013	-0.036	-0.040	0.017	0.010
	(-1.98)	(3.37)	(-1.11)	(-1.27)	(-1.37)	(-1.54)	(1.21)	(0.77)
Other Insurance Services (β_3)	-0.003	0.044	-0.015***	-0.016***	0.005	0.002	-0.019***	-0.012*
	(-1.06)	(1.32)	(-2.86)	(-3.06)	(0.22)	(0.08)	(-2.74)	(-1.85)
Loans Servicing (β_4)	0.002	-0.003	-0.004	-0.003	0.010	0.006	0.026	0.003
	(0.76)	(-0.14)	(-0.55)	(-0.37)	(0.49)	(0.30)	(1.19)	(0.11)
Annuity Sales (β_5)		-0.025	-0.024	-0.013	0.059	0.048	0.221	0.125
		(-0.46)	(-0.73)	(-0.41)	(0.87)	(0.71)	(1.18)	(0.74)
Securities Brokerage (β_6)		-0.053	-0.018	-0.019	-0.088**	-0.083**	-0.018	-0.011
		(-1.25)	(-1.14)	(-1.23)	(-2.19)	(-2.10)	(-0.30)	(-0.22)
Investment Banking (β_7)		0.030	-0.067**	-0.075**	-0.141	-0.143	-0.176*	-0.206***
		(0.26)	(-2.22)	(-2.49)	(-1.55)	(-1.57)	(-1.81)	(-2.65)
Unused Commitment (β_8)	-0.003***	-0.022	-0.002	-0.003	-0.002	-0.002	-0.017***	-0.010*
	(-2.98)	(-1.48)	(-0.67)	(-0.83)	(-0.59)	(-0.60)	(-2.64)	(-1.66)
Loan Sales (β_9)	-0.003***	0.002	-0.003	-0.003	-0.004	-0.004	0.002	0.001
	(-2.89)	(0.23)	(-0.89)	(-0.96)	(-1.14)	(-1.33)	(0.24)	(0.14)
Loan Growth (β_{10})	-0.003***	-0.004	-0.011***	-0.014***	-0.010***	-0.012***	-0.014***	-0.012***
	(-6.38)	(-1.53)	(-3.59)	(-4.19)	(-3.41)	(-3.84)	(-5.15)	(-4.19)
Unsecured Loans (β_{11})	0.000	0.004	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.003***
	(0.56)	(1.18)	(-6.22)	(-6.29)	(-5.29)	(-5.24)	(-5.84)	(-4.51)
Capital (β_{12})	0.002	-0.031	-0.019***	-0.019***	-0.020***	-0.020***	-0.005	-0.003
	(0.88)	(-1.63)	(-3.90)	(-3.79)	(-4.19)	(-4.11)	(-1.06)	(-0.86)
Spread (β_{13})	0.014**	0.139	-0.017	-0.022	-0.021	-0.019	0.017	0.019
	(2.07)	(1.03)	(-1.08)	(-1.31)	(-1.30)	(-1.16)	(0.62)	(0.78)
Inefficiency (β_{14})	0.001**	0.002	0.002***	0.003***	0.003***	0.003***	0.008***	0.005***
	(2.01)	(0.63)	(2.63)	(2.81)	(2.80)	(2.81)	(5.27)	(3.15)
Size (β_{15})	0.077***	0.188	0.074***	0.075***	0.079***	0.077***	0.178***	0.131***
	(4.49)	(1.43)	(5.04)	(4.72)	(5.03)	(4.74)	(4.77)	(3.54)
Log(Age) (β_{16})	0.021	6.053***	-0.089***	-0.090***	-0.090***	-0.089***	-0.140***	-0.108***
	(0.58)	(2.63)	(-8.65)	(-8.45)	(-7.93)	(-7.69)	(-5.30)	(-3.99)

Interest Rate (β_{17})	0.050***		4.127***	4.394***	4.013***	4.270***	3.836***	4.188***
	(17.87)		(5.78)	(5.75)	(5.86)	(6.01)	(4.09)	(3.93)
Home Price Growth (β_{18})	-0.014***	-0.024***	-0.005	-0.006	-0.006	-0.006	-0.015*	-0.006
	(-8.12)	(-2.85)	(-0.66)	(-0.76)	(-0.81)	(-0.82)	(-1.65)	(-0.61)
Income Growth (β_{19})	0.002	0.037	-0.024*	-0.024	-0.026*	-0.027*	-0.012	-0.021
	(1.08)	(0.91)	(-1.66)	(-1.58)	(-1.85)	(-1.85)	(-0.70)	(-1.12)
Constant (β_0)	0.018		0.172***	0.175***	0.166***	0.173***	0.063	0.136***
	(1.10)		(5.82)	(5.60)	(5.75)	(5.83)	(1.14)	(2.62)
Observations	55,941	16,943	21,000	21,000	21,000	21,000	11,111	11,111
R-squared	0.386							
Number of Banks	4,092		3,788	3,788	3,788	3,788	2,045	2,045
AB test for AR (1)	-	-	-14.99***	-13.99***	-14.64***	-14.00***	-12.91***	-9.16***
AB test for AR (2)	-	-	0.14	0.09	0.15	0.12	1.16	1.09
Hansen Test	-	-	75.11***	4.49	233.15**	160.70	114.27***	12.62*
Sargan Test	-	-	21.92	1.73	174.23	148.86	26.80	5.01
Number of Instruments	-	-	41	29	210	198	41	29

Table A5. Loan Composition Model – Further Investigation

This table reports estimations of the *Loan Composition* model (Equation (3)) using quarterly data of 4,092 *Non-Micro Community Banks* during the pre and post-crisis periods. *Non-Micro Community Banks* are defined as community banks with total assets above $100 million.

We replace our dependent variable, i.e. *Unsecured Loans*, with its four major components and regress them on our variables of interest and control variables: share of agricultural loans in total loans portfolio (*Agricultural Loans*), share of commercial and industrial loans in total loans (*C&I Loans*), share of consumer loans in total loans (*Consumer Loans*) and loans to depository and non-depository financial institutions (*Financial Institutions Loans*).

We regress *Agricultural Loans*, *C&I Loans*, *Consumer Loans* and *Financial Institutions Loans* on our variables of interest, i.e. *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Annuity Sales*, *Securities Brokerage* and *Investment Banking* scaled by total operating income while controlling for capital and liabilities structures (i.e. *Core Deposits and Capital*), other bank-level heterogeneities (i.e. *Size and Log(Age)*) and finally macroeconomics, state-level and year fixed effect controls, i.e. *Interest Rate*, *Home Price Growth*, *Income Growth* and year dummies. The results are presented in columns (1) to (4), (5) to (8) and (9) to (12), respectively for the pre, acute and post-crisis periods. We exclude *Annuity Sales*, *Brokerage* and *Investment Banking* from our pre-crisis period analysis due to lack of sufficient observations. We also keep out the *Interest Rate* from our model, due to its high correlation with *Income Growth* in the acute-crisis period.

We estimate our model using fixed effect technique. All the right-hand-side variables are lagged for one quarter. Year dummies are included in the model, but not reported in the table. See Table A2 for variable definitions. Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

	PRE	PRE	PRE	PRE	ACUTE	ACUTE	ACUTE	ACUE	POST	POST	POST	POST
	Agricultural Loans	C&I Loans	Consumer Loans	Financial Institutions Loans	Agricultural Loans	C&I Loans	Consumer Loans	Financial Institutions Loans	Agricultural Loans	C&I Loans	Consumer Loans	Financial Institutions Loans
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Fiduciary Activities (δ_1)	0.009	0.138	-0.009*	0.031*	0.000	-0.135**	0.005	0.020*	0.039	-0.140*	-0.019	0.075*
	(0.30)	(1.33)	(-1.68)	(1.72)	(0.00)	(-1.97)	(0.42)	(1.67)	(1.05)	(-1.89)	(-1.42)	(1.88)
Life Insurance (δ_2)	-0.002	-0.028	-0.002	0.003	-0.011	-0.040	-0.000	-0.009	-0.008	0.028	0.004	-0.041**
	(-0.10)	(-0.45)	(-0.39)	(0.36)	(-0.62)	(-1.17)	(-0.03)	(-0.91)	(-0.28)	(0.54)	(0.98)	(-2.49)
Other Insurance Services (δ_3)	0.000	-0.010	-0.004	0.000	-0.088**	0.044	-0.018**	-0.006	0.075**	0.020	-0.006	0.013
	(0.00)	(-0.16)	(-0.97)	(0.02)	(-2.01)	(0.86)	(-2.13)	(-0.61)	(2.51)	(0.58)	(-1.58)	(0.92)
Loans Servicing (δ_4)	0.037	0.069	-0.008	0.001	-0.030	0.017	0.008	0.010	0.011	0.056	-0.003	-0.008
	(1.05)	(1.00)	(-1.25)	(0.07)	(-1.15)	(0.19)	(1.41)	(0.93)	(0.40)	(1.01)	(-0.75)	(-0.84)
Annuity Sales (δ_5)					0.034	0.182	-0.014	0.003	0.131	0.136	-0.007	-0.049
					(0.56)	(1.36)	(-0.64)	(0.12)	(1.54)	(1.08)	(-0.32)	(-1.00)
Securities Brokerage (δ_6)					-0.065	-0.048	-0.013	0.025	-0.082	-0.094	-0.033*	0.130
					(-1.19)	(-0.53)	(-0.95)	(1.45)	(-1.07)	(-0.84)	(-1.75)	(1.53)
Investment Banking (δ_7)					0.252	-0.575**	0.000	0.100	0.063	0.142	0.068	-0.340
					(1.36)	(-2.00)	(0.01)	(1.47)	(0.51)	(0.25)	(0.89)	(-1.57)
Core Deposits (δ_8)	0.002	-0.014	0.000	-0.000	-0.005	0.000	0.001*	0.000	-0.002	-0.006	-0.000	0.005**
	(0.64)	(-1.46)	(0.20)	(-0.08)	(-1.58)	(0.02)	(1.70)	(0.15)	(-0.95)	(-0.77)	(-0.63)	(2.27)
Capital (δ_9)	0.012	0.045	0.004	0.008	0.004	0.008	0.002	0.001	0.004	0.038	0.003	0.030***
	(1.04)	(0.93)	(0.96)	(1.23)	(0.36)	(0.19)	(0.40)	(0.15)	(0.46)	(0.90)	(0.81)	(3.83)
Size (δ_{10})	-0.854***	3.295***	-0.052*	0.077	-0.969***	1.850***	-0.056	0.004	-0.389**	1.616***	0.005	-0.044
	(-4.03)	(6.15)	(-1.75)	(1.24)	(-4.56)	(2.61)	(-1.30)	(0.05)	(-2.26)	(3.02)	(0.14)	(-0.52)
Log(Age) (δ_{11})	1.482***	4.078***	-0.060	0.114	0.758**	1.864	0.116	0.017	-0.145	3.272***	0.037	-0.189
	(5.29)	(4.62)	(-0.89)	(0.98)	(2.54)	(1.63)	(1.28)	(0.08)	(-0.81)	(3.28)	(0.38)	(-0.88)
Interest Rate (δ_{12})	-0.065***	-0.178***	-0.004	-0.009					-4.246***	1.542	-0.016	6.543***
	(-3.91)	(-4.73)	(-1.26)	(-1.48)					(-8.02)	(1.25)	(-0.14)	(13.63)

Home Price Growth (δ_{13})	-0.037***	0.044	-0.007***	-0.004	0.030***	0.020	0.002	0.006	-0.020***	0.010	0.002*	0.005
	(-3.50)	(1.29)	(-2.72)	(-0.73)	(3.63)	(1.03)	(1.08)	(1.53)	(-4.51)	(1.14)	(1.66)	(1.63)
Income Growth (δ_{14})	0.017**	-0.019	0.000	0.003	0.031***	0.007	0.003**	-0.001	-0.002	-0.012	-0.001	0.008
	(2.08)	(-1.13)	(0.21)	(1.08)	(3.47)	(0.48)	(2.01)	(-0.52)	(-0.17)	(-0.34)	(-0.64)	(0.73)
Constant (δ_0)	-4.471***	0.156	0.058**	-0.089*	-3.210***	0.817**	0.056**	-0.007	-3.403***	0.929***	0.029	0.105
	(-28.44)	(0.40)	(2.46)	(-1.82)	(-26.31)	(1.99)	(2.36)	(-0.15)	(-33.94)	(3.04)	(1.39)	(1.58)
Observations	55,947	55,947	55,947	55,947	20,483	20,483	20,483	20,483	21,006	21,006	21,006	16,946
R-squared	0.022	0.050	0.025	0.004	0.014	0.011	0.005	0.001	0.008	0.010	0.005	0.028
Number of Banks	4,092	4,092	4,092	4,092	3,742	3,742	3,742	3,742	3,789	3,789	3,789	3,782

Table A6. Risk Adjusted Return Model – Non-Micro Community Banks – Robustness Check

This table presents the estimation of *Risk Adjusted Return* model (Equation (8)) for *Non-Micro Community Banks* where different components of non-interest incomes are scaled by total assets in lieu of total operating revenue as robustness check. *Non-Micro Community Banks* are defined as community banks with total assets above $100 million. We analyze the contribution of different sources of non-interest revenue generating activities in bank's risk adjusted return during the pre, acute and post-crisis periods.

The first four columns illustrate regression estimations for the pre-crisis period. Column (1) reports the regression of *Risk Adjusted Return* on *Non-interest Income* and control variables (*Asset Growth*, *Capital*, *Spread*, *Size* and *Log(Age)*, *Home Price Growth* and *Income Growth*). In column (2), *Non-interest Income* is replaced by its components (i.e. *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Service Charges*, *Loan Sales*, *Other Assets Sales* and *Other Activities*). The first four components are our variables of interest. In columns (3) and (4), we replace *Risk Adjusted Return* with *Return* and *Risk*, respectively. We re-estimate our model for acute and post-crisis periods, where we include *Annuity Sales*, *Securities Brokerage* and *Investment Banking* to the model. We use the same dependent variables, controls and the technique used in columns (1) to (4). The results are reported in columns (5) to (8) and (9) to (12), respectively.

We apply cross-section OLS technique with robust standard errors for our estimations. All the explanatory variables are averaged over the sample period. See Table A2 for variable definitions. Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

	Pre-Crisis Period				Acute-Crisis Period				Post-Crisis Period			
	Risk Adjusted Return	Risk Adjusted Return	Return	Risk	Risk Adjusted Return	Risk Adjusted Return	Return	Risk	Risk Adjusted Return	Risk Adjusted Return	Return	Risk
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Non-interest Income (θ_1)	-0.824***				0.261				0.163			
	(-6.58)				(1.56)				(1.06)			
Fiduciary Activities ($\theta_{1,1}$)		4.672***	-0.165**	-0.271***		3.753***	0.016	-0.412***		3.758**	0.062	-0.216***
		(3.90)	(-2.26)	(-6.25)		(2.93)	(0.15)	(-4.08)		(2.48)	(0.63)	(-3.43)
Life Insurance ($\theta_{1,2}$)		-1.043	-0.802***	-0.388***		3.297	-0.669***	-0.410***		-0.580	-0.348	-0.273**
		(-0.36)	(-6.96)	(-6.42)		(1.06)	(-3.45)	(-2.59)		(-0.19)	(-1.64)	(-2.18)
Other Insurance Services ($\theta_{1,3}$)		-0.329	-0.278***	-0.294***		3.245*	-0.147	-0.410***		3.880*	-0.016	-0.224**
		(-0.22)	(-2.93)	(-5.66)		(1.78)	(-1.06)	(-3.82)		(1.94)	(-0.10)	(-2.41)
Loans Servicing ($\theta_{1,4}$)		-0.550	0.241*	-0.077		2.097	0.038	0.179		-4.603**	0.065	0.059
		(-0.28)	(1.83)	(-1.02)		(0.78)	(0.16)	(0.96)		(-2.29)	(0.36)	(0.53)
Annuity Sales ($\theta_{1,5}$)						11.572	0.028	-1.100***		16.341	0.330	-0.666*
						(1.37)	(0.07)	(-3.51)		(1.49)	(0.51)	(-1.70)
Securities Brokerage ($\theta_{1,6}$)						9.445**	0.261	-0.499**		-0.757	-0.138	0.004
						(2.13)	(1.05)	(-2.26)		(-0.16)	(-0.37)	(0.02)
Investment Banking ($\theta_{1,7}$)						-16.573***	-0.072	-0.977**		-9.809	0.682	-1.380***
						(-2.63)	(-0.14)	(-2.56)		(-0.95)	(0.86)	(-2.81)
Service Charges ($\theta_{1,8}$)		2.014***	-0.150***	-0.217***		2.837***	0.009	-0.332***		2.877***	0.041	-0.158***
		(3.27)	(-3.02)	(-6.80)		(5.03)	(0.12)	(-5.35)		(4.62)	(0.56)	(-3.76)
Loan Sales ($\theta_{1,9}$)		-2.434***	-0.303***	-0.120***		0.483	-0.275**	-0.346***		1.083	-0.002	-0.207***
		(-2.62)	(-5.22)	(-3.16)		(0.46)	(-2.05)	(-3.72)		(1.46)	(-0.02)	(-3.37)
Other Assets Sales ($\theta_{1,10}$)		-9.179***	0.091	0.157		10.681***	1.987***	-1.600***		9.588***	1.398***	-0.703***
		(-2.72)	(0.38)	(0.89)		(5.59)	(7.34)	(-7.19)		(12.39)	(11.08)	(-8.86)
Other Activities ($\theta_{1,11}$)		-1.422***	0.157***	0.174***		-1.204***	0.145**	0.222***		-0.837**	0.102*	0.085**
		(-2.99)	(3.68)	(5.96)		(-3.37)	(2.01)	(4.08)		(-2.25)	(1.71)	(2.53)
Asset Growth (θ_2)	-0.062	-0.020	-0.002	-0.004*	0.043	0.055	0.023***	-0.021***	0.657***	0.555***	0.094***	-0.035***
	(-1.33)	(-0.44)	(-0.64)	(-1.68)	(1.22)	(1.57)	(3.76)	(-4.99)	(14.41)	(12.13)	(15.23)	(-8.42)
Capital (θ_3)	0.005	0.017	0.015***	0.005***	0.093**	0.116***	0.007	0.006**	0.267***	0.252***	0.043***	-0.013***
	(0.17)	(0.53)	(6.85)	(4.05)	(2.52)	(3.09)	(1.57)	(2.17)	(6.13)	(5.89)	(9.02)	(-4.84)

Spread (θ_4)	1.115***	0.952***	0.184***	0.030***	0.910***	0.627***	0.167***	0.018*	1.365***	1.004***	0.215***	-0.024**
	(9.62)	(7.80)	(19.49)	(6.57)	(6.28)	(3.63)	(11.83)	(1.65)	(8.39)	(5.98)	(12.66)	(-2.35)
Size (θ_5)	1.004***	0.894***	0.034***	-0.005**	-0.382***	-0.506***	-0.048***	0.066***	-0.447***	-0.496***	-0.056***	0.029***
	(9.67)	(8.69)	(7.62)	(-2.15)	(-3.99)	(-5.15)	(-5.41)	(7.30)	(-4.10)	(-4.47)	(-5.22)	(4.09)
Log(Age) (θ_6)	0.387***	0.303***	0.031***	-0.006*	1.162***	0.978***	0.108***	-0.064***	1.622***	1.367***	0.142***	-0.058***
	(4.07)	(3.09)	(5.65)	(-1.96)	(13.40)	(10.98)	(12.68)	(-9.11)	(17.70)	(13.69)	(16.24)	(-10.76)
Home Price Growth (θ_7)	-0.021***	-0.017***	-0.000	-0.000	-0.018***	-0.014***	-0.001**	0.001***	-0.003	0.000	0.000	-0.000
	(-6.60)	(-4.99)	(-0.87)	(-0.91)	(-5.18)	(-4.06)	(-2.37)	(3.35)	(-0.63)	(0.07)	(0.65)	(-0.22)
Income Growth (θ_8)	-0.135	-0.563*	0.059***	0.027***	2.131***	1.984***	0.105***	-0.022	0.006	-0.051	0.210***	-0.103***
	(-0.49)	(-1.95)	(4.02)	(3.61)	(7.65)	(7.25)	(5.03)	(-1.51)	(0.01)	(-0.10)	(4.67)	(-3.88)
Constant (θ_0)	-6.285***	-5.106***	-0.838***	0.069*	4.201***	5.767***	-0.053	-0.551***	-3.103*	-0.880	-1.157***	0.441***
	(-4.06)	(-3.36)	(-10.94)	(1.78)	(2.95)	(3.95)	(-0.38)	(-4.28)	(-1.87)	(-0.53)	(-7.14)	(4.25)
Observations	3,613	3,613	3,613	3,613	3,453	3,453	3,453	3,453	3,537	3,536	3,536	3,536
R-squared	0.071	0.085	0.322	0.149	0.110	0.125	0.291	0.147	0.184	0.213	0.528	0.264

Table A7. Risk Adjusted Return Model – Micro Community Banks – Robustness Check

This table presents the estimation of *Risk Adjusted Return* model (Equation (8)) for *Micro Community Banks* where different components of non-interest incomes are scaled by total assets in lieu of total operating revenue as robustness check. *Micro Community Banks* are defined as community banks with less than $100 million in total assets. We analyze the contribution of different sources of non-interest revenue generating activities in bank's risk adjusted return during the pre, acute and post-crisis periods.

The first four columns illustrate regression estimations for the pre-crisis period. Column (1) reports the regression of *Risk Adjusted Return* on *Non-interest Income* and control variables (*Asset Growth*, *Capital*, *Spread*, *Size* and *Log(Age)*, *Home Price Growth* and *Income Growth*). In column (2), *Non-interest Income* is replaced by its components (i.e. *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Service Charges*, *Loan Sales*, *Other Assets Sales* and *Other Activities*). The first four components are our variables of interest. In columns (3) and (4), we replace *Risk Adjusted Return* with *Return* and *Risk*, respectively. We re-estimate our model for acute and post-crisis periods, where we include *Annuity Sales*, *Securities Brokerage* and *Investment Banking* to the model. We use the same dependent variables, controls and the technique used in columns (1) to (4). The results are reported in columns (5) to (8) and (9) to (12), respectively.

