Non-Interest Income Activities and Bank Lending

Pejman Abedifar*, Philip Molyneux†ᶜ, Amine Tarazi§

*School of Management, University of St Andrews, The Gateway, North Haugh, St Andrews, Fife, KY16 9RJ, UK
† Bangor Business School, Bangor University, Wales, LL57 2DG, UK
§ Université de Limoges, LAPE, 5 rue Félix Eboué, 87031 Limoges, France

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Abstract. This paper investigates the impact of non-interest income businesses on bank lending. Using quarterly data on 8,287 U.S. commercial banks over 2003-2010, we find that the non-interest income activities of banks with total assets ranging between $100 million and $1 billion influence credit risk. In particular, banks that have higher income from fiduciary activities have lower credit risk. The impact is more pronounced during the post-crisis period. Our findings suggest that fiduciary activities induce managers to behave more prudently in lending because such activities are found to increase banks' franchise value. Moreover, we find little evidence of income or price cross-subsidization between traditional intermediation and non-interest income activities, except for fiduciary activities (after the crisis) and also for the loan servicing income of systemically important banks. Furthermore, we find that micro banks (banks with total assets below $100 million) suffer from diseconomies in joint production of non-interest income activities and lending.

ᶜ Corresponding Author. Tel: +441248382170
E-mail addresses: pa31@st-andrews.ac.uk, p.molyneux@bangor.ac.uk, amine.tarazi@unilim.fr.

1. Introduction

Existing theories have conflicting predictions as to the influence on restricting bank activities. Engaging in different activities may exacerbate conflicts of interest (John et al., 1994, and Saunders, 1985) and moral hazard problems (Boyd et al., 1998). Moreover it may make banks too complex to be monitored and too big to discipline (Barth, et al., 2004). Alternatively, fewer regulatory restrictions permit banks to benefit from informational advantages, exploit economies of scope and create more stable revenues (Claessens and Klingebiel, 2001). The extant empirical literature[1] has substantially focused on diversification gains and bank instability relating to deregulation; as a result, post-crisis regulatory reforms in the US and Europe (Dodd Frank Act, 2010; Liikanen Report, 2012 and the Independent Commission on Banking – Vickers Report, 2011) recommend restrictions on various banks' non-interest income-based activities (International Monetary Fund, 2011).

In this paper, we attempt to examine the potential consequences for lending of engaging in a broad range of activities, an area which has attracted little attention in academia which is somewhat surprising. Bank lending can benefit from informational and cost synergies associated with diverse activities. Moreover, fewer regulatory restrictions may increase banks charter value and thereby encourage managers to behave more prudently (Barth, et al., 2004). Alternatively, getting into different activities may lead to agency problems and loss of focus. Bank lending might also be affected by subsidization across lending and fee based businesses. .

Theories of financial intermediation stress that banks can obtain inside information by developing close relationships with clients over time, and thereby mitigate asymmetric information problems (Berger, 1999; Boot, 2000). The existing empirical literature documents the benefits of relationship banking. Petersen and Rajan (1994) and Berger and Udell (1995)

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[1] DeYoung and Roland, 2001; DeYoung and Rice, 2004; Stiroh, 2004; Stiroh and Rumble, 2006; Stiroh, 2006; Lepetit et al., 2008a; De Jonghe, 2010; Demirguc-Kunt and Huizinga, 2010; Moshirian et al., 2011; Brunnermeier et al., 2011; and DeYoung and Torna, 2013

show that borrowers with longer bank relationship enjoy lower collateral requirements and more available credit. 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. 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 signalling their quality resulting in lower loan rates. Bharath et al. (2007) document the benefits of bank-borrower relationship from the perspective of the bank. They claim that strong previous lending relationships increase the probability of attracting new loan and investment banking businesses from borrowers in the future.

Boot (2000) emphasizes that private customer-specific information is obtained through multiple interactions with the same customer over time, often in the form of providing various financial services. The method of collecting the information and its nature change when banks engage in more business lines. Banks can obtain the information through more channels and have the opportunity to use them in more interactions. As a consequence the traditional lending-borrowing relationship is transformed into a broader relationship.

Financial institutions increasingly sell products that crucially depend on their reputation. The marketability of many financial products, such as contingent liabilities depends primarily on the reputation of financial service providers and their ability to honour such claims (Boot, 2003). Expansion of scope and scale allows financial institutions to make more use of this reputational capital (Boot et al., 1993).