We apply cross-section OLS technique with robust standard errors for our estimations. All the explanatory variables are averaged over the sample period. See Table A2 for variable definitions. Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

	Pre-Crisis Period				Acute-Crisis Period				Post-Crisis Period			
	Risk Adjusted Return	Risk Adjusted Return	Return	Risk	Risk Adjusted Return	Risk Adjusted Return	Return	Risk	Risk Adjusted Return	Risk Adjusted Return	Return	Risk
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Non-interest Income (θ_1)	-0.737***				-0.222				-0.440**			
	(-6.02)				(-1.29)				(-2.40)			
Fiduciary Activities ($\theta_{1,1}$)		-3.182*	-0.545*	-0.281**		-1.390	-0.386	-0.527**		-3.182	-0.753*	0.130
		(-1.75)	(-1.90)	(-2.33)		(-0.67)	(-1.01)	(-2.04)		(-1.24)	(-1.84)	(0.52)
Life Insurance ($\theta_{1,2}$)		-2.055	-0.361**	-0.224**		2.767	-0.012	-0.532***		-1.151	-0.321	-0.362**
		(-1.11)	(-2.11)	(-2.40)		(0.85)	(-0.04)	(-2.80)		(-0.32)	(-1.18)	(-2.56)
Other Insurance Services ($\theta_{1,3}$)		2.862**	-0.072	-0.300***		5.895**	0.157	-0.461***		5.766**	0.367*	-0.422***
		(2.25)	(-0.40)	(-4.10)		(2.47)	(0.71)	(-3.14)		(2.46)	(1.71)	(-3.31)
Loans Servicing ($\theta_{1,4}$)		-6.648***	-0.743***	0.065		-5.867*	-0.107	-0.112		-2.826	-0.388	-0.038
		(-3.15)	(-2.87)	(0.48)		(-1.66)	(-0.25)	(-0.38)		(-1.00)	(-0.75)	(-0.14)
Annuity Sales ($\theta_{1,5}$)						5.280	0.908	-1.436**		-9.424	-2.653	3.172*
						(0.23)	(0.62)	(-2.18)		(-0.29)	(-1.05)	(1.73)
Securities Brokerage ($\theta_{1,6}$)						12.866	0.513	-0.714*		-7.783	0.219	-0.148
						(1.08)	(0.53)	(-1.80)		(-0.63)	(0.21)	(-0.23)
Investment Banking ($\theta_{1,7}$)						5.576	-0.353	0.442		-0.761	-1.509	-1.478
						(0.31)	(-0.26)	(0.29)		(-0.02)	(-0.66)	(-1.54)
Service Charges ($\theta_{1,8}$)		-0.275	-0.348***	-0.141***		0.270	-0.124	-0.240***		0.551	-0.253**	-0.154**
		(-0.54)	(-3.68)	(-3.41)		(0.38)	(-1.06)	(-3.40)		(0.71)	(-2.55)	(-2.58)
Loan Sales ($\theta_{1,9}$)		-3.755***	-0.722***	-0.085		-5.356***	-0.925***	0.018		-2.657**	-0.293	-0.129
		(-4.31)	(-4.12)	(-1.12)		(-3.57)	(-3.00)	(0.09)		(-2.37)	(-1.61)	(-1.27)
Other Assets Sales ($\theta_{1,10}$)		-5.949**	-0.573	0.130		6.856**	1.578**	-1.036**		8.859***	1.896***	-1.053***
		(-2.15)	(-1.51)	(0.54)		(2.41)	(2.42)	(-2.38)		(7.55)	(8.44)	(-8.61)
Other Activities ($\theta_{1,11}$)		0.014	0.338***	0.165***		-0.015	0.190*	0.228***		-0.575	0.175**	0.144***
		(0.04)	(3.72)	(4.46)		(-0.03)	(1.87)	(3.41)		(-1.09)	(2.07)	(2.69)
Asset Growth (θ_2)	0.009	0.030	0.007	-0.006	0.072	0.062	0.018**	-0.011*	0.296***	0.206***	0.062***	-0.030***
	(0.21)	(0.70)	(0.98)	(-1.54)	(1.55)	(1.36)	(2.10)	(-1.94)	(4.98)	(3.43)	(6.25)	(-6.38)
Capital (θ_3)	0.125***	0.116***	0.024***	0.004***	0.118***	0.112***	0.022***	0.002	0.251***	0.235***	0.026***	-0.003
	(6.45)	(5.72)	(8.83)	(3.00)	(3.95)	(3.70)	(6.23)	(0.92)	(6.59)	(6.10)	(6.00)	(-1.19)

Spread (θ_4)	0.629***	0.553***	0.130***	0.021***	0.708***	0.563***	0.146***	0.001	1.159***	1.037***	0.200***	-0.018
	(6.68)	(5.62)	(10.00)	(3.15)	(5.09)	(3.79)	(7.63)	(0.07)	(6.74)	(5.88)	(8.49)	(-1.40)
Size (θ_5)	1.551***	1.623***	0.124***	-0.038***	1.690***	1.710***	0.115***	-0.025*	1.941***	2.159***	0.158***	-0.037***
	(12.90)	(13.38)	(9.64)	(-5.35)	(8.19)	(8.07)	(5.96)	(-1.79)	(8.16)	(8.78)	(6.72)	(-2.93)
Log(Age) (θ_6)	0.524***	0.531***	0.072***	-0.019***	1.087***	1.008***	0.131***	-0.052***	1.345***	1.177***	0.187***	-0.064***
	(5.88)	(5.83)	(8.45)	(-4.04)	(9.30)	(8.71)	(9.02)	(-5.04)	(11.64)	(9.77)	(11.07)	(-7.20)
Home Price Growth (θ_7)	-0.006**	-0.004	0.001***	0.000	-0.015***	-0.013***	-0.000	0.001**	-0.004	-0.001	-0.000	0.001*
	(-2.29)	(-1.37)	(2.74)	(0.27)	(-3.75)	(-3.34)	(-0.10)	(2.18)	(-0.62)	(-0.25)	(-0.38)	(1.65)
Income Growth (θ_8)	-0.682***	-0.957***	0.056**	0.046***	1.161***	0.957***	0.127***	-0.014	0.064	0.026	0.095**	-0.056**
	(-2.65)	(-3.57)	(2.29)	(3.32)	(4.50)	(3.74)	(4.67)	(-0.76)	(0.15)	(0.06)	(2.33)	(-2.39)
Constant (θ_0)	-15.317***	-16.105***	-2.113***	0.471***	-19.209***	-19.087***	-2.257***	0.540***	-28.383***	-29.709***	-3.282***	0.890***
	(-9.05)	(-9.50)	(-12.52)	(4.96)	(-7.06)	(-6.86)	(-8.19)	(2.82)	(-8.75)	(-8.98)	(-9.67)	(5.13)
Observations	2,849	2,849	2,849	2,849	2,085	2,083	2,083	2,083	1,885	1,884	1,884	1,884
R-squared	0.083	0.093	0.190	0.105	0.079	0.095	0.206	0.081	0.114	0.139	0.412	0.263

Chapter 3

Financial Development and Growth in a Dual Banking System

Abstract. This chapter investigates whether the coexistence of Islamic banks alongside conventional banks has any significant influence on the quantitative and qualitative development of the banking system and economic growth. We also explore the possible impact of Islamic banking presence on the performance of conventional banks. We study 22 Muslim countries with a dual banking system during the 1999-2009 period. We find a positive relationship between the market share of Islamic banks and savings mobilization. The operation of more efficient Islamic banks improves credit allocation across private and Governmental sectors and reduces lending-deposit spreads. Moreover, a larger market share of Islamic banking is associated with lower credit risk and cost inefficiency, but higher lending-deposit spreads of small conventional banks in certain countries.

JEL Classifications: G21

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1. Introduction

The financial system is expected to mobilize savings and efficiently allocate them to productive projects. The existing literature[64] shows that a well-functioning financial market and efficient financial intermediation can spur capital productivity and foster economic growth.

Different financial structures may differently affect economic growth, as some structures can be more influential than others. Berger et al. (2004) study the role of community banks in the economic growth of 49 countries between 1993 and 2000. Their findings suggest that financial systems with larger market share and efficiency of small, private, domestically-owned banks can better boost economic growth. In this chapter we attempt to study whether the coexistence of Islamic and conventional banking contributes to financial development and economic growth.

During the recent decades, Islamic finance has evolved and grown rapidly in many Muslim countries. According to The Banker (2013), Islamic finance grows at the rate of 15% to 20% per annum. Commercial banks held around $1.3bn Global Islamic assets in 2011 expected to rise to $1.8bn in 2013. This trend has transformed the financial structure of many countries, by introducing a dual financial system where both Islamic and conventional finance are operated. Islamic banking is expected to offer financial products and services that are compatible with Islamic doctrine, and hence convince Muslim individuals and firms with religious concerns to have access to finance or move from the informal to the formal financial system. This suggests a positive impact of a dual banking system on the size of the financial intermediation sector by boosting savings mobilization.

How efficiently savings are allocated in such an environment is another important subject which we attempt to examine in this chapter. In a dual banking system, Islamic and conventional

[64] For extensive literature review, refer to Ang (2008).

banks do not merely play a supplementary role to one another, they compete with each other in absorbing clients and investors as a portion of Muslims may have a low sensitivity to religious issues. As such, we expect the presence of Islamic banking to also improve the quality and efficiency of financial intermediation.

The extant literature shows that financial development can foster economic growth. Recent studies (for instance Berger et al., 2004; Koetter and Wedow, 2010) suggest that, beside an increase in size, an improvement in quality of the financial sector can also spur economic growth. In this chapter we investigate whether the presence of Islamic banks in a dual banking system can directly contribute to economic growth: On the one hand, Islamic banks may be more risk-averse than conventional banks and hence discourage firms' business expansion; on the other hand, since they invest their funds in the real economy and are not allowed to get involved in speculative activities, they can stimulate economic growth more strongly than their conventional counterparts.

Conventional banks might operate more efficiently in a dual banking system due to competition pressure enforced by the presence of Islamic banks. The competition pressure might be even stronger on conventional than Islamic banks, because Muslims with religious concerns would prefer Islamic to conventional finance; however, other Muslims are expected to be indifferent between the two systems. As such, one may anticipate that credit risk, lending-deposit spreads and cost inefficiency of conventional banks would decline with an increase in quantity and quality of Islamic banks' presence. Alternatively, operating in a dual banking system may deteriorate the quality of conventional banks' performance, since their competitors, i.e. Islamic banks, might be more inefficient or charge higher spreads as they offer *Sharia*-compliant financial products and Muslims have no other choice but to bank with them.

Merton and Bodie (2004) point out that the overall financial development matters more than the type of financial structure in place to better fuel economic growth. Nevertheless, our focus in this chapter is on banks and not the financial system as a whole. Financial intermediation and financial markets have both substantial roles in economic growth. As Boyd and Smith (1998) show in their model, credit and equity markets are complementary components of the whole financial system rather than substitutes for each other. Beck and Levine (2004) also find that the development of both the banking system and financial markets is positively linked with economic growth implying that financial services provided by stock markets are different from those supplied by banks. In developing countries, however, the other components of financial markets such as stock and bond markets, pension funds and insurance firms are not as developed as their banking systems. In fact, banks have the key role in mobilizing deposits and channeling them for investments.

For our study we focus on commercial banking industries of 22 Muslim countries where a dual banking system is practiced during the 1999 - 2009 period. We pursue our analysis using different sub-samples of countries based on institutional environment indices such as the Corruption Perception Index and the Economic Freedom Index. Overall, we find that higher market share of Islamic banks is associated with greater bank deposits (scaled by GDP) in relatively low income countries or countries which suffer more from corruption or economic repression, whereas in countries with comparatively less corruption the higher efficiency rank (rather than market share) of Islamic banks can boost savings mobilization.

The results also show that in countries with relatively high levels of economic freedom, a greater market share of Islamic banks lowers lending allocated to the private sector; however, in rather low income countries, higher efficiency rank of Islamic banks is associated with more

credit extension to the private sector. Moreover, increases in efficiency of Islamic banks reduces credit allocation to the Governmental sector in relatively corrupted or economically repressed countries, but increases credit extension to the Governmental sector in countries with relatively less corruption or economic repression. Higher efficiency rank of Islamic banks can also lower the lending-deposit spread in comparatively low income countries, countries with more economic freedom, or those less exposed to corruption. We notice that in countries with more corruption, the presence of Islamic banks can lower interest spreads only if they benefit from comparatively higher cost efficiency.

We also find that in countries with a relatively repressed economy an increase in the market share of Islamic banks is negatively linked to economic growth. In rather low income countries, however, the efficiency rank of Islamic banks is positively associated with economic growth. In countries with comparatively greater share of Muslims in population, while an increase in the market share of Islamic banks slows down economic growth, increases in efficiency rank of Islamic banks foster the growth. Moreover, we observe that while in certain countries quantitative development of financial market matters, in other groups of countries qualitative financial development can better stimulate economic growth. For instance, in countries which suffer more from corruption, the qualitative improvement - such as more credit allocation to private sector or lower lending-deposit spreads - can boost growth, whereas in countries with less corruption, quantitative financial development - represented by the ratio of bank deposits to GDP - is positively linked with economic growth. Table A1 of appendix provides the summary of our results.

Our bank-level analyses indicate that greater market share of Islamic banks reduces credit risk of small conventional banks in relatively low income countries, countries which suffer more

from corruption or economic repression or countries with lower share of Muslims in their population. However, increases in market share of Islamic banks is associated with higher spreads of small conventional banks, except in comparatively rich or less corrupted countries or countries with relatively lower share of Muslims in population. We also find that cost inefficiency of small conventional banks declines with increases in market share of Islamic banks in relatively low income or more corrupted countries, whereas in relatively high income countries or countries with more economic freedom an increase in market share of Islamic banks is positively associated with cost inefficiency of large conventional banks.

The remainder of the chapter is organized as follows. Section 2 presents the research motivation and econometric specifications, section 3 describes our sample of observations and section 4 discusses the results. Finally, section 5 concludes.

2. Research Motivation and Econometric Specifications

2.1. FINANCIAL INTERMEDIATION IN A DUAL BANKING SYSTEM

Many Muslims do not use traditional financial products and services, since they believe that they are against their religious beliefs. They would preferably use the financial services provided by the informal market[65]. A number of surveys highlight that a considerable proportion of Muslims prefer *Sharia*-compliant financial products and services. In Algeria, for instance, a study shows that around 20.7% of micro-enterprise owners do not apply for loans primarily due to religious concerns (Frankfurt School of Finance and Management, 2006). In Indonesia, around 49% of the rural population of East Java prefer Islamic finance and believe that interest is prohibited (C.G.A.P., 2008). Honohan (2008) finds that in Islamic Development Bank's member

[65] Often known as the curb market and may play a substantial role in developing countries.

countries (i.e. all OIC-member countries except Guyana) only 28 percent of the adult population, including Muslims and non-Muslims, uses the formal or semi-formal financial products and services for deposit accounts or borrowing activities. Given the relatively low access to finance in most Muslim countries, there is a considerable potential for outreaching Islamic finance; hence Islamic banking can contribute to financial intermediation development by transferring lenders and borrowers from the informal to the formal market, depending on whether the informal market is more or less efficient than the formal market[66]. As such, Islamic banks are expected to play a complementary role for conventional banks in collecting deposits.

Islamic banks are supposed to act as the agent for the holder of investment (saving) accounts and allocate their funds to profitable projects (Iqbal, et al., 1998). The realized profit would then be shared between Islamic banks and depositors. We, hence, expect the introduction of Islamic banks to improve the quality of financial intermediation. We explore whether and how funds allocation to private and Governmental sectors is affected by the degree of presence of Islamic banks in a dual banking system.

Islamic and conventional banking may also play a substitutive role for each other in a dual banking system, as a portion of Muslims may have a low sensitivity to religious issues. As such, Islamic banks can absorb lenders and borrowers from conventional financial institutions who have chosen the conventional finance in the absence of the Islamic one. The existence of Islamic financial institutions together with their conventional counterparts increases the number of participants and financial products which may deepen the financial system and improve the efficiency of the whole financial sector. It may also result in a lower lending-deposit spread due

[66] Some economists believe that curb markets are more efficient in saving and investment intermediation (van Wijnbergen, 1982 & 1983; Taylor, 1983, Buffie, 1984); however, Fry (1988) argues that informal markets are not necessarily as efficient as formal markets. Chandavarkar (1992) claims that curb markets are unorganized and do not play a substantial role in financial resource intermediation to boost economic growth. The main problem for examining the potential contribution of informal markets to economic growth is the lack of data.

to greater market competition. For instance, Valverde et al. (2003) who study the relationship between market competition and economic growth in five Spanish regions between 1986 and 1998 show that the lending-deposit spread declines as competition rises; however, they find little evidence on a positive association of competition with growth.

Islamic banks may boost or hinder economic growth than their conventional counterparts. On the one hand, the existing studies show that religious individuals are more risk averse than other agents (Miller and Hoffmann, 1995; Osoba, 2003; Hilary and Hui, 2009). Similarly, Islamic financial institutions might be more risk-averse than their conventional counter-parts. As such, they might limit entrepreneurship by encouraging borrowers to select low-risk projects or invest excessively in tangible assets. On the other hands, Islamic financiers prefer to allocate their funds to the real economy; and they are not authorized to allocate their financial resources to speculative activities.

Jayaratne and Strahan (1996) study the effect of inter-state branching reform in the U.S on state-level economic growth. They show that growth increased following the financial deregulation, as the banking system becomes more competitive and efficient. They argue that the reform has resulted in better loan quality and lower loan prices which in turn have spurred economic growth. Islamic finance can affect economic growth through two channels: First, capital accumulation or the quantitative channel which is developed following the "debt-accumulation" hypothesis proposed by Gurley and Shaw (1955). Second, total factor productivity or the qualitative channel, representing innovations in the financial industry which improve the efficiency in allocating financial resources to investment projects and loan monitoring by reducing informational asymmetries (Townsend, 1979; Greenwood and Jovanovic, 1990; King and Levine, 1993).

We attempt to investigate whether the presence of Islamic banks alongside conventional banks can affect financial intermediation in terms of savings mobilization, funds allocation and lending-deposit spread. We also explore whether the existence of Islamic banking in a dual banking system can encourage economic growth, considering its possible role in framing the size and the performance of financial markets. We adopt the following panel specification for our analysis. We use the random effect technique (which accounts for random unobservable heterogeneities) for our estimation as suggested by the Hausman test.

$$Y_{j,t} = \alpha_0 + \alpha_1 \times ISB\_Share_{j,t} + \alpha_2 \times ISB\_Rank_{j,t} + \alpha_3 \times ISW\_Share_{j,t} + \alpha_4 \times Foreign\_Bank\_Share_{j,t} + \alpha_5 \times State\_Bank\_Share_{j,t} + \alpha_6 \times Inflation_{j,t} + \alpha_7 \times Trend_t + \varepsilon_{j,t} \quad (1)$$

Where j subscript denotes individual countries and t denotes the time dimension.

2.1.a. DEPENDENT VARIABLES

$Y_{j,t}$ as the dependent variable is 1) bank deposits to GDP ratio (*Bank Deposit*) representing the volume of deposits mobilization, 2) the ratios of private credit to GDP (*Private Credit*), and credits to Governmental sector to GDP (*Governmental Credit*) as proxies for the quality of funds allocation, 3) the lending-deposit spread (*Spread*) representing the cost of intermediation (i.e. the efficiency of the financial system), and 4) the annual growth rate of GDP per capita (*Economic Growth*).

2.1.b. VARIABLES OF INTEREST

We are interested in both the quantity and the quality of Islamic banking presence in the banking system. Hence, the share of commercial Islamic banks in total commercial banking industry (*ISB Share*) and the weighted average efficiency rank of Islamic banks (*ISB Rank*) are our variables of interest. We use total noninterest expense on total operating revenue ratio as the proxy for cost inefficiency (higher $\frac{Total\ Noninterest\ Expense}{Total\ Operating\ Revenue}$ translates into lower cost efficiency). We follow Berger et al. (2004) and orderly rank banks in each country and year on the basis of

their cost efficiency. The ranks are then transformed into a uniform scale in [0,100] domain through this formula:$100\times(n_t-Order_{it})/(n_t-1)$. n_t is the number of observations (banks) in each year. $Order_{it}$ is the rank of bank (i) in year (t). Efficiency ranks are preferred to efficiency levels as they are more comparable across countries and years. A bank with efficiency better than 30% of other banks in country A and year B, translates into efficiency rank of 30.

2.1.c. CONTROL VARIABLES

Islamic banking can be introduced in the financial system in two forms: Establishment of pure Islamic banks or launching Islamic branches/window by existing conventional banks. In the former case, the presence of Islamic banking increases both size of the financial sector and the number of financial institutions yielding higher market competition; however, in the latter form, the size of the financial system rises without any increase in the number of participants, resulting in higher market power. Our variable of interest refers to the first type of introduction. We attempt to control for the second type by including the share of commercial Islamic window banks – i.e. commercial banks offering both Islamic and conventional banking (*ISW Share*) – in the total assets of the aggregate commercial banking sector. The benchmark is then the share of pure commercial conventional banks in the total assets of the banking system, which is omitted to avoid perfect multi-collinearity.

We try to capture the heterogeneities associated with the structure of the banking sector in terms of ownership, using the share of total assets of foreign and state-owned banks in total assets (*Foreign Bank Share* and *State Bank Share*). The benchmark is the share of domestic private banks in total assets which is dropped out from the model to avoid perfect multi-collinearity. We also control for inflation represented by the annual growth rate of the GDP deflator (*Inflation*). Deposits mobilization, funds allocation, lending-deposit spread and

economic growth are indeed influenced by inflation. Rousseau and Wachtel (2002) show that the contribution of financial development to economic growth vanishes when the inflation rate exceeds a threshold of 13-25 percent. In their study, the impact of finance on growth is significantly positive at an inflation rate below 6-8 percent. Finally, we add a trend variable to capture the time trend. Table A2 in the appendix describes the variables of interest and the control variables.

2.2. EFFICIENCY OF CONVENTIONAL BANKS IN A DUAL BANKING SYSTEM

Change in market structure may affect banks' performance. We study whether lending quality, lending-deposit spread and cost efficiency of conventional banks are affected when they operate in a dual banking system alongside Islamic banks.

Religious clients are more likely to prefer Islamic to conventional banking, since Islamic banks are supposed to comply with *Sharia* requirements in their operations. As such, a dual banking system segments the market: clients with religious beliefs may select Islamic banking, while others might be indifferent between Islamic and conventional financial services. Taking into account that religious people are more risk averse, we expect that borrowers' quality of conventional banks deteriorates when they operate together with Islamic banks. Alternatively, a dual banking system might discipline conventional banks more effectively which might result in higher efficiency and loan quality. Greater competition may encourage banks to better screen and monitor loan applications; however, excessive competition may deteriorate the lending quality.

The effect of the presence of Islamic banks in a dual banking system on the lending-deposit spread is indeterminate. On the one hand, it may lower *Spread* due to higher market competition; on the other hand, it might increase *Spread* since the market is segmented and

Islamic banks might charge higher rates to their clients for offering financial products in line with their religious beliefs[67]. We examine how the lending-deposit spread of conventional banks is affected in a dual banking system. We use the following panel specifications for our loan quality, spread and cost efficiency analyses which are similar to Abedifar et al. (2013). We use the fixed effect technique for our estimation as suggested by the Hausman test.

$$\begin{aligned}\text{Credit\_Risk}_{i,t} = {} & \beta_0 + \beta_1 \times \text{ISB\_Share}_{j,t-1} + \beta_2 \times \text{ISB\_Rank}_{j,t-1} + \beta_3 \times \text{ISW\_Share}_{j,t-1} + \\ & \beta_4 \times \text{Economic\_Growth}_{j,t-1} + \beta_5 \times \text{HHI}_{j,t-1} + \beta_6 \times \text{Per\_Capita}_{j,t-1} + \beta_7 \times \text{Domestic\_Interest\_Rate}_{j,t-1} + \\ & \beta_8 \times \text{Loan\_Growth}_{i,t-1} + \beta_9 \times \text{Inefficiency}_{i,t-1} + \beta_{10} \times \text{Noninterest\_Income}_{i,t-1} + \\ & \beta_{11} \times \text{Capital}_{i,t-1} + \beta_{12} \times \text{Size}_{i,t-1} + \sum_{y=1}^{9} \beta_{13,y} \times \text{Year\_Dummies}_{t,y} + \xi_{i,t}\end{aligned} \quad (2)$$

$$\begin{aligned}\text{Spread}_{i,t} = {} & \theta_0 + \theta_1 \times \text{ISB\_Share}_{j,t-1} + \theta_2 \times \text{ISB\_Rank}_{j,t-1} + \theta_3 \times \text{ISW\_Share}_{j,t-1} + \\ & \theta_4 \times \text{Economic\_Growth}_{j,t-1} + \theta_5 \times \text{HHI}_{j,t-1} + \theta_6 \times \text{Per\_Capita}_{j,t-1} + \theta_7 \times \text{Domestic\_Interest\_Rate}_{j,t-1} + \\ & \theta_8 \times \text{Credit\_Risk}_{i,t-1} + \theta_9 \times \text{Inefficiency}_{i,t-1} + \theta_{10} \times \text{Noninterest\_Income}_{i,t-1} + \\ & \theta_{11} \times \text{Capital}_{i,t-1} + \theta_{12} \times \text{Size}_{i,t-1} + \sum_{y=1}^{9} \theta_{13,y} \times \text{Year\_Dummies}_{t,y} + \lambda_{i,t}\end{aligned} \quad (3)$$

$$\begin{aligned}\text{Inefficiency}_{i,t} = {} & \delta_0 + \delta_1 \times \text{ISB\_Share}_{j,t-1} + \delta_3 \times \text{ISW\_Share}_{j,t-1} + \\ & \delta_4 \times \text{Economic\_Growth}_{j,t-1} + \delta_5 \times \text{HHI}_{j,t-1} + \delta_6 \times \text{Per\_Capita}_{j,t-1} + \delta_7 \times \text{Domestic\_Interest\_Rate}_{j,t-1} + \\ & \delta_8 \times \text{Credit\_Risk}_{i,t-1} + \delta_9 \times \text{Loan\_Growth}_{i,t-1} + \delta_{10} \times \text{Noninterest\_Income}_{i,t-1} + \\ & \delta_{11} \times \text{Capital}_{i,t-1} + \delta_{12} \times \text{Size}_{i,t-1} + \sum_{y=1}^{9} \delta_{13,y} \times \text{Year\_Dummies}_{t,y} + \vartheta_{i,t}\end{aligned} \quad (4)$$

Where i, t and j subscripts denote individual banks, time dimension and countries, respectively. Credit risk, Spread and Inefficiency are modeled in Equations (2) to (4), respectively.

ISB Share and *ISB Rank* are our variables of interest and we would like to study their impact on *Credit Risk*, *Spread* and *Inefficiency* of conventional banks operating in a dual banking system.

2.2.a. DEPENDENT VARIABLES

We use the ratio of loan-loss reserves to gross loans (*Loan Loss Reserves*) as a proxy for credit risk (*Credit Risk*). *Loan Loss Reserves* takes into account the past performance and the

[67] For instance, Baele et al. (2010) point out that in Pakistan although Islamic loans have on average lower default probabilities than conventional loans, their interest (mark-up) rate is two percentage points higher than conventional loans. However, Weill (2011) shows that Islamic banks have lower prices / mark-ups than conventional banks. Abedifar et al. (2013) find little significant difference between Islamic and conventional banks in terms of the lending-deposit spread.

expectation for future performance of the existing loan portfolio. The proxy represents a bank's lending quality and is widely used in the empirical banking literature (for instance, Shiers, 2002; Abedifar et al. (2013)). For the Spread Equation (Equation (3)), we use the net interest spread defined as $\frac{\text{total interest income}}{\text{average total earning assets}} - \frac{\text{total interest expense}}{\text{average total interest-bearing liabilities}}$ (*Spread*) which is in line with Carbo and Rodriguez (2007) and Lepetit et al. (2008b). Finally, we employ the ratio of total noninterest expense to total operating income (*Inefficiency*) for our cost inefficiency analysis (Equation (4)).

2.2.b. CONTROL VARIABLES

We control for macroeconomic factors such as *Economic Growth*, market concentration (*HHI*), *Domestic Interest Rate* and *Per Capita*, together with bank-level controls including *Loan Growth, Noninterest Income, Capital* and *Size*. Since the Hausman test suggests the use of the fixed effect technique, we do not include ownership and age dummies in our model. Finally, we capture year fixed effects using nine year dummy variables[68].

We introduce four country level variables to capture cross-country variations. We control for the level of domestic interest rates (*Domestic Interest Rate*). T*he extant literature shows the influence of domestic interest rates on banks' risk appetite (Dell' Ariccia and Marquez, 2006; Rajan, 2006; Borio and Zhu, 2008; Delis and Kouretas, 2010; Maddaloni and Peydró, 2011). On the one hand, banks have a greater risk-taking appetite when interest rates are low; on the other hand, an increase in the interest rate level can adversely affect the ability of borrowers to repay loans* (Jarrow and Turnbull, 2000; Carling et al., 2007; Drehmann et al., 2010 and Alessandri and Drehmann, 2010). *We control for the impact of* banking sector concentration on *Credit Risk*, *Spread* and *Inefficiency* by adding the *Herfindahl-Hirschman Index (HHI) to our*

[68] The sample covers eleven years; however, since all accounting and macro level variables are lagged for one year, we use nine year dummies (2001-2009) in our estimations.

models. Finally, we try to capture the possible impact of level and growth in the prosperity of the population by including GDP per capita (Per Capita) and growth in GDP per capita (Economic Growth).

We also control for bank-level heterogeneities. The annual growth rate of gross loans (*Loan Growth*) is included in the *Credit Risk* and *Inefficiency* Equations. A substantial increase in loans may represent weaker screening standards or looser collateral requirements (Dell'Ariccia and Marquez, 2006; Ogura, 2006). Clair (1992) shows an inverse relationship between credit expansion and non-performing loans and loan charge-offs, though for subsequent years a positive linkage is observed as borrowers do not default immediately after taking-on loans (Berger and Udell, 2004 and Foos et al., 2010). The loan expansion strategy might also affect a bank's cost inefficiency.

The share of non-interest income in total operating income (*Noninterest Income*) is controlled for in all three models. A bank may lose its focus on loan activity as it moves towards non-interest income businesses. Alternatively, the expanding scope of activities may improve a bank's position in lending as it can collect valuable information from different business lines which can be used for lending. *Noninterest Income* is included in the second Equation (*Spread*), since Carbo and Rodriguez (2007) and Lepetit et al. (2008b) show that banks with higher *Noninterest Income* have lower margins. Moreover, *Noninterest Income* captures differences in business models which can affect cost inefficiency.

The share of equity capital in total assets (*Capital*) is also included in our models. On the one hand, an increase in equity can lower moral hazard problems and increase the monitoring incentives of banks (Diamond, 1984). On the other hand, higher equity can increase banks' risk-taking capacity. *Capital* is used in the *Spread* Equation, as previous studies on the determinants

of margins suggest a positive relationship (Carbo and Rodriguez, 2007 among others). Equity capital can be considered as a risk aversion proxy (McShane and Sharpe, 1985 and Maudos and De Guevara, 2004) and banks with higher capital ratios expect higher returns. We control for *Capital* in the *Inefficiency* Equation (Equation (4)) following the extant literature. Jensen (1986) and Harris and Raviv (1990) discuss the possible impact of *Capital* on *Inefficiency*. They argue that when capital is more expensive than debt (at the margin) management might endeavor to reduce operating costs to offset the higher financial costs of the capital raise required by regulators. Alternatively, a fall in interest expenses may reduce managerial attempts to control operating expenses.

We control for size by using the logarithm of total assets (*Size*). Larger banks can benefit from scale economies and diversification (Hughes et al., 2001). They may target riskier activities since they might benefit from safety net subsidies (Kane, 2010). They might face higher competition pressure as they have larger and more transparent clients with relatively easier access to capital markets. Larger banks may also use different technologies and business models for their operations. As such, *Credit Risk*, *Spread* and *Inefficiency* might depend on *Size*.

Kwan and Eisenbeis (1997) show that inefficiency increases bank risks – illustrating moral hazard that poorly-run banks have greater incentives for risk-taking. Hence, we control for cost inefficiency (*Inefficiency*) in our *Credit Risk* Equation. A bank with greater *Inefficiency* needs to have a higher spread to compensate for losses incurred due to *Inefficiency*. Thus, *Inefficiency* is included in the *Spread* model (Equation (3)). In the third and fourth Equations (*Spread* and *Inefficiency* models), we control for *Credit Risk*, since an increase in *Credit Risk* may raise *Spread* and *Inefficiency* (Angbazo, 1997; Wong, 1997; Maudos and De Guevara, 2004; Carbo and Rodriguez, 2007).

3. Data and Descriptive Statistics

3.1. DATA

Our empirical analysis is based on country and bank-level data for 22 Muslim countries[69] where both Islamic and conventional banking are practiced in a dual banking system during the 1999-2009 period. We collect country-level data from the World Bank web-site.

The bank-level data is obtained from the Bankscope database. Bankscope classifies banks as commercial, Islamic or other types, while an Islamic bank might be a commercial or a non-commercial bank. Moreover, some commercial conventional banks have Islamic window/branches/wing (*Islamic Window Bank*), which are not differentiated from Islamic or conventional banks. As such and to ensure data accuracy, we retrieve information on a bank's type from the web-site of each bank.

3.2. DESCIPTIVE STATISTICS

The performance of a dual banking system may depend on the institutional environment (such as corruption and economic freedom), population's wealth and the share of Muslims in population. Our sample covers heterogeneous countries in such aspects. Rioja and Valev (2004) show that the finance-growth nexus depends on the level of financial development. Finance fuels growth in countries with relatively developed financial sectors, whereas finance-growth relationship is ambiguous in countries with less developed financial system. As such, we split the countries of our study into two groups based on the median value of 1) Corruption Perception Index which is obtained from the web-site of Transparency International[70] 2) Economic Freedom Index from the web-site of The Heritage Foundation & The Wall Street Journal 3) GDP per

[69] Algeria, Bahrain, Bangladesh, Brunei, Egypt, Gambia, Indonesia, Iraq, Jordan, Kuwait, Lebanon, Malaysia, Mauritania, Pakistan, Qatar, Saudi Arabia, Senegal, Syria, Tunisia, Turkey, United Arab Emirates, Yemen.

[70] Please visit http://www.transparency.org/.

capita collected from the World Bank web-site and 4) Share of Muslim population collected from Pew Research Center (2009)[71]. Hence, we explore the consequences of Islamic banking presence in *Corrupted* versus *Healthy Countries, Repressed* vs. *Free Countries, Poor* vs. *Rich Countries* and *Low* vs. *High Muslims Countries.*

Table I (*PANEL A*) presents the descriptive statistics of our sample. The data shows that the greatest divergence in *ISB Share* and *ISB Rank* can be observed in *Corrupted* vs. *Healthy countries*. (7.69% and 32.21% for *Corrupted Countries* vs. 24.53% and 40.68% for *Healthy Countries*), indicating that quantity and quality of Islamic banks' presence is mostly sensitive to corruption. The *ISB Share* is positively linked to country's wealth (8.59% among *Poor Countries* vs. 22.07% for *Rich Countries*); however, we find little difference for *ISB Rank* between the two groups of countries (35.42% vs. 37.26%). Interestingly, we observe that *ISB Share* is greater in countries with lower Muslims share in population (20.70% in *Low Muslim Countries* vs. 10.50% in *High Muslim Countries*), while *ISB Rank* is not significantly different between the two groups of countries (33.25% vs. 40.05%). The smallest differences in *ISB Share* and *Rank* are observed between *Repressed* and *Free Countries*, where the mean equality test does not reject the null hypothesis (13.75% and 37.85% for *Repressed Countries* vs. 17.07% and 35.15% for *Free Countries*).

The data also show that *Islamic Window Banks* are mostly present in *Low Muslim Countries* (with 24.02% share in the banking system total assets), *Rich Countries* (with 23.92% share), *Free Countries* (23.04%) and *Healthy Countries* (22.86%). *ISW Share* is the lowest among *Poor Countries* (15.66%), *High Muslim Countries* (15.92%), *Repressed Countries* (16.34%) and *Corrupted Countries* (17.33%).

[71] Please visit http://pewforum.org/Mapping-the-Global-Muslim-Population.aspx

Table I. Descriptive Statistics

PANEL A. Country-Level Analysis

This table presents the descriptive statistics for 22 countries where commercial Islamic and conventional banking are practiced for the 1999-2009 period. We split the sample into two parts, on the basis of Corruption Perception Index, GDP Per capita, Muslims share in population and Economic Freedom Index.

	Countries with Corruption Perception Index below the Median (3.2)					Countries with Corruption Perception Index above the Median (3.2)					
Variables	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	T-Stat.†
ISB Share	120	7.69	13.38	0.00	72.25	104	24.53	26.55	0.00	100.00	-5.86***
ISB Rank	99	32.21	28.62	0.00	100.00	97	40.68	29.99	0.00	100.00	-2.02**
ISW Share	120	17.33	22.69	0.00	91.20	104	22.86	28.54	0.00	88.05	-1.59
Foreign Bank Share	120	32.21	26.55	0.00	97.23	104	17.15	21.28	0.00	92.75	4.71***
State Bank Share	120	18.93	25.53	0.00	98.41	104	13.30	21.91	0.00	100.00	1.78*
Bank Deposit	103	34.80	17.40	6.98	80.13	88	62.52	33.43	15.27	139.38	-7.01***
Private Credit	99	21.59	12.98	3.39	64.27	76	56.56	30.20	12.54	142.85	-9.45***
Governmental Credit	101	16.88	12.59	1.50	73.54	103	14.71	8.76	0.00	44.30	1.42
Spread	120	4.36	1.83	1.27	10.10	102	3.22	1.37	0.60	9.86	5.29***
Growth	120	2.42	2.72	-6.09	15.73	104	1.05	4.55	-11.99	14.18	2.68***
Inflation	120	7.49	8.45	-30.14	35.12	104	8.23	12.31	-24.25	54.18	-0.51
	Countries with GDP Per Capita below the Median ($ 4,544)					Countries with GDP Per Capita above the Median ($ 4,544)					
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	T-Stat.†
ISB Share	109	8.59	13.78	0.00	72.25	115	22.07	26.33	0.00	100.00	-4.84***
ISB Rank	91	35.42	29.28	0.00	100.00	105	37.26	29.87	0.00	100.00	-0.44
ISW Share	109	15.66	22.74	0.00	91.20	115	23.92	27.66	0.00	88.05	-2.45***
Foreign Bank Share	109	30.45	26.81	0.00	97.23	115	20.25	22.89	0.00	92.75	3.05***
State Bank Share	109	15.13	20.50	0.00	65.13	115	17.44	27.00	0.00	100.00	-0.72
Bank Deposit	103	40.71	25.19	6.98	105.91	88	55.61	32.04	15.27	139.38	-3.53***
Private Credit	98	28.29	19.87	3.39	81.85	77	47.57	33.08	4.62	142.85	-4.51***
Governmental Credit	99	15.07	9.19	1.50	36.08	105	16.46	12.22	0.00	73.54	-0.93
Spread	109	4.30	1.85	1.27	10.10	113	3.38	1.47	0.60	9.92	4.10***
Growth	109	2.55	2.67	-6.09	15.73	115	1.06	4.41	-11.99	14.18	3.09***
Inflation	109	7.56	8.43	-30.14	35.12	115	8.09	12.01	-24.25	54.18	-0.38
	Countries with Muslims Share in Population below the Median (95%)					Countries with Muslims Share in Population above the Median (95%)					
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	T-Stat.†
ISB Share	110	20.70	25.47	0.00	100.00	114	10.50	17.14	0.00	72.25	3.51***
ISB Rank	105	33.25	27.02	0.00	100.00	91	40.05	31.96	0.00	100.00	-1.59
ISW Share	110	24.02	22.27	0.00	83.59	114	15.92	28.09	0.00	91.20	2.39***
Foreign Bank Share	110	20.97	19.98	0.00	92.75	114	29.32	29.11	0.00	97.23	-2.51***
State Bank Share	110	16.80	24.86	0.00	100.00	114	15.84	23.31	0.00	98.41	0.30
Bank Deposit	82	65.13	28.51	25.07	139.38	109	34.37	22.44	6.98	105.91	8.07***
Private Credit	72	49.92	31.92	9.66	142.85	103	27.59	20.77	3.39	81.85	5.22***

Governmental Credit	100	17.51	12.25	0.00	73.54	104	14.12	9.07	1.50	37.68	2.24**
Spread	110	3.24	1.25	0.60	6.19	112	4.42	1.93	1.83	10.10	-5.42***
Growth	110	1.62	4.27	-11.99	14.18	114	1.94	3.14	-7.04	15.73	-0.63
Inflation	110	7.08	8.54	-24.25	29.02	114	8.55	11.93	-30.14	54.18	-1.06

	Countries with Economic Freedom Index below the Median (57.4)					Countries with Economic Freedom Index above the Median (57.4)					
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	T-Stat.†
ISB Share	105	13.75	22.74	0.00	100.00	119	17.07	21.66	0.00	82.19	-1.12
ISB Rank	91	37.85	27.90	0.00	99.25	105	35.15	30.96	0.00	100.00	0.64
ISW Share	105	16.34	22.90	0.00	91.20	119	23.04	27.59	0.00	88.05	-1.98**
Foreign Bank Share	105	25.46	22.57	0.00	72.46	119	25.00	27.64	0.00	97.23	0.14
State Bank Share	105	26.92	29.38	0.00	100.00	119	6.95	11.93	0.00	42.14	6.51***
Bank Deposit	99	37.79	18.48	6.98	80.13	92	58.11	34.98	15.27	139.38	-4.96***
Private Credit	92	22.82	14.12	3.39	53.69	83	52.24	31.54	12.54	142.85	-7.82***
Governmental Credit	94	16.36	9.92	0.00	37.68	110	15.29	11.62	1.50	73.54	0.71
Spread	105	4.42	1.93	1.27	10.10	117	3.31	1.34	0.60	9.86	4.96***
Growth	105	2.32	2.67	-6.09	15.73	119	1.31	4.42	-11.99	14.18	2.10**
Inflation	105	8.79	9.02	-30.14	35.12	119	6.99	11.46	-24.25	54.18	1.31

† T-Stat.of mean equality test. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

PANEL B. Bank-Level Analysis

	Small Banks (Total Assets less than one billion $)					Large Banks (Total Assets more than one billion $)					
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	T-Stat.†
Total Assets (mil. $)	1,323	323	256	2	1000	1,096	8,580	11,300	1,000	87,900	
Loan Loss Reserves	1,101	10.56	11.64	0.08	54.81	985	6.89	6.71	0.08	54.81	8.93***
Inefficiency	1,185	58.94	33.16	8.72	208.73	928	56.53	33.68	8.72	208.73	1.64
Spread	1,282	4.21	4.02	-8.22	23.19	1,091	3.67	3.23	-8.22	23.19	3.63***
Capital	1,323	15.94	13.02	0.58	61.66	1,096	10.55	6.63	0.58	61.66	13.12***
Loan Growth	1,121	25.12	51.00	-77.92	213.60	921	21.80	29.66	-77.92	213.60	1.83*
Noninterest Income	1,180	32.33	22.52	-66.32	108.72	917	33.33	25.07	-66.32	108.72	-0.94
Domestic Interest Rate	1,323	10.42	10.25	0.94	78.43	1,096	11.58	14.08	0.94	78.43	-2.28**
HHI	1,323	18.44	12.08	6.19	91.83	1,096	17.41	11.59	6.19	86.17	2.13**
Economic Growth	1,323	2.63	3.50	-8.92	42.86	1,096	2.78	3.94	-8.01	42.86	-0.96
Per Capita	1,323	8.11	12.34	0.86	84.04	1,096	11.89	15.02	0.86	84.04	-6.68***

See Table A2 for variable definitions.

Foreign-owned banks are mostly present in *Corrupted Countries* and have the lowest weight in the banking system total assets of *Healthy Countries* (32.21% vs. 17.15%). Similarly to *ISB Share*, the smallest divergence is observed between *Repressed* vs. *Free Countries* (25.46%

vs. 25.00%). State-owned banks of *Repressed Countries* have, on average, 26.92% share in commercial banking total assets (which is the highest value among different sub-samples of countries), whereas in *Free Countries*, state-owned banks account for merely 6.95% of the banking system. After Economic Freedom Index, state-ownership is mostly sensitive to the Corruption Perception Index, where 18.93% of commercial banks in *Corrupted Counties* are owned by the government. In *Healthy Countries*, however, governments own, on average, 13.30% of the banking system. Across *Poor* vs. *Rich* and *Low* vs. *High Muslim Countries* we observe little differences.

The largest and smallest bank deposits to GDP ratio (*Bank Deposit*) are observed in *Low* and *High Muslim Countries* (65.13% versus 34.37%), respectively. There is also a major difference for *Corrupt* and *Healthy Countries* where bank deposits represent 34.80% and 62.52% of GDP respectively. *Bank Deposit* is equal to 37.79% in *Repressed Countries*, and 58% in *Free Countries*. *Bank Deposit* is larger for *Rich* compared to *Poor Countries* (55.61% vs. 40.71%). The private credit to GDP ratio (*Private Credit*) is the lowest in *Corrupted Countries* and the highest in *Healthy Countries* (21.59% vs. 56.56%). We observe the second largest difference across *Repressed* versus *Free Countries* with private credit equals to 22.82% and 52.24% of GDP, respectively. *Private Credit* is, on average, 28.29% for *Poor Countries* and 47.57% for *Rich Countries*. Credit to the private sector in *Low Muslim Countries* is on average 49.92% of GDP, whereas it equals to about 27.6% for *High Muslim Countries*. In terms of credit to Governmental sector we merely find significance difference between *Low* versus *High Muslim Countries*, for the former group Governmental credit to GDP ratio (*Governmental Credit*) is on average 17.51% and for the latter group of countries it equals to 14.12%. For other countries *Governmental Credit* is about 15%.