Boot (2003) argues that increasing diversity in saving products encourages financial institutions to combine and offer substitutes jointly in one organization and through the same channels to reduce the risk arising from alternative choices thereby augmenting scope

economies. Joint production and distribution of several relatively substitutable products such as life insurance, annuity sales and fiduciary services can be also explained by synergies and economies of scale in the provision of asset management services.

On the basis of the extant theories and literature we can articulate three arguments in support of the hypothesis that broadening bank businesses can improve loan quality. First, through activity diversification banks can gather more private information on client quality as well as access a wider array of potential borrowers. Second, information, relationships and reputation obtained/built-up through various businesses can increase banks' franchise value and hence increase the potential indirect costs of financial distress, leading to more prudent behavior in lending (Marcus, 1984; Keeley, 1990; Demsetz et al., 1996 and Gonzalez, 2005 show the negative relationship between banks' charter value and risk-taking). Finally, the benefits arising from cost synergies may also enhance bank's lending positions.

There are four countervailing debates against the hypothesis. First, banks may adopt loss-leading lending policies to augment the sale of other financial products. Carbo and Rodriguez (2007) show that income from non-traditional activities influence net interest margins through possible cross-subsidization effects and Lepetit et al. (2008b) also find that banks may charge lower rates on loans (under-pricing credit risk) if they expect to obtain additional fees from borrowers. Such behavior could, therefore, 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.

Second, a greater reliance on non-interest activities may increase credit risk due to agency problem. Several studies show that agency cost stemming from exacerbated information asymmetries outweigh the benefits of activity diversification (Laeven and Levine,

2007; Elyasiani and Wang, 2009; Akhigbe and Stevenson 2010). Third, banks expanding into non-interest income activities may lose their focus on lending. Lastly, lower credit exposure may encourage managers to be less conservative in their loan-granting activities.

In this paper, we investigate the impact on lending of banks' diversification into six major business lines[2] which we identify as playing an important role among a broader array of non-interest income items. They range from activities such as fiduciary where clients entrusts funds for asset management by the banks, to loan servicing which is directly attached to lending. Generally, 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 customers. Moreover, they are also likely to expand the scope of relationships with clients beyond merely lending-deposit activities, providing more soft information, financial resources and also enhancing bank franchise values. Alternatively, they may cause agency problems, loss of focus or risk mispricing. We examine the influence of these activities on banks' lending in terms of loan quality and interest spread. We also investigate the role of bank charter/franchise value as well as the possible existence of cost complementarity or diseconomies of joint production between non-interest income activities and lending.

We use quarterly data on 8,287 U.S. commercial banks and our data span from 2003 to 2010 covering the period before and after the 2007-2008 financial crises. Since the U.S. banking system is dominated by small banks, we also study banks with less than $100 million in total assets (3,116 *'micro'* commercial banks) separately from the rest of our sample.

Overall, we do not find any significant evidence in favour of an adverse effect of non-interest income activities on bank lending. Our credit risk analysis for commercial banks with total assets between $100 million and $1 billion even indicates that an increase in income from fiduciary activities lowers credit risk. In other words, banks that manage client

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[2] Fiduciary, life insurance and annuity sales, other insurance services, loan servicing, loans sale and service charges on deposit accounts.

investments (asset management) have lower credit risk. The impact is more pronounced during the post-crisis period and this finding is robust across different specifications, credit risk proxies and estimation techniques. Further investigation also shows a positive association between fiduciary income and bank's franchise value. The results can be one way of explaining the positive relationship between fiduciary and risk adjusted return shown by Stiroh (2004). We do not find significant evidence to support the conjecture of cross-subsidization between traditional intermediation and non-interest income activities except for some evidence on fiduciary activities of larger banks after the crisis and also from the loan servicing of systemically important banks, in these cases higher income shares are associated with lower lending-deposit spreads. This is particularly important, because previous studies (Carbo and Rodriguez, 2007 and Lepetit et al., 2008b) typically find more widespread evidence of cross-subsidization effects.

Our analysis of micro commercial banks (those with assets under $100 million) provides us with little evidence to support any significant link between non-interest income activities and credit risk, and price cross-subsidization[3]. Finally, we investigate for possible pair-wise cost complementarity or alternatively diseconomy of joint production between lending (both secured and unsecured) and non-interest income activities. The analysis shows that micro commercial banks suffer from diseconomy of joint production, whereas non-micro commercial banks neither suffer from diseconomy of joint production nor benefit from cost complementarity (non-jointness).

The remainder of the paper 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.

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[3] Non-interest income activities have too small weight in total operating income of these banks to affect their lending.