Lending-deposit spread (*Spread*) is the highest in descending order for *Repressed, High Muslim, Corrupted* and *Poor Countries* (4.42%, 4.42%, 4.36% and 4.30%, respectively). It is the lowest in the ascending order for *Healthy, Low Muslim, Free* and *Rich Countries* and equals to 3.22%, 3.24%, 3.31% and 3.38%, respectively. The economic growth represented by the annual growth rate of GDP per capita (*Economic Growth*) is significantly larger for *Corrupted, Poor* and *Repressed Countries* than *Healthy, Rich* and *Free Countries,* respectively (2.42%, 2.55% and 2.32% versus 1.05%, 1.06% and 1.31%). We find, however, little difference between *Economic Growth* of *Low* versus *High Muslim Countries* (1.62% versus 1.94%). The annual growth rate of the GDP deflator (*Inflation*) does not significantly vary across our sub-samples of *Corrupted* versus *Healthy, Poor* versus *Rich, Low Muslim* versus *High Muslim* and *Repressed* versus *Free Countries* and it is around 8% on average. It ranges from 6.99% among *Free Countries* to 8.79% for *Repressed Countries*.

PANEL B of Table I describes our bank-level variables. We split our sample of banks into two groups of small and large banks similar to Abedifar et al. (2013). Small banks are defined as banks with total assets less than one billion $ (*Small Banks*); and the rest is called large banks (*Large Banks*). *Small Banks* might be different from *Large Banks* regarding borrowers' type. *Small Banks* typically deal with small and relatively opaque firms with limited access to financial markets. *Small Banks* mostly rely on soft information obtained over time; however, *Large Banks* mostly rely on hard information received from their clients. They have larger firms as their clients who are relatively transparent and have easier access to direct finance. As such *Large Banks* might face more competition pressure than *Small Banks*. Hence *Small Banks* are different from *Large Banks* in terms of loan quality and business model which may result in different *Credit Risk, Spread* and *Inefficiency*.

Small Banks have on average, 323 million in total assets, whereas total assets of *Large Banks* of our sample reach 8.58 billion U.S. Dollars. The figures show that *Credit Risk* represented by *Loan Loss Reserves* and *Spread* of *Small Banks* are on average 10.56% and 4.21% which are significantly higher than those of *Large Banks* (6.89% *Loan Loss Reserves* and 3.67% *Spread*). We observe little difference between the two groups in terms of *Inefficiency*. Total non-interest expense of *Small* and *Large Banks* stands for 58.94% and 56.53% of their total operating income. As expected, *Small Banks* are more capitalized than *Large Banks*. Their gross loans also grow, on average, at a higher rate than those of *Large Banks*. We find little difference between the income share of non-interest income activities in total operating income across *Small* and *Large Banks* sub-samples (32.33% & 33.33% respectively). The second part of PANEL B shows that *Small Banks*, on average, operate in countries with lower *Domestic Interest Rate*, more concentrated banking markets (represented by *HHI*) and lower *Per Capita*, whereas *Economic Growth* depicts no significant difference between the two groups of banks.

4. Empirical Results

4.1. FINANCIAL INTERMEDIATION IN A DUAL BANKING SYSTEM

The greatest divergence in *ISB Share* (and also *ISB Rank*) is observed across *Corrupted* and *Healthy Countries*. Hence, we primarily present our analysis for these two sub-samples and report where necessary the results on other sub-samples.

4.1.a. DEPOSIT MOBILIZATION MODEL

First, we attempt to investigate the possible impact on deposit mobilization of introducing Islamic banks in the banking system. We assume that Islamic banks are effectively introduced and present in the system when they start playing a significant role which we capture by a threshold. More specifically, we consider their share in the banking system in terms of total

assets. As such, we define three dummy variables, i.e. *ISB_D5, ISB_D7* and *ISB_D10* which take the value of one when the share of Islamic banks in the whole commercial banking reaches 5%, 7% and 10%, respectively. We define similar dummies for *Islamic Window Banks* (*ISW_D5, ISW_D7* and *ISW_D10*). The dummy variables enable us to examine the consequence of Islamic banking introduction in the banking market. Table A3 of appendix presents the results, where we use bank deposits to GDP ratio (*Bank Deposit*) as the dependent variable. Columns (1) to (6) illustrate our analyses for *Corrupted Countries* and in columns (7) to (12) we study the sub-sample of *Healthy Countries*.

In the first column, we regress *Bank Deposit* on *ISB_D5*, while controlling for *Foreign Bank Share, State Bank Share, Inflation* and *Trend*. In the second column, we include *ISW_D5* in our model. Columns (3) and (4) exhibit the results when we use *ISB_D7* and *ISW_D7* in lieu of *ISB_D5* and *ISW_D5*, respectively. In columns (5) and (6) we replace *ISB_D7* and *ISW_D7* with *ISB_D10* and *ISW_D10*. Finally, columns (7) to (12) demonstrate our analyses for the *Healthy Countries* sub-sample, using the same specifications as of columns (1) to (6). The estimations show that when the market share of Islamic banks exceeds seven percent, *Bank Deposit* significantly increases. For *Healthy Countries*, however, we do not observe a significant difference in *Bank Deposit*, even when the market share of Islamic banks exceeds ten percent[72]. We pursue our studies using proportionate (continuous) variables representing market share of Islamic banks in lieu of dummy (binary) variables.

We estimate the Equation (1) where we use *ISB Share* and *ISB Rank* as our variables of interest representing the market share and efficiency rank of Islamic banks in commercial

[72] In spite of our main model and possibly because of the introduction of dummy variables which barely change over time, the model fails to meet the asymptotic assumptions of the Hausman test. We primarily use random effect technique; as a robustness check, however, we employ the fixed effect technique and find similar results which are not reported but available on request.

banking markets. We try to explore the relationship between the presence and quality of Islamic banking (represented by *ISB Share* & *ISB Rank*) and deposit mobilization in a dual banking system. We use *Bank Deposit* as the dependent variable. Table II displays the estimation results for two sub-samples of *Corrupted* and *Healthy Countries*. *Corrupted Countries* are studied in columns (1) to (8) and columns (9) to (13) exhibit the analyses of *Healthy Countries*.

The first column displays the regression estimation, where we regress *Bank Deposit* on our variable of interest, i.e. *ISB Share*, and control merely for *ISW Share*. Other control variables, i.e. ownership structure (*Foreign Bank Share* and *State Bank Share*), *Inflation* and *Trend*, are included in columns (2) to (4), respectively. In all four specifications, we observe a positive relationship between *ISB Share* and *Bank Deposit*. *ISW Share* also appears with a positive and significant coefficient. The results imply that diversity in banks' type (*Islamic* and *Islamic Window Banks*) improves deposit mobilization in *Corrupted Countries*. We also attempt to capture the effect of ownership structure by controlling for the share of foreign and state-owned banks in total assets (*Foreign Bank Share* and *State Bank Share*). As expected, we find that a larger share of foreign and state-owned banks in the banking system is associated with lower deposit mobilization. Higher *Inflation* translates into lower deposits mobilization. The positive coefficient of *Trend* suggests the upward trend of deposit accumulation in commercial banking. In the fifth column we add the interaction term of *ISB Share* and *ISW Share* to investigate whether the impact of *ISB Share* on *Bank Deposit* depends on the share of *Islamic Window Banks* in total assets. The interaction term (*ISB Share*×*ISW Share*) appears with a positive and relatively small coefficient at the ten percent significance level. The result shows that the presence of *Islamic Window Banks* does not outweigh the positive contribution of Islamic Banks in deposit mobilization. In column (6) we include the quadratic form of *ISB Share* (*ISB Share*^{2}) in the model to investigate the impact of possible excessive presence of Islamic

Banking in the commercial banking market. The estimation suggests that the positive relationship of *ISB Share* with *Bank Deposit* slightly declines and weakens as the share of Islamic banks in total assets increases. In column (7) we add *ISB Rank* to our analysis to explore whether the quality of Islamic banking presence in the banking industry matters. *ISB Rank* depicts little relationship with *Bank Deposit* implying that in the *Corrupted Countries* sub-sample the quantity rather than quality of Islamic banking presence can positively contribute to *Bank Deposit*. In column (8) we add the interaction term of *ISB Share* and *ISB Rank* (*ISB Share*×*ISB Rank*) to the model. We find that an increase in the efficiency of Islamic banks boosts the positive contribution of Islamic banking in deposit mobilization.

In columns (9) to (13), we re-estimate our model for the *Healthy Countries* sub-sample using the same specifications of columns (4) to (8). *ISB Share* depicts insignificant association with *Bank Deposit* in column (9) whereas *ISB Rank* appears with a significantly positive coefficient in column (12). The findings show that in *Healthy Countries*, the quantity of Islamic banking presence represented by the share in total assets does not significantly contribute to deposit mobilization; however, the quality of Islamic banking presence matters and increases in efficiency of Islamic banks is correlated with increases in *Bank Deposit*.

We perform a similar analysis for other sub-samples. The results show that *ISB Share* is positively associated with higher *Bank Deposit* in *Poor, Repressed, Low* and *High Muslim Countries.* In *Rich* and *Free Countries*, however, we observe little difference between Islamic and conventional banks in contribution to deposits mobilization. *ISB Rank* depicts little linkage with *Bank Deposit* in all other sub-samples[73].

[73] The estimations are not reported in the chapter, but are available from the authors on request.

Table II. Deposit Mobilization Model – Corrupted / Healthy Countries

This table illustrates the estimation of the Deposit Mobilization Model (Equation (1)), using bank deposits on GDP ratio (*Bank Deposit*) as the dependent variable. We employ the random effect technique as suggested by Hausman Test. We split our sample into two groups on the basis of the median value of Corruption Perception Index (CPI). Countries with CPI below the median are in one group (*Corrupted Countries*) and the rest in the other group called *Healthy Countries*. The median value of CPI in our sample is 3.2. The results for *Corrupted Countries* are presented in columns (1) to (8), whereas columns (9) to (13) display our analysis for *Healthy Countries*. We regress *Bank Deposit* on our variables of interest, i.e. *ISB Share* and *ISB Rank*, and control variables (*ISW Share*, *Foreign Bank Share*, *State Bank Share*, *Inflation* and *Trend*).

In the first column we regress *Bank Deposit* on *ISB Share*, while controlling for *ISW Share*. Ownership structure of the banking system is controlled for in column (2) where we include *Foreign Bank Share* and *State Bank Share*. We add *Inflation* to the model in the third column and *Trend* is incorporated in the fourth column. Column (5) depicts the result when we include the interaction term of *ISB Share* and *ISW Share* (*ISB Share×ISW Share*) to our model. In column (6) we add the quadratic form of *ISB Share* (*ISB Share*^{2}). In column (7) we include *ISB Rank* in our analysis. Column (8) demonstrates the result when we add the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share×ISB Rank*. In columns (9) to (13), we re-estimate our model with the specification as of columns (4) to (8) for the *Healthy Countries* sub-sample.

	Corrupted Countries								Healthy Countries				
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
ISB Share (α_1)	0.220**	0.137**	0.136***	0.180***	0.095	0.356***	0.179***	0.138***	-0.096	-0.012	-0.467	-0.051	-0.139
	(2.56)	(2.42)	(2.66)	(3.13)	(1.61)	(4.07)	(3.45)	(3.12)	(-0.59)	(-0.05)	(-1.47)	(-0.29)	(-0.44)
ISB Share×ISW Share (α_{13})					0.002*					-0.008			
					(1.75)					(-0.78)			
ISB Share^2 (α_{11})						-0.003***					0.005		
						(-2.78)					(1.57)		
ISB Rank (α_2)							-0.009	-0.025				0.066*	-0.038
							(-0.30)	(-0.71)				(1.66)	(-0.30)
ISB Share×ISB Rank (α_{12})								0.001**					0.003
								(2.44)					(1.38)
ISW Share (α_3)	0.300*	0.270**	0.276***	0.250***	0.216**	0.304***	0.255***	0.262***	0.138	0.070	0.079	0.181	0.144
	(1.87)	(2.09)	(2.65)	(3.94)	(2.13)	(3.85)	(3.68)	(4.10)	(0.48)	(0.30)	(0.33)	(0.62)	(0.45)
Foreign Bank Share (α_4)		-0.016	-0.042	-0.144**	-0.109	-0.149**	-0.144**	-0.150**	-0.236***	-0.287***	-0.230***	-0.257***	-0.149
		(-0.14)	(-0.37)	(-2.19)	(-1.36)	(-2.36)	(-2.26)	(-2.33)	(-3.49)	(-2.59)	(-3.01)	(-3.84)	(-0.85)
State Bank Share (α_5)		-0.165*	-0.189**	-0.145**	-0.111	-0.146**	-0.166**	-0.166**	-0.301*	-0.413	-0.417**	-0.420***	-0.407**
		(-1.82)	(-2.26)	(-2.34)	(-1.64)	(-2.36)	(-2.14)	(-2.06)	(-1.93)	(-1.64)	(-2.55)	(-3.03)	(-2.11)
Inflation (α_6)			-0.257**	-0.215**	-0.220**	-0.211**	-0.251**	-0.240**	-0.339**	-0.355**	-0.362**	-0.563***	-0.618***
			(-2.31)	(-2.34)	(-2.39)	(-2.20)	(-2.34)	(-2.21)	(-2.22)	(-2.20)	(-2.43)	(-2.75)	(-2.61)
Trend (α_7)				1.148***	1.161***	1.174***	0.927*	0.968*	0.731	0.868	0.697	0.937*	0.465
				(3.03)	(2.90)	(3.19)	(1.82)	(1.94)	(1.47)	(1.32)	(1.59)	(1.86)	(0.64)
Constant (α_0)	27.515***	32.355***	36.158***	31.954***	31.343***	30.466***	33.962***	34.148***	68.475***	74.073***	74.598***	65.623***	70.529***
	(5.70)	(3.25)	(3.71)	(4.37)	(4.08)	(4.07)	(3.74)	(3.71)	(5.41)	(6.00)	(7.06)	(5.79)	(5.66)
Observations	103	103	103	103	103	103	86	86	88	88	88	81	81
Number of Country	11	11	11	11	11	11	11	11	10	10	10	10	10
Chi-Squared	6.59	37.20	94.89	136.4	343.1	1899	186.1	1002	48.28	143.8	34.79	251	224.2
H_0: $\alpha_1 = \alpha_{13} = 0$					14.58***					2.03			
H_0: $\alpha_1 + \alpha_{13} = 0$					2.80*					0.01			
H_0: $\alpha_1 = \alpha_{11} = 0$						51.72***					2.47		
H_0: $\alpha_1 + \alpha_{11} = 0$						16.72***					2.15		
H_0: $\alpha_1 = \alpha_{12} = 0$								32.67***					2.05
H_0: $\alpha_1 + \alpha_{12} = 0$								10.08***					0.18

Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

4.1.b. CREDIT ALLOCATION MODEL

We estimate the Equation (1) using private credit to GDP ratio (*Private Credit*) and credit to Governmental sector to GDP ratio (*Governmental Credit*) as the dependent variable to investigate whether Islamic banking presence in a commercial banking market improves or deteriorates banking system credits allocation. Table III and IV display the results for *Private Credit* and *Governmental Credit*, respectively. In table III, *Corrupted Countries* are studied in columns (1) to (3) and *Healthy Countries* are analyzed in columns (4) to (6).

In the first column, we regress *Private Credit* on our variable of interest, i.e. *ISB Share*, while controlling for *ISW Share*, *Foreign Bank Share*, *State Bank Share*, *Inflation* and *Trend*. In the second column, we add *ISB Rank* to our analysis. Both *ISB Share* and *ISB Rank* depict insignificant relationship with *Private Credit*. In the third column, we include the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share*×*ISB Rank* in the model. The results show that Islamic banking presence irrespective of its quality do not contribute to *Private Credit* significantly different from conventional banks. However, we find a positive association between *ISW Share* and *Private Credit* implying that *Islamic Window Banks* can ease funds allocation to private sector more efficiently than conventional banks in *Corrupted Countries*. The results also show little linkage between banks' ownership structure and *Private Credit*. *Inflation* is inversely linked to our dependent variable. *Trend* appears with significant and positive coefficient, suggesting the positive trend of funds allocation to the private sector. Columns (4) to (6) display the estimation for *Healthy Countries*, using the same specifications as of columns (1) to (3). Similar to our findings for *Corrupted Countries*, *ISB Share* and *ISB Rank* depict little relationship with *Private Credit*.

Table III. Credit Allocation Model – Private Credit - Corrupted / Healthy Countries

This table illustrates the estimation of the Credit Allocation Model (Equation (1)), using private credit on GDP ratio (*Private Credit*) as the dependent variable. We employ the random effect technique for our estimation as suggested by Hausman Test. We split our sample into two groups on the basis of the median value of Corruption Perception Index (CPI). Countries with CPI below the median are in one group (*Corrupted Countries*) and the rest in the other group called *Healthy Countries*. The median value of CPI in our sample is 3.2. The results for *Corrupted Countries* are presented in columns (1) to (3), whereas columns (4) to (6) display our analysis for *Healthy Countries*. We regress *Private Credit* on our variables of interest, i.e. *ISB Share* and *ISB Rank*, while controlling for *ISW Share*, *Foreign Bank Share*, *State Bank Share*, *Inflation* and *Trend*.

In the first column we estimate our model excluding *ISB Rank*. We include *ISB Rank* in the second column. Column (3) demonstrates the result, when we add the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share×ISB Rank* to the model. In columns (4) to (6), we re-estimate our model with the same specifications as of columns (1) to (3) for the *Healthy Countries* sub-sample.

	Corrupted Countries			Healthy Countries		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
ISB Share (α_1)	0.008	0.032	-0.024	-0.137*	-0.109	-0.172
	(0.11)	(0.41)	(-0.28)	(-1.68)	(-1.37)	(-0.41)
ISB Rank (α_2)		0.019	0.000		-0.020	-0.209
		(1.04)	(0.02)		(-0.29)	(-0.62)
ISB Share×ISB Rank (α_{12})			0.002			0.004
			(1.38)			(0.72)
ISW Share (α_3)	0.183**	0.249***	0.273***	0.017	0.068	0.096
	(2.19)	(2.85)	(2.97)	(0.12)	(0.62)	(0.29)
Foreign Bank Share (α_4)	-0.029	-0.025	-0.024	-0.092	-0.100	0.286
	(-0.68)	(-0.50)	(-0.50)	(-0.93)	(-1.23)	(0.85)
State Bank Share (α_5)	-0.037	-0.034	-0.028	-0.268*	-0.293**	-0.315
	(-0.93)	(-0.77)	(-0.63)	(-1.79)	(-2.50)	(-1.36)
Inflation (α_6)	-0.107*	-0.101*	-0.091*	-0.292**	-0.456***	-0.883**
	(-1.89)	(-1.87)	(-1.75)	(-2.40)	(-3.54)	(-2.57)
Trend (α_7)	0.522***	0.421*	0.493**	1.045***	1.218**	-0.250
	(2.75)	(1.92)	(2.34)	(2.79)	(2.53)	(-0.15)
Constant (α_0)	18.667***	17.254***	16.640**	59.273***	58.509***	70.285***
	(3.39)	(2.74)	(2.50)	(6.01)	(4.10)	(4.27)
Observations	99	81	81	76	69	69
Number of Country	12	12	12	9	9	9
Chi-Squared	66.96	103.4	58.03	303.2	1976	205.7
H_0: $\alpha_1 = \alpha_{12} = 0$			2.79			0.85
H_0: $\alpha_1 + \alpha_{12} = 0$			0.07			0.16

Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

We estimate the model for other sub-samples. We obtain similar results as of the previous findings, except for *Free* and *Poor Countries* sub-samples. For the former group of countries, we observe a negative linkage between the share of Islamic banks in total assets and *Private Credit*, which suggests in such countries Islamic banks contribute to *Private Credit* less than conventional banks. Our *Poor Countries* analysis shows a positive relationship between *ISB Rank* and *Private Credit*, while *ISB Share* depicts little association. The results imply that

presence of relatively efficient Islamic banks can spur funds allocation to the private sector in such countries[74].

Table IV illustrates our credit allocation analysis using *Governmental Credit* as the dependent variable. Columns (1) to (3) show the estimation for *Corrupted Countries*. The first column displays the regression result where we regress our dependent variable (*Governmental Credit*) on *ISB Share* while controlling for *ISW Share*, *Foreign Bank Share*, *State Bank Share*, *Inflation* and *Trend*. *ISB Share* depicts insignificant association with *Governmental Credit*. The estimation suggests that Islamic banking presence does not contribute to *Governmental Credit* significantly different from conventional banks (the benchmark). In column (2), we include *ISB Rank* into our analysis. Interestingly, higher efficiency of Islamic banks is linked to lower *Governmental Credit*. This finding is particularly important given that we study the sample of *Corrupted Countries*. In the third column, we add the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share*×*ISB Rank*, to the model which appears with insignificant coefficient. We also find no significant relationship between *ISW Share* and *Governmental Credit*. The results show that increases in the share of foreign banks in total assets of commercial banking market is negatively linked to *Governmental Credit*, implying that foreign-owned banks allocate less funds to Governmental sector than domestically owned banks (the benchmark) in *Corrupted Countries*. Contrary to our findings for *Private Credit*, we observe that credit allocation to Governmental sector (scaled by GDP) is irrespective of *Inflation*.

Columns (4) to (11) display our analysis for *Healthy Countries* sub-sample. In column (4) we regress *Governmental Credit* on *ISB Share*, while controlling for *ISW Share*. We attempt to capture the heterogeneities associated with ownership structure of the banking system, by including *Foreign Bank Share* and *State Bank Share* into the model in the fifth column. We add

[74] The estimations are not reported in the chapter, but are available from the authors on request.

Inflation to the model in the column (6) and *Trend* is incorporated in our study in column (7). In all four specifications, *ISB Share* depicts negative relationship with *Governmental Credit* implying that Islamic Banks contribute less than conventional banks in *Governmental Credit* in *Healthy Countries*. Column (8) exhibits the result when we add the interaction term of *ISB Share* and *ISW Share* (*ISB Share*×*ISW Share*) to our model. The finding suggests that the negative linkage between *ISB Share* and *Governmental Credit* declines with an increase in share of *Islamic Window Banks* in commercial banking total assets. In column (9) we consider the quadratic form of *ISB Share* (*ISB Share*^{2}) in our analysis in lieu of *ISB Share*×*ISW Share*. The estimation does not suggest that the relationship of *ISB Share* and *Governmental Credit* is parabolic. In column (10) we take into account *ISB Rank*. The result shows that higher efficiency of Islamic banks is positively correlated with *Governmental Credit* in *Healthy Countries* which contradicts with our finding for *Corrupted Countries* sub-sample. While efficient Islamic banks avoid credit allocation to *Governmental* sector in *Corrupted Countries*, they encourage such allocations in *Healthy Countries*. Column (11) presents the result when we add the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share*×*ISB Rank* which appears with a tiny and insignificant coefficient.

We analyze the relationship between our variables of interest, i.e. *ISB Share* and *ISB Rank*, and *Governmental Credit* among other groups of countries. Similar to our previous finding, the results show that an increase in efficiency of Islamic banks is associated with lower *Governmental Credit* in *Repressed Countries* but higher *Governmental Credit* in *Free Countries*; however, we find little linkage between Islamic banks share in total assets and credit allocation to Governmental sector (scaled by GDP). *ISB Share* and *ISB Rank* depict little relationship with *Governmental Credit* in *Poor, Rich, Low* and *High Muslim Countries*[75].

[75] The estimations are not reported in the chapter, but are available from the authors on request.

Table IV. Credit Allocation Model – Governmental Credit - Corrupted / Healthy Countries

This table demonstrates the estimation of the Credit Allocation Model (Equation (1)), using credit to Governmental sector on GDP ratio (*Governmental Credit*) as the dependent variable. We employ the random effect technique for our estimation as suggested by Hausman Test. We split our sample into two groups on the basis of the median value of Corruption Perception Index (CPI). Countries with CPI below the median are in one group (*Corrupted Countries*) and the rest in the other group called *Healthy Countries*. The median value of CPI in our sample is 3.2. The results for *Corrupted Countries* are presented in columns (1) to (3), whereas columns (4) to (11) display our analysis for *Healthy Countries*. We regress *Governmental Credit* on our variables of interest, i.e. *ISB Share* and *ISB Rank*, and control variables (*ISW Share*, *Foreign Bank Share*, *State Bank Share*, *Inflation* and *Trend*).

In the first column we estimate our model excluding *ISB Rank*. We include *ISB Rank* in the second column. Column (3) illustrates the result, when we add the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share×ISB Rank* to the model. In columns (4) to (11), we estimate our model for the *Healthy Countries* sub-sample. In the fourth column we regress *Bank Deposit* on *ISB Share*, while controlling for *ISW Share*. We try to capture the possible effect of ownership structure of the banking system in column (5) where we include *Foreign Bank Share* and *State Bank Share*. We add *Inflation* to the model in the sixth column and *Trend* is incorporated in column (7). Column (8) depicts the result when we include the interaction term of *ISB Share* and *ISW Share* (*ISB Share×ISW Share*) to our model. In column (9) we take into account the quadratic form of *ISB Share* (*ISB Share*^{2}) in lieu of *ISB Share×ISW Share*. In column (10) we include *ISB Rank* in our analysis. Column (11) displays the result when we add to the model the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share×ISB Rank*.

	Corrupted Countries			Healthy Countries							
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
ISB Share (α_1)	0.156	0.155	0.157	-0.136***	-0.112***	-0.106**	-0.122**	-0.208***	-0.052	-0.121**	-0.090
	(1.50)	(1.58)	(1.18)	(-2.68)	(-2.81)	(-2.53)	(-2.56)	(-3.66)	(-0.32)	(-2.24)	(-1.09)
ISB Share×ISW Share (α_{13})								0.005**			
								(2.03)			
ISB Share^2 (α_{11})									-0.001		
									(-0.45)		
ISB Rank (α_2)		-0.042**	-0.042							0.073*	0.063
		(-1.97)	(-1.63)							(1.79)	(0.88)
ISB Share×ISB Rank (α_{12})			0.000								0.000
			(0.01)								(0.02)
ISW Share (α_3)	0.068	0.092	0.093	0.027	0.015	0.009	0.022	-0.013	0.012	0.015	-0.017
	(0.63)	(1.32)	(1.26)	(0.35)	(0.20)	(0.12)	(0.29)	(-0.15)	(0.16)	(0.21)	(-0.30)
Foreign Bank Share (α_4)	-0.172**	-0.198***	-0.199***		-0.096	-0.112	-0.111	-0.082	-0.131	-0.126*	-0.178***
	(-2.39)	(-3.93)	(-3.91)		(-0.98)	(-1.26)	(-1.26)	(-0.96)	(-1.60)	(-1.83)	(-3.67)
State Bank Share (α_5)	-0.056	-0.077	-0.077		-0.080	-0.108	-0.098	-0.001	-0.106	-0.160**	-0.214***
	(-0.83)	(-1.23)	(-1.18)		(-1.09)	(-1.56)	(-1.53)	(-0.01)	(-1.64)	(-2.13)	(-2.82)
Inflation (α_6)	-0.057	-0.053	-0.052			0.014	0.027	0.012	0.043	-0.031	0.009
	(-1.23)	(-0.86)	(-1.00)			(0.27)	(0.47)	(0.23)	(0.73)	(-0.45)	(0.10)
Trend (α_7)	-0.120	-0.320	-0.316				0.275	0.037	0.275	0.418	0.436
	(-0.33)	(-0.67)	(-0.65)				(0.58)	(0.07)	(0.54)	(0.91)	(0.76)
Constant (α_0)	26.157***	29.473***	29.439***	17.324***	19.726***	20.278***	18.767***	18.510***	18.701***	16.448***	17.909***
	(3.87)	(4.33)	(4.27)	(4.25)	(3.79)	(4.18)	(3.02)	(3.03)	(3.19)	(3.15)	(3.91)
Observations	101	83	83	103	103	103	103	103	103	96	96
Number of Country	11	11	11	10	10	10	10	10	10	10	10
Chi-Squared	24.81	120.2	611.2	11.59	16.26	20.85	24.58	105.1	33.73	454.4	517.3
H_0: $\alpha_1 = \alpha_{13} = 0$								14.28***			
H_0: $\alpha_1 + \alpha_{13} = 0$								13.10***			
H_0: $\alpha_1 = \alpha_{11} = 0$									6.43**		
H_0: $\alpha_1 + \alpha_{11} = 0$									0.11		
H_0: $\alpha_1 = \alpha_{12} = 0$			6.02**								2.29
H_0: $\alpha_1 + \alpha_{12} = 0$			1.43								1.22

Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

4.1.c. SPREAD MODEL

We estimate the Equation (1) using lending-deposit spread (*Spread*) as the dependent variable to investigate whether Islamic banking presence in the banking industry would lead to higher or lower *Spread*. Table V illustrates the results for two sub-samples of *Corrupted* and *Healthy Countries*. *Corrupted Countries* are analyzed in columns (1) to (3) and *Healthy Countries* are studied in columns (4) to (6).

In the first column, we regress *Spread* on *ISB Share* and control for *ISW Share*, *Foreign Bank Share*, *State Bank Share*, *Inflation* and *Trend*. We add *ISB Rank* to our analysis in the second column. Both *ISB Share* and *ISB Rank* display little relationship with *Spread*. In column (3), we include the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share*×*ISB Rank* in the model. The result shows that presence of Islamic banks can lower *Spread* only in case such banks benefit from relatively high cost efficiency. *ISW Share* depicts insignificant relationship with *Spread*. We observe a negative association between the share of foreign and state-owned banks in total assets (*Foreign Bank Share* and *State Bank Share*) and *Spread*. *Inflation* and *Trend* appear with insignificant coefficients in our estimations.

Columns (4) to (6) present the analysis of *Healthy Countries*, using the same specifications as of columns (1) to (3). *ISB Share* depicts insignificant association with *Spread*; however, in column (5), we find that an increase in *ISB Rank* lowers *Spread*, implying that the presence of efficient Islamic banks can reduce *Spread* in *Healthy Countries*. Finally, the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share*×*ISB Rank* appears with tiny and insignificant coefficient in column (6).

Table V. Spread Model –Corrupted / Healthy Countries

This table illustrates the estimation of the Spread Model (Equation (1)), using lending-deposit spread (*Spread*) as the dependent variable. We employ the random effect technique for our estimation as suggested by Hausman Test. We split our sample into two groups on the basis of the median value of Corruption Perception Index (CPI). Countries with CPI below the median are in one group (*Corrupted Countries*) and the rest in the other group called *Healthy Countries*. The median value of CPI in our sample is 3.2. The results for *Corrupted Countries* are presented in columns (1) to (3), whereas columns (4) to (6) demonstrate our analysis for *Healthy Countries*. We regress *Spread* on our variables of interest, i.e. *ISB Share* and *ISB Rank*, while controlling for *ISW Share*, *Foreign Bank Share*, *State Bank Share*, *Inflation* and *Trend*.

In the first column we estimate our model excluding *ISB Rank*. We include *ISB Rank* in the second column. Column (3) displays the result when we add the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share*×*ISB Rank* to the model. In columns (4) to (6), we re-estimate our model with the same specification as of columns (1) to (3) for the *Healthy Countries* sub-sample.

	Corrupted Countries			Healthy Countries		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
ISB Share (α_1)	0.006	0.009	0.025	-0.004	0.005	-0.001
	(0.29)	(0.67)	(1.17)	(-0.47)	(0.50)	(-0.08)
ISB Rank (α_2)		-0.004	0.001		-0.006*	-0.008
		(-0.85)	(0.30)		(-1.78)	(-1.54)
ISB Share×ISB Rank (α_{12})			-0.0005**			0.0001
			(-2.06)			(0.77)
ISW Share (α_3)	-0.018	-0.020	-0.020	-0.010*	-0.001	-0.006
	(-1.39)	(-1.35)	(-1.28)	(-1.85)	(-0.11)	(-1.17)
Foreign Bank Share (α_4)	-0.031***	-0.031***	-0.031**	0.011	0.014	0.010
	(-2.67)	(-2.78)	(-2.50)	(0.91)	(1.49)	(1.10)
State Bank Share (α_5)	-0.037***	-0.035***	-0.036***	0.018***	0.025***	0.023***
	(-3.51)	(-3.53)	(-3.72)	(3.65)	(4.75)	(4.93)
Inflation (α_6)	0.019*	0.011	0.009	0.033	-0.001	0.000
	(1.73)	(1.20)	(1.09)	(1.07)	(-0.19)	(0.06)
Trend (α_7)	0.030	0.070	0.062	-0.004	0.018	0.021
	(0.37)	(0.92)	(0.78)	(-0.10)	(0.77)	(0.80)
Constant (α_0)	5.971***	5.760***	5.683***	2.948***	2.612***	2.889***
	(5.76)	(5.06)	(5.20)	(5.10)	(5.50)	(5.71)
Observations	120	99	99	102	97	97
Number of Country	12	12	12	10	10	10
Chi-Squared	46.84	276.1	118.7	65.73	63.55	265.5
H_0: $\alpha_1 = \alpha_{12} = 0$			11.11***			1.81
H_0: $\alpha_1 + \alpha_{12} = 0$			1.35			0.00

Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

Similar to our finding for *Corrupted Countries*, we observe little relationship between *ISW Share* and *Spread*. The results on banks' ownership structure however, differ in *Healthy* versus *Corrupted Countries*. We find little difference between the market share of foreign-owned banks and *Spreads*; however, an increase in the share of state-owned banks in total assets of banking industry is associated with higher *Spreads* in *Healthy Countries*.

The analysis of other sub-samples shows that higher efficiency of Islamic banks is associated with lower *Spread* in *Poor* and *Low Muslim Countries*; however, we find little linkage between *ISB Share* and *Spread* for any of our sub-samples[76].

4.1.d. ECONOMIC GROWTH MODEL

We estimate the Equation (1) using the annual growth rate of GDP per capita (*Economic Growth*) as the dependent variable to investigate whether Islamic banking presence in the banking industry would spur or slow down *Economic Growth*. Table VI presents the results for two sub-samples of *Corrupted* and *Healthy Countries*. *Corrupted Countries* are analyzed in columns (1) to (7) and *Healthy Countries* are studied in columns (8) to (14).

In the first column, we regress *Economic Growth* on our variable of interest, i.e. *ISB Share*, and control for *ISW Share*, *Foreign Bank Share*, *State Bank Share*, *Inflation* and *Trend*. We add *ISB Rank* to the model in the second column. *ISB Share* and *ISB Rank* depict little relationship with *Economic Growth*. In column (3), we include the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share×ISB Rank*, in the model which also appears with insignificant coefficient. In columns (4) to (7), we incorporate respectively *Spread, Bank Deposit, Private Credit* and *Governmental Credit* into our model. The results show that lower *Spread* and *higher Private Credit* are associated with greater *Economic Growth*. Columns (8) to (14) present estimation of our model for *Healthy Countries* with the same specifications of columns (1) to (7). Similar to *Corrupted Countries* analyses, we find little relationship between *ISB Share* and *ISB Rank* with *Economic Growth*. However, in spite of our previous results, the estimations show that in *Healthy Countries* sub-sample, *Bank Deposit* is positively linked to *Economic Growth*, whereas *Private Credit* and *Spread* display insignificant linkage with our dependent variable.

[76] The estimations are not reported in the chapter, but are available from the authors on request.

Table VI. Economic Growth Model – Corrupted / Healthy Countries

This table illustrates the estimation of the Economic Growth Model (Equation (1)), using the random effect technique as suggested by Hausman Test. We split our sample into two groups on the basis of the median value of Corruption Perception Index (CPI). Countries with CPI below the median are in one group (*Corrupted Countries*) and the rest in the other group called *Healthy Countries*. The median value of CPI in our sample is 3.2. The results for Corrupted Countries are presented in columns (1) to (7), whereas columns (8) to (14) display our analysis for Healthy Countries. We regress *Economic Growth* on our variables of interest, i.e. *ISB Share* and *ISB Rank*, and control variables (*ISW Share*, *Foreign Bank Share*, *State Bank Share*, *Inflation* and *Trend*).

In the first column, we estimate our model excluding *ISB Rank*. We add *ISB Rank* to the model in the second column. Column (3) depicts the result when we include the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share*×*ISB Rank*. In columns (4) to (7), we include *Spread*, *Bank Deposit*, *Private Credit* and *Governmental Credit*, respectively. Columns (8) to (14) demonstrate the estimation of our model for *Healthy Countries*.

	Corrupted Countries							Healthy Countries						
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
ISB Share (α_1)	-0.025	-0.032	-0.061***	-0.052***	-0.057***	-0.051***	-0.045***	0.005	-0.008	-0.009	-0.015	0.003	-0.002	-0.034
	(-1.06)	(-1.61)	(-2.80)	(-2.65)	(-2.85)	(-3.61)	(-2.68)	(0.17)	(-0.26)	(-0.24)	(-0.46)	(0.12)	(-0.04)	(-0.93)
ISB Rank (α_2)		0.005	-0.005	-0.005	-0.005	-0.007	-0.002		-0.014	-0.019	0.000	-0.014	-0.021	-0.025
		(0.39)	(-0.37)	(-0.40)	(-0.34)	(-0.50)	(-0.19)		(-0.61)	(-0.65)	(0.01)	(-0.61)	(-0.89)	(-1.06)
ISB Share×ISB Rank (α_{12})			0.001	0.001	0.001	0.001	0.001			0.000	-0.000	-0.001	-0.000	0.000
			(1.06)	(0.85)	(1.18)	(1.41)	(0.98)			(0.22)	(-0.00)	(-1.13)	(-0.75)	(0.80)
ISW Share (α_3)	0.005	0.011	0.009	0.004	0.004	-0.008	0.006	-0.031*	-0.038**	-0.036*	-0.035**	-0.015	-0.033*	-0.035***
	(0.49)	(0.76)	(0.57)	(0.32)	(0.39)	(-0.75)	(0.37)	(-1.67)	(-2.38)	(-1.66)	(-2.23)	(-0.93)	(-1.79)	(-3.18)
Foreign Bank Share (α_4)	-0.013	-0.016	-0.018	-0.022**	-0.018	-0.030***	-0.025**	-0.057***	-0.054***	-0.058***	-0.034	-0.013	-0.021**	-0.017
	(-1.24)	(-1.36)	(-1.53)	(-2.10)	(-1.52)	(-3.55)	(-2.18)	(-2.83)	(-2.64)	(-2.91)	(-1.36)	(-1.22)	(-2.02)	(-0.60)
State Bank Share (α_5)	-0.000	-0.004	-0.002	-0.011	-0.008	-0.020*	-0.018*	-0.054**	-0.054*	-0.053*	-0.068	0.003	-0.001	-0.036**
	(-0.00)	(-0.42)	(-0.21)	(-1.18)	(-1.13)	(-1.66)	(-1.91)	(-1.96)	(-1.79)	(-1.79)	(-1.56)	(0.23)	(-0.05)	(-1.98)
Inflation (α_6)	0.066	0.067	0.070	0.073*	0.090	0.083*	0.057	-0.014	0.072*	0.074*	0.051	0.126***	0.125***	0.042
	(1.56)	(1.53)	(1.63)	(1.78)	(1.43)	(1.78)	(0.89)	(-0.23)	(1.69)	(1.72)	(1.21)	(3.19)	(3.28)	(1.01)
Trend (α_7)	0.170**	0.136	0.155*	0.148	0.105	0.032	0.051	-0.307	-0.381**	-0.374**	-0.408**	-0.121	-0.188	-0.492**
	(2.16)	(1.39)	(1.68)	(1.47)	(1.05)	(0.24)	(0.48)	(-1.59)	(-1.99)	(-1.97)	(-1.96)	(-0.97)	(-1.22)	(-2.40)
Spread (α_{81})				-0.300*							0.367			
				(-1.82)							(0.69)			
Bank Deposit (α_{82})					0.021							0.022*		
					(1.61)							(1.92)		
Private Credit (α_{83})						0.038**							0.017	
						(2.36)							(1.41)	
Governmental Credit (α_{84})							0.016							-0.030
							(0.82)							(-0.61)
Constant (α_0)	1.558*	1.874**	2.075**	3.726***	1.685**	3.116**	3.121**	4.928***	5.918***	5.996***	4.369***	1.880	3.641***	6.993***
	(1.80)	(2.26)	(2.42)	(2.61)	(2.17)	(2.35)	(2.55)	(3.16)	(6.10)	(4.85)	(3.21)	(1.27)	(2.82)	(4.92)
Observations	120	99	99	99	86	81	83	104	97	97	97	81	70	98
Number of Country	12	12	12	12	11	12	11	10	10	10	10	10	10	11
Chi-Squared	17.42	30.01	31.80	56.45	605.9	86.90	1221	17.91	72.34	18864	334	65.58	95.40	1345
H_0: $\alpha_1 = \alpha_{12} = 0$			12.26***	13.29***	9.17**	18.13***	9.09**			0.07	0.27	3.23	3.19	0.98
H_0: $\alpha_1 + \alpha_{12} = 0$			8.09***	7.32***	8.30***	13.51***	7.38***			0.06	0.22	0.01	0.00	0.86

Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

We estimate our model using other sub-samples. The regression estimations show that for *Repressed* and *High Muslim Countries*, an increase in share of Islamic banking in commercial banking total assets is associated with lower *Economic Growth*. *ISB Rank*, however, depicts positive linkage with *Economic Growth* in *Poor* and *High Muslim Countries*. Among quantitative and qualitative proxies of financial development, we observe positive relationship between *Bank Deposit* and *Economic Growth* in *Free, Poor, Rich* and *Low Muslim Countries*. *Private Credit* is positively linked to *Economic Growth* in *Repressed, Free* and *Low Muslim Countries*. A decrease in *Spread* translates into an increase in *Economic Growth* merely in *Repressed Countries*[77].

4.2. EFFICIENCY OF CONVENTIONAL BANKS IN A DUAL BANKING SYSTEM

4.2.a. CREDIT RISK MODEL

We estimate the *Credit Risk* Model (Equation (2)), using the ratio of loan loss reserves on gross loans (*Loan Loss Reserves*) as the *Credit Risk* proxy. We analyze our sub-sample of *Small Banks* separately from *Large Banks*. Table VII presents the results. Columns (1) to (6) display the analysis for *Small Banks* and the findings for *Large Banks* are illustrated in columns (7) & (8).

In the first column we regress *Loan Loss Reserves* on *ISB Share*, while controlling for *ISW Share* and year dummies. *ISB Rank* is added to the model in the second column. In column (3), we control for *Economic Growth* and *HHI*. *Per Capita* and *Domestic Interest Rate* are included into the model in column (4). We attempt to capture bank-level heterogeneities represented by *Loan Growth, Cost Inefficiency* and *Noninterest Income* in column (5). Column (6) illustrates the result when we control for *Capital* and *Size*. In all specifications *ISB Share* appears with insignificant coefficient; however, *ISB Rank* depicts a negative linkage with *Credit Risk*.

[77] The estimations are not reported in the chapter, but are available from the authors on request.

Table VII. Credit Risk Model – Small / Large Banks

This table presents the estimation of the Credit Risk Model (Equation (2)), using the fixed effect technique as suggested by Hausman Test. The *Credit Risk* proxy (dependent variable) is the ratio of loan loss reserves on gross loans (*Loan Loss Reserves*). We split our sample into two groups on the basis of total assets. Conventional banks with total assets less than one billion U.S. $ are classified as small banks (*Small Banks*) and the rest are classified as large banks (*Large Banks*). Columns (1) to (6) demonstrate the analysis for *Small Banks* and the results for *Large Banks* are displayed in columns (7) & (8). We regress *Loan Loss Reserves* on our variables of interest, i.e. *ISB Share* and *ISB Rank*, and control variables (*ISW Share*, *Economic Growth*, *HHI*, *Per Capita*, *Domestic Interest Rate, Loan Growth, Cost Inefficiency, Noninterest Income, Capital, Size* and year dummies).

In the first column we regress *Loan Loss Reserves* on *ISB Share*, while controlling for *ISW Share* and year dummies. *ISB Rank* is included into the model in the second column. In column (3), we control for *Economic Growth* and *HHI*. *Per Capita* and *Domestic Interest Rate* are added to the model in column (4). We attempt to capture heterogeneities represented by *Loan Growth*, *Inefficiency* and *Noninterest Income* in columns (5). Column (6) illustrates the result when we control for *Capital* and *Size*. Column (7) depicts the result when we include the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share*×*ISB Rank*. In column (8) we estimate our model for *Large Banks* sub-sample, excluding *ISB Rank*. In column (9) we include *ISB Rank* in our estimation. Year dummies are included by not reported in the table. All the right-hand-side variables are lagged for one period.