2. Econometric Specification and Methodology

Our objective is to investigate the impact of non-interest income activities on credit risk and also interest spreads to seek any evidence on the existence of cross-subsidization between interest income and non-interest income business. For this purpose, we estimate the following *dynamic* panel models based on Berger and DeYoung (1997) and Carbo and Rodriguez (2007). The variables we consider are the determinants of credit risk and lending-deposit spread highlighted in the literature (McShane and Sharpe, 1985; Clair, 1992; Angbazo, 1997; Kwan and Eisenbeis, 1997; Maudos and De Guevara, 2004; Dell'Ariccia and Marquez, 2006; Ogura, 2006; Lepetit et al., 2008b; Foos, et al., 2010):

$$
\begin{aligned}
\text{Credit\_Risk}_{i,t} = {} & \alpha_0 + \alpha_1 \times \text{Credit\_Risk}_{i,t-1} + \sum_{k=1}^{6} \alpha_{2,k} \times \text{Non-interest\_Income\_Activities}_{k,i,t} + \\
& \alpha_3 \times \text{Capital}_{i,t} + \alpha_4 \times \text{Inefficiency}_{i,t} + \alpha_5 \times \text{Risk\_Weighted\_Assets}_{i,t} + \\
& \alpha_6 \times \text{Loan\_Commitment}_{i,t-1} + \alpha_7 \times \text{Loan\_Growth}_{i,t-1} + \\
& \alpha_8 \times \text{Size}_{i,t-1} + \alpha_9 \times \text{Log(Age)}_{i,t-1} + \\
& \alpha_{10} \times \text{HHI}_{j,i} + \alpha_{11} \times \text{Home\_Price\_Growth}_{j,t} + \alpha_{12} \times \text{Income\_Growth}_{j,t-1} + \\
& \sum_{y=1}^{7} \alpha_{13,y} \times \text{Year\_Dummies}_{k} + \varepsilon_{i,t}
\end{aligned} \tag{1}
$$

$$
\begin{aligned}
\text{Spread}_{i,t} = {} & \beta_0 + \beta_1 \times \text{Spread}_{i,t-1} + \sum_{k=1}^{6} \beta_{2,k} \times \text{Non-interest\_Income\_Activities}_{k,i,t} + \\
& \beta_3 \times \text{Capital}_{i,t} + \beta_4 \times \text{Infficiency}_{i,t} + \\
& \beta_5 \times \text{Credit\_Risk}_{i,t} + \beta_6 \times \text{Liquidity\_Risk}_{i,t} + \beta_7 \times \text{Interest\_Rate\_Risk}_{i,t} + \\
& \beta_8 \times \text{Core\_Deposit}_{i,t} + \beta_9 \times \text{Loan\_Commitment}_{i,t} + \beta_{10} \times \text{Wage}_{i,t} + \\
& \beta_{11} \times \text{Size}_{i,t} + \beta_{12} \times \text{Log(Age)}_{i,t} + \\
& \beta_{13} \times \text{HHI}_{j,t} + \beta_{14} \times \text{Home\_Price\_Growth}_{j,t} + \beta_{15} \times \text{Income\_Growth}_{j,t} + \\
& \sum_{y=1}^{7} \beta_{16,y} \times \text{Year\_Dummies}_{y} + \eta_{i,t}
\end{aligned} \tag{2}
$$

where individual banks, time dimension and U.S. states in which they operate are represented by i, t and j subscripts, respectively. Variation in credit risk (*Credit Risk*) and lending-borrowing spread (*Spread*) are modelled in Equations (1) and (2) as a function of our variables of interest, namely, income shares from various non-interest income activities including fiduciary activities, life insurance and annuities, other insurance services and loan servicing. These are activities that are expected to increase the scope of banking operations and extend the relationship with borrowers. Moreover, we also take into account non-interest income from loan sales and also service charges on deposit accounts. The former represents

how active banks are in their loan portfolio management and the latter how actively clients do banking (the scale of relationship) and/or banks' market power. Both models also include a range of bank-level, U.S. state-level and time control variables.

We use a dynamic panel setting for our study as suggested by Carbo and Rodriguez, 2007 and Berger and DeYoung, 1997. This allows us to address the persistence in bank risk-taking which is also pointed out by previous literature (Delis and Kouretas, 2011, among others). We estimate the models using the fixed effect technique, similar to Loutskina (2011)[4].