	Small Banks							Large Banks	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ISB Share (β_1)	0.041	0.031	0.009	-0.007	0.002	0.003	0.068	0.024	0.005
	(0.32)	(0.23)	(0.05)	(-0.07)	(0.02)	(0.03)	(0.58)	(0.55)	(0.13)
ISB Share×ISB Rank (β_{12})							-0.001		
							(-0.92)		
ISB Rank (β_2)		-0.055***	-0.057**	-0.046**	-0.045**	-0.045**	-0.034*		0.004
		(-2.67)	(-2.50)	(-2.50)	(-2.49)	(-2.50)	(-1.88)		(0.39)
ISW Share (β_3)	0.110	0.144*	0.130	0.074	0.086	0.096	0.103*	-0.002	-0.017
	(1.62)	(1.72)	(1.29)	(1.23)	(1.42)	(1.54)	(1.67)	(-0.06)	(-0.46)
Economic Growth (β_4)			0.096	0.083	0.097	0.109	0.109	0.019	0.028
			(1.60)	(0.77)	(0.78)	(0.88)	(0.90)	(0.28)	(0.29)
HHI (β_5)			-0.027	-0.016	-0.008	-0.008	-0.007	0.039	0.048
			(-0.20)	(-0.18)	(-0.09)	(-0.09)	(-0.09)	(0.58)	(0.70)
Per Capita (β_6)			0.537	1.098**	1.332**	1.303**	1.314**	0.358*	0.410**
			(0.74)	(2.06)	(2.47)	(2.41)	(2.33)	(1.89)	(2.12)
Domestic Interest Rate (β_7)			0.159	-0.043	-0.038	-0.033	-0.019	-0.239**	-0.219
			(1.04)	(-0.27)	(-0.23)	(-0.20)	(-0.11)	(-2.05)	(-1.32)
Loan Growth (β_8)				-0.041***	-0.042***	-0.043***	-0.042***	-0.001	0.000
				(-3.51)	(-3.64)	(-3.65)	(-3.74)	(-0.06)	(0.03)
Inefficiency (β_9)				-0.083*	-0.086*	-0.087*	-0.088*	0.012	0.014
				(-1.86)	(-1.91)	(-1.92)	(-1.93)	(1.47)	(1.57)
Noninterest Income (β_{10})				-0.056	-0.062	-0.059	-0.057	0.029	0.025
				(-1.35)	(-1.50)	(-1.50)	(-1.43)	(1.01)	(0.85)
Capital (β_{11})					-0.098	-0.131	-0.137	-0.070	-0.070
					(-1.37)	(-1.60)	(-1.65)	(-0.87)	(-0.88)
Size (β_{12})						-0.651	-0.718	-0.035	-0.070
						(-0.93)	(-1.05)	(-0.06)	(-0.11)
Constant (β_0)	10.977***	12.155***	6.353	15.920***	15.862***	24.147**	24.221**	7.917	7.794
	(6.66)	(4.78)	(0.97)	(2.83)	(2.89)	(2.34)	(2.37)	(0.92)	(0.85)
Observations	868	708	708	524	524	524	524	562	523
R-squared	0.042	0.092	0.098	0.218	0.225	0.227	0.229	0.212	0.228
Number of Banks	222	201	201	161	161	161	161	160	157
H_0: $\beta_1 = \beta_{12} = 0$							0.42		
H_0: $\beta_1 + \beta_{12} = 0$							0.33		

Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

The results show that presence of relatively cost efficient Islamic banks (represented by weighted average cost efficiency rank) in the commercial banking market reduces *Credit Risk* of small conventional banks. Column (7) displays the result when we include the interaction term of *ISB*

Share and *ISB Rank*, i.e. *ISB Share×ISB Rank*, in the model which appears with insignificant coefficient. In column (8) we estimate our model for *Large Banks* sub-sample, excluding *ISB Rank*. In column (9) we include *ISB Rank* into our analysis. The results show little relationship of *ISB Share* and *ISB Rank* with *Credit Risk* of large conventional banks.

We pursue our analysis using our eight sub-samples based on the median value of Corruption Perception Index, Economic Freedom Index, Wealth (represented by GDP per capita) and Muslims share in population. The results show that the negative association between *ISB Rank* and *Credit Risk* is held for small conventional banks operating in *Corrupted, Repressed, Poor* and *Low Muslim Countries*. For other sub-samples of countries, we find little evidence[78].

4.2.b. SPREAD MODEL

We estimate our *Spread* Model (Equation (3)), using the lending-deposit spread (*Spread*) as our dependent variable. We use two sub-samples of *Small* and *Large* conventional banks for our analysis. Table VIII displays the results. Columns (1) to (9) illustrate the analysis for *Small Banks* and the estimations for *Large Banks* are exhibited in columns (10) & (11).

In the first column we regress *Spread* on *ISB Share*, and control for *ISW Share* and year dummies. *ISB Rank* is added to model in the second column. In column (3), we control for *Economic Growth* and *HHI*. *Per Capita* and *Domestic Interest Rate* are taken into account in column (4). In column (5), we try to capture the possible impact of *Credit Risk*, *Inefficiency* and *Noninterest Income*. Column (6) shows the result when we control for *Capital* and *Size*. *ISB Share* depicts positive relationship with *Spread* of *Small* conventional banks in the last two specifications, where we control for bank-level heterogeneities. *ISB Rank*, however, shows little relationship with *Spread*. The finding suggests that an increase in share of Islamic banks in the banking system total assets increases *Spread* of *Small* conventional banks.

[78] The estimations are not reported in the chapter, but are available from the authors on request.

Table VIII. Spread Model – Small / Large Banks

This table presents the estimation of the Spread Model (Equation (3)), using the fixed effect technique as suggested by Hausman Test. Lending-deposit spread defined as $\frac{\text{total interest income}}{\text{average total earning assets}} - \frac{\text{total interest expense}}{\text{average total interest-bearing liabilities}}$ is our proxy for the analysis. We split our sample into two groups on the basis of total assets. Conventional banks with total assets less than one billion U.S. $ are classified as small banks (*Small Banks*) and the rest are classified as large banks (*Large Banks*). Columns (1) to (9) illustrate the analysis for *Small Banks* and the results for *Large Banks* are displayed in columns (10) & (11). We regress *Spread* on our variables of interest, i.e. *ISB Share* and *ISB Rank*, and control variables (*ISW Share*, *Economic Growth*, *HHI*, *Per Capita*, *Domestic Interest Rate*, *Credit Risk*, *Inefficiency*, *Noninterest Income*, *Capital*, *Size* and year dummies).

In the first column we regress *Spread* on *ISB Share*, while controlling for *ISW Share* and year dummies. *ISB Rank* is taken into account in the second column. In column (3) we control for *Economic Growth* and *HHI*. *Per Capita* and *Domestic Interest Rate* are added to the model in column (4). We attempt to capture heterogeneities represented by *Credit Risk*, *Inefficiency* and *Noninterest Income* in columns (5). Column (6) illustrates the result when we control for *Capital* and *Size*. In column (7) we add the interaction term of *ISB Share* and *ISW Share* (*ISB Share×ISW Share*) to our model. Column (8) depicts the result when we consider the quadratic form of *ISB Share* (*ISB Share*^{2}) in our model. Column (8) demonstrates the result when we add the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share×ISB Rank*. In column (10) we estimate our model for *Large Banks* sub-sample, excluding *ISB Rank*. In column (11) we include *ISB Rank* in our estimation. Year dummies are incorporated in our analysis by not reported in the table. All the right-hand-side variables are lagged for one period.

	Small Banks									Large Banks	
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
ISB Share (θ_1)	0.001	-0.006	0.023	0.021	0.046**	0.047**	0.046*	0.019	0.072***	0.016	0.021
	(0.06)	(-0.27)	(1.16)	(0.90)	(2.13)	(2.22)	(1.80)	(0.42)	(2.95)	(0.65)	(0.89)
ISB Share×ISW Share (θ_{13})							0.0001				
							(0.09)				
ISB Share^2 (θ_{11})								0.0004			
								(0.64)			
ISB Share×ISB Rank (θ_{12})									-0.0005*		
									(-1.91)		
ISB Rank (θ_2)		0.004	0.002	0.002	0.001	0.001	0.001	0.001	0.006		0.002
		(0.54)	(0.27)	(0.25)	(0.21)	(0.17)	(0.16)	(0.12)	(0.81)		(0.65)
ISW Share (θ_3)	-0.025	-0.036	-0.006	-0.007	-0.003	-0.002	-0.002	-0.003	-0.001	0.021	0.022
	(-1.19)	(-1.54)	(-0.25)	(-0.27)	(-0.15)	(-0.07)	(-0.07)	(-0.12)	(-0.04)	(1.35)	(1.43)
Economic Growth (θ_4)			-0.038	-0.041	0.002	0.004	0.004	0.003	0.009	0.025	-0.084**
			(-1.37)	(-1.40)	(0.04)	(0.11)	(0.10)	(0.07)	(0.24)	(0.65)	(-2.39)
HHI (θ_5)			-0.100***	-0.099***	-0.098***	-0.100***	-0.100***	-0.101***	-0.095***	0.003	-0.009
			(-3.29)	(-3.35)	(-3.13)	(-3.25)	(-3.23)	(-3.23)	(-2.97)	(0.11)	(-0.37)
Per Capita (θ_6)				0.065	0.002	-0.008	-0.007	-0.011	-0.015	-0.036	-0.041
				(0.42)	(0.02)	(-0.07)	(-0.06)	(-0.10)	(-0.13)	(-0.83)	(-0.86)
Domestic Interest Rate (θ_7)				-0.004	0.016	0.018	0.017	0.013	0.027	0.076***	-0.052
				(-0.09)	(0.48)	(0.51)	(0.51)	(0.39)	(0.79)	(3.17)	(-1.07)
Credit Risk (θ_8)					-0.031**	-0.032**	-0.032**	-0.032**	-0.035***	-0.016	-0.010
					(-2.38)	(-2.57)	(-2.56)	(-2.57)	(-2.85)	(-1.02)	(-0.65)
Inefficiency (θ_9)					0.009	0.009	0.009	0.008	0.009	-0.002	0.009
					(1.60)	(1.53)	(1.53)	(1.49)	(1.53)	(-0.16)	(0.97)
Noninterest Income (θ_{10})					0.001	0.001	0.001	0.001	0.002	-0.037***	-0.011**
					(0.08)	(0.10)	(0.10)	(0.06)	(0.17)	(-4.69)	(-2.14)
Capital (θ_{11})						-0.007	-0.007	-0.007	-0.010	0.020	0.019

						(-0.32)	(-0.31)	(-0.30)	(-0.44)	(0.91)	(0.94)
Size (θ_{12})						-0.125	-0.125	-0.128	-0.145	0.427**	0.483**
						(-0.52)	(-0.52)	(-0.53)	(-0.61)	(2.24)	(2.35)
Constant (θ_0)	4.516***	4.240***	5.618***	5.168***	5.291***	7.023*	7.022*	7.321*	6.978*	-2.446	-3.507
	(10.75)	(6.96)	(7.69)	(3.77)	(4.39)	(1.86)	(1.86)	(1.86)	(1.87)	(-0.77)	(-1.03)
Observations	1,009	831	831	831	630	630	630	630	630	706	614
R-squared	0.025	0.030	0.061	0.062	0.104	0.106	0.106	0.107	0.113	0.290	0.154
Number of Banks	241	219	219	219	192	192	192	192	192	179	170
H_0: $\theta_1 = \theta_{13} = 0$							2.77*				
H_0: $\theta_1 + \theta_{13} = 0$							3.36*				
H_0: $\theta_1 = \theta_{11} = 0$								2.50*			
H_0: $\theta_1 + \theta_{11} = 0$								0.19			
H_0: $\theta_1 = \theta_{12} = 0$									4.35**		
H_0: $\theta_1 + \theta_{12} = 0$									8.69***		

Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

In column (7) we add the interaction term of *ISB Share* and *ISW Share* (*ISB Share*×*ISW Share*) to our model. The estimation suggests that the relationship between *ISB Share* and *Spread* of *Small* conventional banks is irrespective of *Islamic Window Banks* presence. Column (8) depicts the result when we include the quadratic form of *ISB Share* (*ISB Share*^{2}) to the model to explore whether the relationship follows first or second order. The coefficient suggests a linear relationship. Column (8) illustrates the result when we add the interaction term of *ISB Share* and *ISB Rank*, i.e. *ISB Share*×*ISB Rank*. The interaction term appears with significant and negative coefficient; however, its absolute value is tiny. The finding suggests that an increase in efficiency rank of Islamic banks, slightly weaken the positive impact of *ISB Share* on *Spread*.

In column (10) we estimate our model for *Large Banks* sub-sample, excluding *ISB Rank*. In column (11) we include *ISB Rank* in our estimation. We observe little association of *ISB Share* and *ISB Rank* with *Spread* of *Large* conventional banks.

We estimate our *Spread* model for different country sub-samples. The results show that the relationship between *ISB Share* and *Spread* of *Small* conventional banks is merely observed in *Corrupted, Repressed, Free, Poor* and *High Muslim Countries*[79].

4.2.c. INEFFICIENCY MODEL

We estimate our *Inefficiency* Model (Equation (4)) for our bank-level analysis, using the ratio of total noninterest expense on total operating income (*Inefficiency*) as the proxy. We estimate our model for *Small* and *Large* sub-sample of conventional banks. Table IX presents the estimations. Columns (1) to (5) illustrate the analysis for *Small Banks* and the result for *Large Banks* is displayed in column (6).

[79] The estimations are not reported in the chapter, but are available from the authors on request.

Table IX. Inefficiency Model – Small / Large Banks

This table presents the estimation of the Inefficiency Model (Equation (4)), using the fixed effect technique as suggested by Hausman Test. The *Inefficiency* proxy (dependent variable) is the ratio of total noninterest expense on total operating income (*Inefficiency*). We split our sample into two groups on the basis of total assets. Conventional banks with total assets less than one billion U.S. $ are classified as small banks (*Small Banks*) and the rest are classified as large banks (*Large Banks*). Columns (1) to (5) illustrate the analysis for *Small Banks* and the results for *Large Banks* are exhibited in column (6). We regress *Inefficiency* on our variable of interest, i.e. *ISB Share*, and control variables (*ISW Share*, *Economic Growth*, *HHI*, *Per Capita*, *Domestic Interest Rate*, *Credit Risk*, *Loan Growth*, *Noninterest Income*, *Capital*, *Size* and year dummies).

In the first column we regress *Inefficiency* on *ISB Share*, while controlling for *ISW Share* and year dummies. In the second column, we control for *Economic Growth* and *HHI. Per Capita* and *Domestic Interest Rate* are added to the model in column (3). We attempt to capture heterogeneities represented by *Credit Risk, Loan Growth* and *Noninterest Income* in column (4). Column (5) illustrates the result when we control for *Capital* and *Size*. In column (6) we estimate our model for *Large Banks* sub-sample, with the same specification as of column (5). Year dummies are included by not reported in the table. All the right-hand-side variables are lagged for one period.

	Small Banks					Large Banks
Variables	(1)	(2)	(3)	(4)	(5)	(6)
ISB Share (δ_1)	-0.252**	-0.213**	-0.200*	-0.217	-0.202	0.055
	(-2.45)	(-2.03)	(-1.83)	(-1.18)	(-1.15)	(0.41)
ISW Share (δ_3)	-0.203	-0.138	-0.117	0.084	0.117	0.075
	(-1.48)	(-1.05)	(-0.87)	(0.47)	(0.67)	(0.71)
Economic Growth (δ_4)		0.299	0.200	0.146	0.167	-0.069
		(1.55)	(0.95)	(0.34)	(0.37)	(-0.23)
HHI (δ_5)		-0.179	-0.173	-0.313	-0.336	-0.313
		(-0.85)	(-0.80)	(-1.17)	(-1.24)	(-1.59)
Per Capita (δ_6)			0.405	-0.215	-0.398	0.601
			(0.99)	(-0.14)	(-0.25)	(1.53)
Domestic Interest Rate (δ_7)			-0.267	-0.134	-0.112	0.428
			(-1.10)	(-0.45)	(-0.37)	(0.98)
Credit Risk (δ_8)				0.449**	0.445**	0.394**
				(2.00)	(2.05)	(2.05)
Loan Growth (δ_9)				0.065**	0.063**	-0.008
				(2.23)	(2.09)	(-0.35)
Noninterest Income (δ_{10})				0.045	0.055	0.212
				(0.53)	(0.63)	(1.52)
Capital (δ_{11})					-0.110	-0.303*
					(-0.56)	(-1.72)
Size (δ_{12})					-2.923	-2.601
					(-1.41)	(-1.33)
Constant (δ_0)	59.405***	61.355***	61.985***	54.208***	91.348***	78.449***
	(22.46)	(15.05)	(10.97)	(5.62)	(3.36)	(2.73)
Observations	931	931	931	641	641	533
R-squared	0.036	0.041	0.044	0.079	0.084	0.155
Number of Banks	240	240	240	180	180	156

Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

In the first column we regress *Inefficiency* on *ISB Share*, while controlling for *ISW Share* and year dummies. In the second column, we control for *Economic Growth* and *HHI. Per Capita* and *Domestic Interest Rate* are added to the model in column (3). *ISB Share* depicts a negative association with *Inefficiency*. In the next step, we attempt to capture bank-level heterogeneities represented by *Credit Risk, Loan Growth* and *Noninterest Income* in column (4). Column (5)

illustrates the result when we control for *Capital* and *Size*. We observe that the negative relationship between *ISB Share* and *Inefficiency* disappears when bank-level control variables are incorporated in our investigation. In column (6) we estimate our model for *Large Banks* sub-sample, with the same specification as of column (5). Similar to our findings for *Small Banks* sub-sample, we discover little linkage between *ISB Share* and *Inefficiency*.

As further analysis, we estimate our model for different groups of countries. The results show that in *Poor* and *Repressed Countries, ISB Share* is negatively associated with *Inefficiency* of *Small* conventional banks; however, in *Free* and *Rich Countries, ISB Share* is positively correlated with *Inefficiency* of *Large* conventional banks[80].

5. Summary and Concluding Remarks

In this chapter, we investigate whether the presence of Islamic commercial banks alongside their conventional counterparts can foster the development of the overall commercial banking sector and economic growth. Moreover, we explore the possible impact of operating in a dual banking system for conventional banks.

During the recent decades, Islamic banking has grown fast in many Muslim countries. As such, a dual banking system has emerged in many countries, where both Islamic and conventional banks share the market. Islamic finance is expected to offer *Sharia*-compatible financial products and services. This suggests a considerable potential for lessening financial exclusion and outreaching Muslims who refrain from using the conventional borrowing and lending instruments or prefer Islamic banking to the conventional one.

Islamic banks may behave differently from their conventional counterparts in several ways: they are not authorized to get involved in speculative activities. They are supposed to act

[80] The estimations are not reported here, but are available from the authors on request.

as the agent of investment account holders for allocating their savings to profitable projects. They might be more risk-averse and have stronger preference for investing in the real economy than conventional banks. Moreover, the coexistence of Islamic and conventional banking could increase the efficiency of the whole banking system.

We study 22 Muslim countries with a dual banking system during the 1999-2009 period. Due to considerable heterogeneities among the countries under study, we split them into eight sub-samples based on: Corruption Perception Index (CPI), Economic Freedom Index (EFI), GDP per capita and Muslims share in population; however, we primarily focus on two groups of countries below and above the median value of CPI, as we observe the greatest divergence in quantity and quality of Islamic banking presence across these two groups of countries.

First, we investigate the possible relationship between Islamic commercial banking and savings mobilization. The results show that the presence of Islamic banks increases bank deposits (scaled by GDP), especially in relatively low income countries or countries which suffer more from corruption or economic repression. In terms of funds allocation, we find little difference between Islamic and conventional banks in allocating credits to the private sector, except for comparatively low income countries where the presence of efficient Islamic banks is associated with more lending to the private sector (scaled by GDP). Moreover, in countries with higher levels of economic freedom, we observe a negative linkage between the market share of Islamic banks and the amount of loans to the private sector. Furthermore, an increase in efficiency of Islamic banks is associated with lower allocation of credit to the Governmental sector in countries with relatively more corruption or economic repression and higher credit allocation to the Governmental sector in countries with less corruption or more economic freedom. The results also suggests that higher efficiency of Islamic banks is associated with

lower lending-deposit spread in countries below the median value of CPI, GDP per capita or Muslims share in population.

Our analysis of economic growth shows that for countries with more economic repression, an increase in the market share of Islamic banks is associated with lower economic growth; however, the presence of efficient Islamic banks can effectively spur economic growth in rather low income countries. In countries with comparatively greater share of Muslims in population, while an increase in the market share of Islamic banks slows down economic growth, increases in efficiency rank of Islamic banks foster growth. For other countries, we find no direct links. Moreover, we observe that bank deposits and private credits are positively associated with economic growth, whereas spreads depict a negative linkage with growth. The degree of influence depends on the institutional environment of the countries under study. For instance, in more corrupted countries, the quality of credit allocation and lending-deposit spreads (representing financial intermediation efficiency) can affect economic growth. Whereas in less corrupted countries, savings mobilization as the indicator of quantitative aspect of financial development, matters and can boost economic growth.

We also investigate the impact of Islamic banks' presence on the performance of conventional banks in terms of lending quality (credit risk), spread and cost inefficiency. We find a negative relationship between the efficiency rank of Islamic banks and the credit risk of small conventional banks. An increase in the share of Islamic banks in the banking system increases the lending-deposit spread of small conventional banks, except in countries with less corruption, higher per capita income or lower Muslims share in population. The results show that in low income countries or countries with rather economic repression, the market share of Islamic banks is negatively associated with cost inefficiency of small conventional banks; however, in comparatively rich or economically free countries the share of Islamic banking in the banking

system is positively correlated with cost inefficiency of large conventional banks. Overall, the results show that the presence Islamic banks alongside conventional banks can affect financial development, economic growth and the performance of conventional banks. The extent and modality of such effects considerably depend on the institutional environment within which a dual banking system operates.

Appendices

Table A1. Summary of Results

This table provides a summary of our results for Deposit Mobilization Model (bank deposit on GDP ratio '*Bank Deposit*'), Credit Allocation Model (using private credit on GDP ratio '*Private Credit*' and credit to Governmental sector on GDP ratio '*Governmental Credit*'), Spread Model (lending-deposit spreads '*Spread*') and Economic Growth Model (the annual growth rate of GDP per capita '*Economic Growth*'). See Table A2 for variable definitions and section 2 for econometric specifications.

		Corruption Perception Index		Economic Freedom Index		GDP Per Capita		Muslim Share in Population	
		Corrupted Countries [below median]	Healthy Countries [above median]	Repressed Countries [below median]	Free Countries [above median]	Poor Countries [below median]	Rich Countries [above median]	Low Muslim Countries [below median]	High Muslim Countries [above median]
Bank Deposit									
	ISB Share	+++	0	++	0	+++	0	+++	++
	ISB Rank	0	+	0	0	0	0	0	0
Private Credit									
	ISB Share	0	0	0	-	0	0	0	0
	ISB Rank	0	0	0	0	+	0	0	0
Governmental Credit									
	ISB Share	0	--	0	0	0	0	0	0
	ISB Rank	--	+	--	+	0	0	0	0
Spread									
	ISB Share	0	0	0	0	0	0	0	0
	ISB Rank	0	-	0	0	--	0	--	0
Economic Growth									
	ISB Share	0	0	---	0	0	0	0	---
	ISB Rank	0	0	0	0	+	0	0	+
	Bank Deposit	0	+	0	+++	++	+	++	0
	Private Credit	++	0	+	+++	0	0	+++	0
	Spread	-	0	--	0	0	0	0	0

+: positive relationship, significant at 10% level.
++: positive relationship, significant at 5% level.
+++: positive relationship, significant at 1% level.
0: no significant relationship.
-: negative relationship, significant at 10% level.
--: negative relationship, significant at 5% level.
---: negative relationship, significant at 1% level.

Table A2. Variable Description

This table presents description of variables used in this study.

Variables	Description
Variables of Interest	
ISB Share	The share of Islamic banks in total assets of the whole commercial banking market.
ISB_D5	The dummy variable which takes the value of one when ISB Share exceeds 5%, and zero otherwise.
ISB_D7	The dummy variable which takes the value of one when ISB Share exceeds 7%, and zero otherwise.
ISB_D10	The dummy variable which takes the value of one when ISB Share exceeds 10%, and zero otherwise.
ISB Rank	The weighted average cost efficiency rank of Islamic banks among all commercial banks. We use total noninterest expense on total operating revenue ratio as the proxy for cost efficiency (higher $\frac{Total\ Noninterest\ Expense}{Total\ Operating\ Revenue}$ translates into lower cost efficiency). We follow Berger et. al (2004) and orderly rank banks in each country and year. The ranks are then transformed into a uniform scale in [0,100] domain through this formula:$100\times(n_t\text{-}Order_{it})/(n_t\text{-}1)$. n_t is the number of observations (banks) in each year. $Order_{it}$ is the rank of bank (i) in year (t).
Dependent Variables	
Bank Deposit	The ratio of bank deposits on GDP.
Private Credit	The ratio of private credit on GDP.
Governmental Credit	The ratio of credit to Governmental sector on GDP.
Spread	The lending-deposit spread defined as $\frac{\text{total interest income}}{\text{average total earning assets}} - \frac{\text{total interest expense}}{\text{average total interest-bearing liabilities}}$ averaged across country and year.
Economic Growth	The annual growth rate of GDP per capita.
Control Variables	
ISW Share	The share of total assets of commercial banks offering both Islamic and conventional products in total assets of commercial banks.
ISW_D5	The dummy variable which takes the value of one when ISW Share exceeds 5%, and zero otherwise.
ISW_D7	The dummy variable which takes the value of one when ISW Share exceeds 7%, and zero otherwise.
ISW_D10	The dummy variable which takes the value of one when ISW Share exceeds 10%, and zero otherwise.
Foreign Bank Share	The share of foreign-owned banks in total assets of commercial banks.
State Bank Share	The share of state-owned banks in total assets of commercial banks.
Inflation	The annual inflation rate measured by GDP deflator.
HHI	Hirschman-Herfindahl index (HHI) is a proxy for market concentration: $HHI_{c,t} = 100 \times \sum_{i=1}^{n}\left(Total\_Assets_{i,t,c}/\sum_{i=1}^{n} Total\_Assets_{i,t,c}\right)^2$. It has a value between zero and one hundred. Higher values show that the market is more concentrated.
Domestic Interest Rate	Deposit interest rate provided by the World Bank website; for years and countries with missing observations, the data is obtained from the central bank web-sites.
Per Capita	GDP per capita (th. $), measured by PPP approach (constant 2005 international).
Bank-Level Variables	
Size	The logarithm of total assets.
Credit Risk	Represented by *Loan Loss Reserves* which is the ratio of loan loss reserves on gross loans.
Spread	The lending-deposit spread defined as $\frac{\text{total interest income}}{\text{average total earning assets}} - \frac{\text{total interest expense}}{\text{average total interest-bearing liabilities}}$.
Inefficiency	The ratio of total noninterest expense on total operating revenue.
Capital	Equity capital to asset ratio.
Loan Growth	Annual growth rate of gross loans.
Noninterest Income	Share of non-interest income in total operating income.

Table A3. Deposit Mobilization Model – Corrupted / Healthy Countries

This table illustrates the estimation of the Deposit Mobilization Model (Equation (1)), using bank deposits on GDP ratio (*Bank Deposit*) as the dependent variable. We employ the random effect technique. We split our sample into two groups on the basis of the median value of Corruption Perception Index (CPI). Countries with CPI below the median are in one group (*Corrupted Countries*) and the rest in the other group called *Healthy Countries*. The median value of CPI in our sample is 3.2. The results for *Corrupted Countries* are presented in columns (1) to (6), whereas columns (7) to (12) display our analysis for *Healthy Countries*. We regress *Bank Deposit* on our variables of interest, i.e. *ISB_D5, ISB_D7* and *ISB_D10*, and control variables (*ISW_D5* / *ISW_D7 / ISW_D10* and *Foreign Bank Share*, *State Bank Share*, *Inflation* and *Trend*).

In the first column we regress *Bank Deposit* on *ISB_D5*, excluding *ISW_D5*. In the second column, we include *ISW_D5*. In columns (3) and (4) we replace *ISB_D5* and *ISW_D5* with *ISB_D7* and *ISW_D7* and re-estimate our model. Columns (5) and (6) display the results when we use *ISB_D10* and *ISW_D10* in lieu of *ISB_D7* and *ISW_D7*. In columns (7) to (12), we re-estimate our model with the specification as of columns (1) to (6) for the *Healthy Countries* sub-sample.

	Corrupted Countries						Healthy Countries					
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ISB_D5 (α_1)	0.662	0.856					-2.987	-4.649				
	(0.35)	(0.41)					(-0.75)	(-1.25)				
ISW_D5 (α_3)		2.112						10.841				
		(1.36)						(1.38)				
ISB_D7 (α_1)			2.994***	3.764***					0.183	-2.603		
			(2.64)	(3.47)					(0.04)	(-0.41)		
ISW_D7 (α_3)				4.372**						9.619		
				(2.55)						(1.08)		
ISB_D10 (α_1)					3.222***	4.141***					0.418	-1.610
					(2.93)	(3.47)					(0.12)	(-0.35)
ISW_D10 (α_3)						6.235***						9.052
						(7.52)						(1.11)
Foreign Bank Share (α_4)	-0.196***	-0.185***	-0.209***	-0.193***	-0.209***	-0.157**	-0.254***	-0.176	-0.273***	-0.209	-0.274***	-0.215
	(-2.70)	(-2.58)	(-2.90)	(-2.61)	(-2.87)	(-2.05)	(-3.02)	(-1.27)	(-3.29)	(-1.47)	(-3.32)	(-1.59)
State Bank Share (α_5)	-0.183**	-0.174**	-0.182**	-0.176**	-0.177**	-0.142**	-0.249**	-0.194	-0.246**	-0.194	-0.246**	-0.198
	(-2.55)	(-2.46)	(-2.56)	(-2.49)	(-2.48)	(-1.99)	(-2.07)	(-1.62)	(-1.99)	(-1.44)	(-1.99)	(-1.49)
Inflation (α_6)	-0.216**	-0.213**	-0.218***	-0.206**	-0.224***	-0.196**	-0.415***	-0.387**	-0.419***	-0.382**	-0.420***	-0.389**
	(-2.57)	(-2.44)	(-2.63)	(-2.32)	(-2.80)	(-2.11)	(-2.80)	(-2.44)	(-2.63)	(-2.12)	(-2.68)	(-2.27)
Trend (α_7)	1.164***	1.161***	1.201***	1.203***	1.214***	1.192***	0.093	0.195	0.160	0.325	0.155	0.309
	(2.93)	(2.87)	(3.16)	(3.10)	(3.09)	(3.09)	(0.25)	(0.61)	(0.39)	(0.73)	(0.38)	(0.70)
Constant (α_0)	39.147***	37.682***	38.870***	36.075***	38.887***	33.595***	74.536***	68.361***	72.279***	67.165***	72.173***	66.969***
	(4.44)	(4.14)	(4.34)	(4.08)	(4.34)	(4.05)	(7.48)	(5.65)	(7.35)	(5.55)	(7.08)	(5.37)
Observations	103	103	103	103	103	103	88	88	88	88	88	88
Number of Country	11	11	11	11	11	11	10	10	10	10	10	10
Chi- Squared	214.1	341.	418.8	186.1	221.5	505.6	17.13	1657	15.81	700.4	15.70	733.6

Robust z-statistics are reported in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% respectively. See Table A2 for variable definitions.

General Summary and Concluding Remarks

Chapter 1. Risk in Islamic Banking

The first chapter analyzes the risk and stability features of Islamic banks. The obligations of Islamic banks towards depositors (investment account holders) are different from those of conventional banks and hence they face different risks. Conventional banks have to fulfill their obligations towards depositors irrespective of their profits or losses whereas Islamic banks are supposed to share the realized profit or loss with investment account holders. This special relationship may discipline Islamic banks more effectively by imposing higher withdrawal risk. In practice, to avoid withdrawal risk, Islamic banks tend to partly deviate from the profit and loss sharing (PLS) principles of Islamic finance. They pay a relatively competitive rate of return to investment account holders, regardless of their realized performance. Moreover, on the asset side, Islamic banks mainly apply non-PLS modes of Islamic finance which are in nature closer to conventional finance. Nevertheless, Islamic banks still may face extra risks because of the complexity of Islamic modes of finance and limitations in their funding, investment and risk management activities. On the other hand, customers of Islamic banks are expected to be more concerned about their religious beliefs. Taking into account the positive relationship between religiosity and an individual's risk aversion, Islamic banks may face less risk (credit risk) than conventional banks.

After controlling for various factors we find that Islamic banks have lower credit risk than conventional banks, and this is specifically the case for small highly leveraged banks, or operating in predominantly Muslim countries (those where Muslims exceed 90% of the population). In terms of insolvency risk, small Islamic banks also appear to exhibit greater stability than conventional banks; however, no significant difference between large Islamic and conventional banks is observed. Loan quality, (implicit) interest income and (implicit) interest

expense of Islamic banks are less sensitive to domestic interest rates compared to conventional counterparts; however, the sensitivity of Islamic banks' solvency to interest rates movements is not significantly different from that of their conventional counterparts. Finally, we find little evidence that Islamic banks charge rents to their customers for offering *Sharia* compliant financial products. The fact that Islamic banks do not appear to emulate the risk and stability characteristics of their conventional counterparts has implications for policymakers (in terms of whether there should be a different legislation for the two types of banks), regulators (should they be regulated differently?) and market participants (can traditional risk management tools be used to gauge and control these risks?).

Chapter 2. Non-interest Income and Bank Lending

This chapter investigates the impact of non-interest income activities on banks' lending in terms of quality, spread and loan structure. Agency problems and loss of focus associated with diversification into non-interest income activities may cause deterioration in loan quality. Alternatively, expanding the scope and scale of client relationships might improve the quality of banks' credit if banks are able to collect more soft information via multiple interactions by cross-selling non-traditional banking services. Banks with a wider scope of relationships are able to reach more potential borrowers (as well as depositors). This may result in different loan portfolio structures. Moreover, non-interest earnings may also influence banks' loan pricing strategy through possible cross-subsidization effects.

We examine the possible impact of seven non-interest income business lines that are likely to expand the scope of relationship with clients and provide banks with a larger funding base, on a bank's credit risk, net interest spread and loan composition.

This chapter takes a closer and deeper look inside the non-interest income black box; the extant literature mainly focuses on degree of co-movements between interest and non-interest income activities and examines how returns per unit of risk are affected as a result of the income diversity from the portfolio theory perspective. This chapter isolates the contribution of eleven non-interest income activities to banks' risk-adjusted returns, and attempts to draw the attention of policy-makers and researchers on the complex interaction between non-interest income and lending activities. For instance, our analysis of U.S. community banks with total assets above $100 million shows that an increase in the income share of fiduciary activities in total operating income lowers credit risk, especially before and after the global financial crisis of 2007-2008. It increases the weight of unsecured loans in total loans in the pre-crisis period. It also reduces the proportion of commercial and industrial loans in total loans during and after the recent crisis, while increasing the weight of loans to financial institutions (in total loans) in the post-crisis period. We also find that banks with a greater income share of fiduciary business in total operating income have, on average, a higher risk adjusted return before and after the crisis.

We find little evidence to support the view that there is cross-subsidization between traditional intermediation and non-interest income activities except for loan servicing in the post-crisis period where we observe that a higher income share of loan servicing is associated with a lower lending-deposit spreads. The results also show that loan servicing is negatively linked risk-adjusted return.

Finally, we investigate whether a pair-wise cost complementarity exists between lending (both secured and unsecured) and non-interest income activities that could explain their joint production. The results provide us with little evidence to support this hypothesis.

Chapter 3. Financial Development and Growth in a Dual Banking System

The third chapter examines whether the presence of commercial Islamic banks alongside their conventional counterparts can foster the development of the overall commercial banking sector and economic growth. We also explore the possible impact of operating in a dual banking system for conventional banks.

During the recent decades, Islamic banking has grown fast in many Muslim countries. As such, a dual financial system, where both Islamic and conventional banking are operated, has progressively emerged in such countries. Islamic finance is expected to offer *Sharia*-compatible financial products and services. This suggests a considerable potential for lessening financial exclusion and outreaching Muslims who refrain from using the conventional borrowing and lending or prefer Islamic banking to a conventional one.

Islamic banks may behave differently from their conventional counterparts in several ways: they are not authorized to get involved in speculative activities. They are supposed to act as the agent of investment account holders for allocating their savings to profitable projects. They might be more risk-averse and have stronger preference for investing in the real economy than conventional banks. Moreover, the coexistence of Islamic and conventional banking may increase the efficiency of the whole banking system.

The results show that the presence of Islamic banks increases bank deposits, especially in relatively low income countries or countries which suffer more from corruption or economic repression. The presence of more efficient Islamic banks is also found to improve the allocative efficiency of credits across private and Governmental sectors. For instance, an increase in efficiency of Islamic banks is associated with a lower allocation of credits to the Governmental sector in countries with relatively more corruption or economic repression and a higher credit allocation to the Governmental sector in countries with less corruption or more economic

freedom. The findings also indicate that a greater efficiency of Islamic banks is correlated with a lower lending-deposit spread in relatively low income countries, countries which suffer more from corruption, or those with comparatively lower Muslims share in population.

Our analysis of economic growth also shows that the relationship between Islamic banking and growth is dependent on the institutional environment of the countries under study. For instance, in countries with a relatively repressed economy, an increase in market share of Islamic banks is negatively linked to a growth in GDP per capita. In relatively low income countries, however, the efficiency rank of Islamic banks is positively associated with economic growth. Moreover, we observe that while in certain countries quantitative development of financial system matters, in other groups of countries qualitative financial development can more effectively stimulate economic growth.

Finally, we investigate the impact of Islamic banks' presence on the performance of conventional banks in terms of lending quality (credit risk), spread and cost inefficiency. We find that a greater market share of Islamic banks is associated with a lower credit risk and cost inefficiency, but a higher lending-deposit spreads of small conventional banks in certain countries. Overall, the results show that the presence Islamic banks alongside conventional banks can affect financial development, economic growth and the performance of conventional banks. The extent and modality of such effects considerably depend on the institutional environment within which a dual banking system operates.

Bibliography

Abdul-Majid, M., Saal, D.S. and Battisti, G. (2010) Efficiency in Islamic and conventional banking: An international comparison, *Journal of Productivity Analysis* **34**, 25-43.

Abedifar, P., Molyneux, P. and Tarazi, A. (2013) Risk in Islamic banking, *Review of Finance*, doi: 10.1093/rof/rfs041.

Accounting and Auditing Organization for the Islamic Financial Institutions "AAOIFI" (1999) Accounting, Auditing and Governance Standards for Islamic Financial Institutions, Bahrain.

Aggarwal, R.K. and Yousef, T. (2000) Islamic banks and investment financing, *Journal of Money, Credit and Banking* **32**, 93-120.

Ahmad, A. (1993) Contemporary practices of Islamic financing techniques, *Research Paper No. 20*, IRTI, Islamic Development Bank, Jeddah.

Aigner, D., Lovell, C. A. K. and Schmidt, P. (1977) Formulation and estimation of stochastic frontier production function models, *Journal of Econometrics* **6**, 21–37.

Akhigbe, A and Stevenson, B.A. (2010) Profit efficiency in U.S. BHCs: Effects of increasing non-traditional revenue sources, *The Quarterly Review of Economics and Finance* **50**, 132-140.

Alessandri, P. and Drehmann, M. (2010) An economic capital model integrating credit and interest rate risk in the banking book, *Journal of Banking & Finance* **34**, 730-742.

Al-Jarrah, I. and Molyneux, P. (2005) Efficiency in Arabian banking, in: M. Iqbal and R. Wilson (eds.), *Islamic Perspectives on Wealth Creation*, Edinburgh University Press, Edinburgh.

Altunbas, Y., Carbo, S., Gardener, E.P.M. and Molyneux, P. (2007) Examining the relationships between capital, risk and efficiency in European banking, *European Financial Management* **13**, 49-70.

Altunbas, Y., Evans, L. and Molyneux, P. (2001) Ownership and efficiency in banking, *Journal of Money, Credit and Banking* **33**, 926-954.

Anderson, T. and Hsiao, C. (1981) Estimation of dynamic models with error components, *Journal of the American Statistical Association* **76**(375), 598–606.

Ang, B. A. (2008) A survey of recent developments in the literature of finance and growth, *Journal of Economic Surveys* **22**, 536-576.

Angbazo, L. (1997) Commercial bank net interest margins, defaults risk, interest-rate risk, and off-balance sheet banking, *Journal of Banking & Finance* **21**, 55-87.

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

Bader, M. K. I., Mohamad, S., Ariff, M. and Hassan, T. (2008) Cost, revenue and profit efficiency of Islamic versus conventional banks: International evidence using Data Envelopment Analysis, *Islamic Economic Studies* **15**, 23-76.

Baele, L., De Jonghe, O. and Vennet, R. V. (2007) Does the stock market value bank diversification?, *Journal of Banking & Finance* **31**, 1999-2023.

Baele, L., Farooq, M. and Ongena, S. (2010) Of religion and redemption: Evidence from default on Islamic loans, CentER Discussion Paper Series No. 2010-136; European Banking Center Discussion Paper No. 2010-32. Available at SSRN: http://ssrn.com/abstract=1740452 or doi:10.2139/ssrn.1740452

Bank for International Settlements (2010) 80th Annual Report, June, Basel.

Bank Indonesia Report (2009) The lack of profit-and-loss sharing financing in Indonesia's Islamic banks: Revisited**,** Center of Education and Central Banking Studies, Bank Indonesia, Jakarta, Indonesia.

Barry, T.A, Lepetit, L. and Tarazi, A. (2011) Ownership structure and risk in publicly held and privately owned banks, *Journal of Banking & Finance* **35**, 1327-1340.

Bashir, A. (1999) Risk and profitability measures in Islamic banks: The case of two Sudanese banks, *Islamic Economic Studies* **6**, 1-24.

Battese, G. E., and Coelli, T. J. (1992) Frontier production functions, technical efficiency and panel data: With application to paddy farmers in India, *Journal of Productivity Analysis* **3**, 153–169.

Beck T., Demirgüç-Kunt, A. and Merrouche, O. (2013) Islamic vs. conventional banking: business model, efficiency and stability, *Journal of Banking & Finance* **37**, 433-447.

Beck, T. and Levine, R. (2004) Stock markets, banks, and growth: Panel evidence, *Journal of Banking & Finance* **28**, 423-442.

Beck, T., Demirgüç-Kunt, A. and Levine, R. (2007) Finance, Inequality and the Poor, *Journal of Economic Growth* **12**, 27-49.

Berg, T., Saunders, A. and Steffen, S. (2013) The total cost of corporate borrowing in the loan market: Don't forget the fees, *Working Paper*.

Berger, A. (1995) The relationship between capital and earnings in banking, *Journal of Money, Credit, and Banking* **27**, 432–456.

Berger, A. and Udell, G. (2004) The institutional memory hypothesis and the procyclicality of bank lending behaviour, *Journal of Financial Intermediation* **13**, 458–495.

Berger, A. N. (1999) The 'Big Picture' of relationship finance, in business access to capital and credit (J.L. Blanton, A. Williams and S.L. Rhine, Eds.), pp. 390-400, A Federal Reserve System Research Conference.

Berger, A., Hasan, I. and Zhou, M. (2009) Bank ownership and efficiency in China: What will happen in the world's largest nation?, *Journal of Banking & Finance* **33**, 113-130.

Berger, A.N. and DeYoung, R. (1997) Problem Loans and cost efficiency in commercial banks, *Journal of Banking & Finance* **21**, 849-870.

Berger, A.N. and Mester, L.J. (1997) Inside the black box: What explains differences in the efficiencies of financial institutions?, *Journal of Banking & Finance* **21**, 895-947.

Berger, A.N., Hasan, I. and Klapper, L.F. (2004) Further evidence on the link between finance and growth: An international analysis of community banking and economic performance, *Journal of Financial Services Research* **25**, 169-202.

Berndt, E. and Christensen, L. (1973) The translog function and the substitution of equipment, structures, and labor in U.S. manufacturing 1929-68, *Journal of Econometrics* **1**, 81-144.

Bonin, J.P., Hasan, I., Wachtel, P. (2005) Bank performance, efficiency and ownership in transition countries, *Journal of Banking & Finance* **29**, 31-53.

Boot, A.W.A. (2000) Relationship banking: What do we know?, *Journal of Financial Intermediation* **9**, 7-25.

Boot, A.W.A. (2003) Consolidation and strategic positioning in banking with implications for Europe, *Working Paper*.

Boot, A.W.A. and Schmeits, A. (2000) Market discipline and incentive problems in conglomerate firms with applications to banking, *Journal of Financial Intermediation* **9**, 240-273.

Borio, C. and Zhu, H. (2008) Capital regulation, risk-taking and monetary policy: A missing link in the transmission mechanism?, *Bank for International Settlements Working Paper No. 268*.

Boyd, J. H. and Runkle, D.E. (1993) Size and performance of banking firms, *Journal of Monetary Economics* **31**, 47–67.

Boyd, J.H. and Smith, B.D. (1998) The evolution of debt and equity markets in economic development, *Economic Theory* **12**, 519-560.

Brunnermeier, M., Dong, G. and Palia, D. (2011) Banks non-interest income and systemic risk. Working Paper, 2011.

Buffie, E.F. (1984) Financial repression, the new structuralists, and stabilization policy in semi-industrialized economies, *Journal of Development Economics* **14**, 305–322.

C.G.A.P. (2008) Islamic microfinance: An emerging market niche, No. 49, August.

Calomiris, C.W. and Kahn, C.M. (1991) The role of demandable debt in structuring optimal banking arrangements, *American Economic Review* **81**, 497-513.

Carbo, S. and Rodriguez, F. (2007) The determinants of bank margins in European banking, *Journal of Banking & Finance* **31**, 2043-2063.

Carling, K., Jacobson, T., Linde, J. and Roszbach, K. (2007) Corporate credit risk modeling and the macroeconomy, *Journal of Banking & Finance* **31**, 845-868.

Cebenoyan, S.A. and Strahan, P.E. (2004) Risk management, capital structure and lending at banks, *Journal of Banking & Finance* **28**, 19-43.

Chandavarkar, A. (1992) Of finance and development: neglected and unsettled questions, *World Development* **20**, 133–142.

Chong, B.S. and Liu, M.H. (2009) Islamic banking: Interest-free or interest-based?, *Journal of Pacific-Basin Finance* **17**, 125-144.

Čihák, M. and Hesse, H. (2010) Islamic banks and financial stability: An empirical analysis, *Journal of Financial Services Research* **38**, 95-113.

Čihák, M., Maechler, A., Schaeck, K. and Stolz, S. (2009) Who disciplines bank managers?, *IMF Working Paper No. WP/09/272*, Washington D.C., I.M.F.

Clair, R. (1992) Loan growth and loan quality: Some preliminary evidence from Texas banks, *Federal Reserve Bank of Dallas Economic Review*, 3rd quarter, 9–22.

Clark, J.A. (1988) Economies of scale and scope at depository financial institutions: A review of the literature, *Economic Review*, September/October 1988, 16-33.

Dar, H. A. and Presley, J. R. (2000) Lack of profit loss sharing in Islamic banking: Management and control imbalances, *International Journal of Islamic Financial Services* **2**, No.2.

De Jonghe, O (2010) Back to the basics in banking? A micro-analysis of banking system stability. *Journal of Financial Intermediation* **19**, 387-417.

Degryse, H. and Cayseele, P.V. (2000) Relationship lending within a bank-based system: Evidence from European small business data, *Journal of Financial Intermediation* **9**, 90-109.

Delis, M.D. and Kouretas, G.P. (2011) Interest rates and bank risk-taking, *Journal of Banking & Finance* **35**, 840-855.

Dell'Ariccia, G. and Marquez, R. (2006) Lending booms and lending standards, *The Journal of Finance* **61**, 2511–2546.

Demirguc-Kunt, A. and Huizinga, H. (2010) Bank activity and funding strategies: the impact on risk and returns. *Journal of Financial Economics* **98**, 626-650

DeYoung R. and Roland, K. P. (2001) Product mix and earnings volatility at commercial banks: Evidence from a degree of total leverage model, *Journal of Financial Intermediation* **10**, 54-84.

DeYoung, R. and Rice, T. (2004) Noninterest income and financial performance at U.S. commercial banks, *The Financial Review* **39**, 101-127.

DeYoung, R. And Torna, G. (2013) Nontraditional banking activities and bank failures during the financial crisis, *Journal of Financial Intermediation* **22**, 397-421.

DeYoung, R., Hunter, W.C. and Udell, G.F. (2004) The past, present, and probable future for community banks, *Journal of Financial Services Research* **25**, 85-133.

Diamond, D. (1984) Financial intermediation and delegated monitoring, *Review of Economic Studies* **51**, 393–414.

Diamond, D.W. and Rajan, R.G. (2000) A theory of bank capital, *The Journal of Finance* **55**, 2431-2465.

Diamond, D.W. and Rajan, R.G. (2001) Liquidity risk, liquidity creation and financial fragility: A theory of banking, *Journal of Political Economy* **109**, 287-327.

Dollar, D. and Kraay, A. (2002) Growth is good for the poor, *Journal of Economic Growth* **7**, 195-225.

Drehmann, M., Sorensen, S. and Stringa, M. (2010) The integrated impact of credit and interest rate risk on banks: A dynamic framework and stress testing application, *Journal of Banking & Finance* **34**, 735-751.

El-Gamal, M., and Inanoglu, H. (2002) Efficiencies and unobserved heterogeneity in Turkish banking: 1990-2000, unpublished working paper, Rice University, Department of Economics.

Elyasiani, E. and Wang, Y. (2009) Non-interest income diversification and information asymmetry of bank holding companies, *Working Paper*.

Ernst & Young (2012) World Islamic Banking Competitiveness Report 2013, December.

Errico, L. and Farrahbaksh, M. (1998) Islamic banking: Issues in prudential regulation and supervision, *IMF Working Paper No. 98/30*.

Fasih, F. (2012) Inclusive growth in India through Islamic banking, *Social and Behavioral Sciences* **37**, 97-110.

Federal Deposit Insurance Corporation (2012) Community banking study, December**.**

Financial Times (2011) *Islamic Finance Special Report*, 12 May.

Fiordelisi, F., Marques-Ibanez, D. and Molyneux, P. (2011) Efficiency and risk in European banking, *Journal of Banking & Finance* **35**, 1315-1326.

Foos, D., Norden, L. and Weber, M. (2010) Loan Growth and riskiness of banks, *Journal of Banking & Finance* **34**, 2929-2940.

Forssbæck, J. (2011) Ownership structure, market discipline, and banks' risk-taking incentives under deposit insurance, *Journal of Banking & Finance* **35**, 2666-2678.

Frankfurt School of Finance and Management (Bankakademie International), (2006) Access to Finance Study in Algeria, Final Report. Frankfurt: Frankfurt School of Finance and Management, July.

Fry, M.J. (1988) Money, Interest, and Banking in Economic Development, Baltimore, MD, and London: Johns Hopkins University Press.

Goddard, J.A, Molyneux, P, and Wilson J.O.S. (2004) Dynamics of growth and profitability in banking, *Journal of Money, Credit and Banking* **36**, 1069-1090.

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

Goyeau, D. and Tarazi, A. (1992) Evaluation du risque de de´faillance bancaire en Europe, *Revue d'Economie Politique* **102**, 249–280.

Greenwood, J. and Jovanovic, B. (1990) Financial development, growth, and the distribution of income, *Journal of Political Economy* **98**, 1076-1107.

Gurley, J.G. and Shaw, E.S. (1955) Financial aspects of economic development, *American Economic Review* **45**, 515-538.

Hansen, L.P. (1982) Large Sample properties of generalized method of moments estimators, *Econometrica* **50**, 1029-1054.

Harris, M. and Raviv, A. (1990) Capital structure and the informational role of debt, *Journal of Finance* **45**, 321-349.

Hassan, M. and Dridi, J. (2010) The effects of the global crisis on Islamic and conventional banks: A comparative study, *IMF Working Paper No. 10/201*, Washington D.C., I.M.F.

Hassan, M.K. and Bashir, A. (2003) Determinants of Islamic banking profitability, paper presented at the *ERF Tenth Annual Conference*, Marrakesh, Morocco, 16-18 December.

Hellmann, T., Lindsey, L. and Puri, M. (2008) Building relationships early: banks in venture capital, *The Review of Financial Studies* **21**, 513-541.

Hesse, H. and Čihák, M. (2007) Cooperative banks and financial stability, *IMF Working Paper No. 07/02*, Washington D.C., I.M.F.

Hilary, G. and Hui, K. W. (2009) Does religion matter in corporate decision making in America?, *Journal of Financial Economics* **93**, 455-473.

Holy Hebrew Bible, Exodus, 22: 24, Leviticus 25:36-37, Deuteronomy, 23:20-21, (1917) *Jewish Publication Society translations*.

Holy Quran, Chapter 1, Verses 275-279.

Honohan, P. (2008) Cross-country variation in household access to financial services, *Journal of Banking & Finance* **32**, 2493-2500.

Hughes, J.P. and Mester, L.J. (2013) Who said large banks don't experience scale economies? Evidence from a risk-return-driven cost function, *Journal of Financial Intermediation*, http://dx.doi.org/10.1016/j.jfi.2013.06.004.

Hughes, J.P., Mester, L. and Moon, C. (2001) Are scale economies in banking elusive or illusive: Evidence obtained by incorporating capital structure and risk-taking into models of bank production, *Journal of Banking & Finance* **25**, 2169–2208.

Iannota, G., Giacomo, N. and Sironi, A. (2007) Ownership structure, risk and performance in the European banking industry, *Journal of Banking & Finance* **31**, 2127-2149.

Imam, P. and Kpodar, K. (2010) Islamic banking: How has it diffused?, *IMF Working Paper No. 10/195*, Washington D.C., I.M.F.

Independent Commission on Banking (2011) "Vickers Report" The, Final Report, Recommendations, September, HMSO: London.

International Monetary Fund (2011) Making banks safer: Can Volcker and Vickers do it?, IMF Working Paper, November.

Iqbal, M., Ausaf, A. and Khan, T. (1998) Challenges facing Islamic banking, *Occasional Paper No. 1*, IRTI, Islamic Development Bank, Jeddah.

Iqbal, Z. and Mirakhor, A. (2007) An introduction to Islamic finance: Theory and practice, Wiley, London, ISBN 0470821884.

Jacques, K. and Nigro, P. (1997) Risk-based capital, portfolio risk, and bank capital: A simultaneous equations approach, *Journal of Economics and Business* **49**, 533–47.

Jarrow, R.A. and Turnbull, S.M. (2000) The intersection of market and credit risk, *Journal of Banking & Finance* **24**, 271-299.

Jayaratne, J. and Strahan, P.E. (1996) The finance-growth nexus: Evidence from bank branch deregulation, *Quarterly Journal of Economics* **111**, 639-670.

Jeanne, O. (2000) Debt maturity and the global financial architecture, *Discussion Paper No. 2520*, Centre for Economic Policy Research, London.

Jensen, M. C. (1986) Agency costs of free cash flow, corporate finance and takeovers, *American Economic Review* **76**, 323–29.

Kahf, M. and Khan, T. (1992) Principles of Islamic financing, *Research Paper No. 16*, IRTI, Islamic Development Bank, Jeddah.

Kane, E. (2010) Redefining and containing systemic risk, *Atlantic Economic Journal* **38**, 251–264.

Khan, F. (1991) Comparative economics of some Islamic financing techniques, *Research Paper No. 12*, IRTI, Islamic Development Bank, Jeddah.

Khan, T. and Ahmed, H. (2001) Risk management: An analysis of issues in Islamic financial industry, *Occasional Paper No. 5*, IRTI, Islamic Development Bank, Jeddah.

King, R. and Levine, R. (1993) Finance and Growth: Schumpeter might be right, *Quarterly Journal of Economics* **108**, 717-737.

Koetter, M. and Wedow, M. (2010) Finance and growth in a bank-based economy: Is it quantity or quality that matters?, *Journal of International Money and Finance* **29**, 1529-1545.

Konishi, M. and Yasuda, Y. (2004) Factors affecting bank risk taking: Evidence from Japan, *Journal of Banking & Finance* **28**, 215-232.

Kwan, S. and Eisenbeis, R. (1997) Bank risk, capitalization and operating efficiency, *Journal of Financial Services Research* **12**, 117-31.

La Porta, R., Lopez-de-Silanes, F. and Shleifer, A. (2002) Government ownership of banks, *The Journal of Finance* **57**, 265-301.

Laeven, L. and Levine, R. (2007) Is there a diversification discount in financial conglomerates?, *Journal of Financial Economics* **85**, 331-367.

Laeven, L. and Levine, R. (2009) Bank governance, regulation and risk taking, *Journal of Financial Economics* **93**, 259-275.

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

Lepetit, L., Nys, E., Rous, P. and Tarazi, A. (2008b) The expansion of services in European banking: Implications for loan pricing and interest margins, *Journal of Banking & Finance* **32**, 2325-2335.

Levine, R., Loayza, N. and Beck, T. (2000) Financial intermediation and growth: Causality and causes, *Journal of Monetary Economics* **2000**, 31-77.

Liikanen, E. (2012) *High-level Expert Group on Reforming the Structure of the EU Banking Sector*, Brussels, 2 October 2012.

Loutskina, E. (2011) The role of securitization in bank liquidity and funding management, Journal of Financial Economics **100**, 663-684.

Maddaloni, A. and Peydró, J. (2011) Bank risk-taking, securitization, supervision, and low interest rates: Evidence from the Euro area and U.S. lending standards, *Review of Financial Studies* **24**, 2121-65.

Majid, A. M, Nor, N.G. and Said, F.F. (2003) Efficiency of Islamic banks in Malaysia, Paper presented to the Fifth International Conference on Islamic Economics and Banking, Bahrain, October, 7-9, 2003.

Maudos, J. and De Guevara, J.F. (2004) Factors explaining the interest margin in the banking sectors of the European Union, *Journal of Banking & Finance* **28**, 2259-2281.

McShane, R.W. and Sharpe, I.G. (1985) A time series/cross section analysis of the determinants of Australian trading bank loan/deposit interest margins: 1962–1981, *Journal of Banking & Finance* **9**, 115–136.

Merton, R.C. and Bodie, Z. (2004) The design of financial systems: towards a synthesis of function and structure, *Journal of Investment Management* **3**, 1-23.

Miller, A. and Hoffmann, J. (1995) Risk and religion: An explanation of gender differences in religiosity, *Journal for the Scientific Study of Religion* **34**, 63–75.

Mills, P. S. and Presley, J.R. (1999) Islamic finance: Theory and practice, *Macmillan*, London.

Mohamad, S., Hassan, T. and Bader, M.K.I. (2008) Efficiency of conventional versus Islamic banks: International evidence using the stochastic frontier approach (SFA), *Journal of Islamic Economics, Banking and Finance* **4**, 107-130.

Moshirian, F., Sahgal, S. and Zhang, B. (2011) Non-interest income and systemic risk: The role of concentration, working paper.

Obaidullah, M. (2005) *Islamic financial services*, Islamic Economics Research Center, King Abdulaziz University, Jeddah, Saudi Arabia.

Ogura, Y. (2006) Learning from a rival bank and lending boom, *Journal of Financial Intermediation* **15**, 535–555.

Ongena, S. and Şendeniz-Yüncü, İ. (2011) Which firms engage small, foreign, or state banks? And who goes Islamic? Evidence from Turkey, *Journal of Banking & Finance* **35**, 3213-3224.

Osoba, B. (2003) Risk preferences and the practice of religion: Evidence from panel data, Unpublished Working Paper, West Virginia University.

Petersen, M.A. and Rajan, R.G. (1995) The effect of credit market competition on lending relationships, *Quarterly Journal of Economics* **110**, 406–443.

Pew Research Center (2009) Mapping the global Muslim population: a report on the size and distribution of the World's Muslim population, *The Pew Forum on Religion & Public Life*, October 2009.

Puri, M., Rochell, J. and Steffen, S. (2011) On the importance of prior relationships in bank loans to retail customers, *ECB Working Paper No. 1395*.

Rajan, R.G. (2006) Has finance made the world riskier?, *European Financial Management* **12**, 499-533.

Rashid Reza, M. (1947) Tafsir Al-Manar, *Dar al-Manar*, Cairo, Egypt.

Rashwan, M. H. (2010) A comparison between Islamic and traditional banks: Pre and post the 2008 financial crisis, Available at SSRN: http://ssrn.com/abstract=1724451.

Rewilak, J. (2012) Finance is good for the poor but it depends where you live, *Journal of Banking & Finance* **37**, 1451-1459.

Rime, B. (2001) Capital requirements and bank behaviour: Empirical evidence for Switzerland, *Journal of Banking & Finance* **25**, 789–805.

Rioja, F. and Valev, N. (2004) Does one size fit all?: a reexamination of the finance and growth relationship, *Journal of Development Economics* **74**, 429-447.

Roodman, D. (2006) How to do xtabond2: An introduction to difference and system GMM in Stata, *Center for Global Development*, working paper number 103, December 2006.

Roodman, D. (2009) How to do xtabond2: An introduction to difference and system GMM in Stata, *Stata Journal* **9**, 86-136.

Rousseau, P.L. and Wachtel, P. (2002) Inflation thresholds and the finance-growth nexus, *Journal of International Money and Finance* **21**, 777-793.

Samad, A. (1999) Comparative efficiency of the Islamic bank vis-à-vis conventional banks in Malaysia, *IIUM Journal of Economics and Management* **7**, 1-25.

Sargan, J.D. (1958) The estimation of economic relationships using instrumental variables, *Econometrica* 26, 393-415.

Shaltoot, M. (1975) Al-Fatawi, *Dar al-Shoroogh*, Beirut, Lebanon.

Shiers A.F. (2002) Branch banking, economic diversity and bank risk, *The Quarterly Review of Economics and Finance* **42**, 587-598.

Shrieves, R.E. and Dahl, D. (1992) The relationship between risk and capital in commercial banks, *Journal of Banking & Finance* **16**, 439–57.

Sir Harry Page 'In Restraint of Usury: The Lending of Money at Interest' Chartered Institute for Public Finances and Accounts (CIPFA), London, 1985.

Stiroh, K. (2004) Diversification in banking: Is non-interest income the answer?, *Journal of Money, Credit and Banking* **36**, 853–882.

Stiroh, K. (2006) A portfolio view of banking with interest and noninterest activities, *Journal of Money, Credit and Banking* **38**, 1351-1361.

Stiroh, K. (2010) Diversification in banking, Chapter 6 in: A. Berger, P. Molyneux and J.O.S. Wilson (eds.) *Oxford Handbook of Banking,* Oxford: Oxford University Press, pp. 146-170.

Stiroh, K. and Rumble, A. (2006) The dark side of diversification: The case of US financial holding companies, *Journal of Banking & Finance* **30**, 2131-2161.

Sundararajan, V. and Errico, L. (2002) Islamic financial institutions and products in the global financial system: Key issues in risk management and challenges ahead, *IMF Working Paper No. WP/02/192*, Washington D.C., I.M.F.

Taboada, A.G. (2011) The impact of changes in bank ownership structure on the allocation of capital: International evidence, *Journal of Banking & Finance* **35**, 2528-2543.

Taylor, L. (1983) Structuralist Macroeconomics: Applicable Models for the Third World, New York: Basic Books.

The Banker (2013) Islamic finance in 2013: Beyond the growth, March.

The World Bank (2008) Dollar a day revisited, *Policy Research Working Paper* **4620**, August.

The World Factbook (2009) Washington, DC: Central Intelligence Agency, 2009.

TheCityUK (2011) *Islamic Finance*, Financial Market Series, May, London:TheCityUK.

Townsend, R.M. (1979) Optimal contracts and competitive markets with costly state verification, *Journal of Economic Theory* **21**, 265-293.

Valverde, S.C., Humphrey, D.B. and Fernandez, F. (2003) Deregulation, bank competition and regional growth. *Regional Studies* **37**, 227–23.

van Wijnbergen, S. (1982) Stagflationary effects of monetary stabilization policies: a quantitative analysis of South Korea, *Journal of Development Economics* **10**, 133–169.

van Wijnbergen, S. (1983) Interest rate management in LDCs. *Journal of Monetary Economics* **12**, 433–452.

Wagner, D. (2009) AP IMPACT: Government mortgage partners sued for abuses, *Associated Press*, August 06, 2009.

Weill, L. (2011) Do Islamic banks have greater market power?, *Comparative Economic Studies* **53**, 291-306.

Windmeijer, F. (2005) A finite sample correction for the variance of linear efficient two-step GMM estimators, *Journal of Econometrics* **126**, 25-51.

Wong, K. (1997) On the determinants of bank interest margins under credit and interest rate risks, *Journal of Banking & Finance* **21**, 251–271.

Yudistra. D. (2004) Efficiency in Islamic banking: An empirical analysis of eighteen banks, *Islamic Economic Studies* **12**, 1-19.

Abstract

This dissertation comprises three chapters. The first chapter explores risk and stability features of Islamic banking using a sample of 553 banks from 24 countries between 1999 and 2009. The results show that small Islamic banks have lower credit and insolvency risks than their conventional Counterparts. Little evidence is found to support that Islamic banks charge rents to their customers for offering *Sharia* compliant financial products. Moreover, the loan quality of Islamic banks is less responsive to domestic interest rates compared to conventional banks. In the second chapter, using quarterly data of 7,578 U.S. community banks between 2003 and 2010, the impact of seven non-interest income businesses on bank lending is studied. The findings show that for banks with total assets above $100 million non-interest income activities influence credit risk and loan portfolio compositions. Banks which emphasize fiduciary and life insurance businesses appear to have a lower credit risk. Moreover, a greater reliance on loan servicing is associated with lower lending-deposit spreads. The results provide little evidence to support whether cost complementarity can explain the joint production of non-interest income and lending. The third chapter analyses whether the coexistence of Islamic banks alongside conventional banks has any significant influence on the size and quality of the banking system and economic growth. The possible impact of Islamic banking presence on the performance of conventional banks is also examined. 22 Muslim countries with a dual banking system during the 1999-2009 period are studied. The results show a positive relationship between the market share of Islamic banks and savings mobilization. The operation of more efficient Islamic banks improves credit allocation across private and Governmental sectors and reduces lending-deposit spreads. Moreover, a larger market share of Islamic banking is associated with lower credit risk and cost inefficiency, but higher lending-deposit spreads of small conventional banks in certain countries.

Keywords: Islamic Banking, Bank Risk, Bank Diversification, Banking System Structure & Financial Development.

Résumé

Cette thèse est composée de trois chapitres. Le premier chapitre explore les problématiques de risque et de stabilité de l'activité des banque Islamiques en utilisant un échantillon de 553 banques réparties dans 24 pays entre 1999 et 2009. Les résultats montrent que les banques islamiques de petite taille ont des risques de crédits et d'insolvabilité plus faibles que leurs homologues dans la banque traditionnelle. Il existe en revanche peu d'éléments pour soutenir l'existence de charges imposées par les banques islamiques en contrepartie de leur offre de produits compatibles avec la *Sharia*. En outre, l'étude montre que la qualité des crédits est moins sensible aux variations des taux d'intérêts domestiques pour les banques islamiques que pour les banques traditionnelles. Le second chapitre utilise des données collectées trimestriellement pour 7,578 banques Américaines entre 2003 et 2010 dans le but d'étudier l'impact de sept activités distinctes, sources de revenus hors intérêts, sur l'activité de crédit bancaire. Les résultats montrent que les activités sources de revenus hors intérêts influencent à la fois la composition du portefeuille de prêts et le risque de crédits des banques disposant d'un total de l'actif dépassant les 100 millions de dollar. Les banques qui privilégient les activités d'assurances vies et fiduciaires présentent des niveaux de risques de crédits plus faibles. De plus, une dépendance accrue à l'activité d'octroi de crédit entraîne des marges réduites sur l'activité de crédit. Il est cependant difficile de se prononcer sur une éventuelle complémentarité des coûts qui expliquerait la double tenue d'activités hors d'intérêts et d'activités de crédits. Enfin, le troisième chapitre de la thèse analyse la coexistence des banques Islamiques aux côtés des banques traditionnelles et tout particulièrement son influence sur la croissance économique et sur la qualité et la taille du système bancaire. Ce chapitre s'intéresse aussi à l'éventuel impact de la présence des banques Islamiques sur les performances des banques traditionnelles. L'étude porte sur 22 pays musulmans présentant les deux types de banque au sein de leurs systèmes bancaires sur la période 1999- 2009. Les résultats font apparaître une relation positive entre la part de marché des banques Islamiques et la mobilisation de l'épargne. La présence des banques Islamiques les plus efficientes améliore l'allocation de crédits entre les secteurs privés et publics tout en réduisant les marges d'intérêt sur les crédits. En outre, les résultats font état d'un risque de crédit et d'inefficiences-coûts plus faibles lorsque la part de marché des banques Islamique est plus élevée, au prix en revanche de marges de crédits plus élevées appliquées par les banques traditionnelles de taille modeste dans certains pays de l'échantillon.

Mots clés: Banque Islamique, Risque bancaire, Diversification bancaire, Structure du système bancaire et développement financier.