2.1. DEPENDENT VARIABLES

In model (1) we use the ratio of non-performing loans to gross loans (*Non-performing Loans*) as a 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. As a robustness check, we consider the ratio of loan loss reserves to gross loans (*Loan Loss Reserve)* and the ratio of loan loss provisions to average gross loans *(Loan Loss Provision).* The former represents managers' appraisal of the loan portfolio quality. It accounts for both non-performing and performing loans. The latter is a flow proxy for loan quality as it shows the quarterly adjustment of loan loss reserves and loans write-off. We also use the more generic *Credit Risk* proxy, namely the ratio of risk weighted assets to total assets (*Risk Weighted Assets*) which is considered by the Basel Accord to measure the riskiness of banks' assets and it also accounts for off balance sheet items (Cordell and King, 1995; Jones and King, 1995 and Berger and DeYoung, 1997). These proxies are widely used in the literature as accounting-based credit

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[4] 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 a sample with less than 15 time periods, whereas in this study we have 32 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, a 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.

risk indicators (for instance Kwan and Eisenbeis, 1997; Gonzalez, 2005; Carbo and Rodriguez, 2007; Delis and Kouretas, 2011; Fiordelisi, et al., 2011).

For our *Spread* model (2) we use the lending-borrowing spread otherwise known as the net interest spread and 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).

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 six major non-interest income business lines that may have an impact on customer credit relationships and banks' lending[5].

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

   Clients using fiduciary services have entrusted assets to the bank for management or safekeeping, and hence are expected to be relatively risk-averse. Moreover, banks do not have an unconditional obligation to pay a pre-determined interest rate; instead, they simply receive a fee for the services. The trust of such clients is worthy and valuable for the banks and is likely to increases banks' franchise value. We expect that banks with more *Fiduciary Activities* have less incentive for risky lending and excessive risk-taking because of the higher bankruptcy costs in case of failure (Marcus, 1984; Keeley, 1990).

2) Earnings on/increases in value of cash surrender value of life insurance policies plus fees and commissions from annuity sales (*Life Insurance*).

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[5] Due to a lack of data, we are unable to take into account income from venture capital activities. Moreover, the data on securities brokerage and investment banking is available merely as of 2007 onward. Because we focus primarily on lending we do not analyze various other items of non-interest income which are not expected to expand the scope of clients' relationships. These other items include trading revenues and other assets sales.

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. This financial resource is likely to enhance the bank's position in lending.

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

Other insurance income provides banks with financial resources (pool of premiums) that may also be linked to lending. Banks that have more general insurance business are likely to be aware of the items insured – autos, residential and commercial property, other high value goods – that may require re-financing in the future and therefore can suggest lending opportunities. In addition, existing borrowers may request insurance services which might strengthen relationships and therefore enhance banks' lending quality.

4) Net servicing fees (*Loan Servicing*). [6]

Servicers can collect soft information and identify borrowers who regularly fulfil their repayment obligations and this information can be used by banks for future loan origination. However, to collect more late fees, servicing companies may target borrowers less likely to make timely instalments (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) Net gains (losses) on sales of loans and leases and net securitization income (*Loan Sales*).

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[6] 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 instalments to a loan servicing firm. Most of mortgages are backed by Federal housing programs such as Fannie Mae and Freddie Mac.

Income from *Loans Sale* may show how active banks manage their loan portfolio; however, banks with more effective presence in the loan sales market may target riskier loans. As such, the relationship between *Loans Sale* and loan quality is not clear.

6) 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 (*Service Charge*).

Service Charge represents the scale of relationships as it can show the volume of interactions with clients and how much income can be obtained from such activities (banks' market power). Hence, we expect that banks with more income from these services might have a greater charter value. Alternatively, a higher service charge might be due to a bank's pricing policy or even the quality of clients – riskier clients will likely pay higher service fees, suggesting a reverse relationship with franchise value.

Our aim is to analyse the implications for credit risk and spread resulting from variation in the aforementioned non-interest income activities. The income from such activities is measured as a percentage of total net operating income following the existing literature (Stiroh, 2004 among others). For Equation (2), however, we scale the non-interest income items by total assets in lieu of total net operating income, since the latter includes net interest income (alongside non-interest income) and this may cause a mechanical inverse relationship between the share of non-interest income in total operating income and *Spread*[7].

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

2.3. CONTROL VARIABLES

The ratio of equity capital to total assets (*Capital*) is controlled for in both models. On the one hand, higher *Capital* is associated with lower moral hazard problems and better capitalized banks have greater monitoring incentives (Berger et al., 1995, and Keeley and Furlong, 1990). On the other hand, an increase in equity capital encourages risk-taking behaviour (Koehn and Santomero, 1980; Kim and Santomero, 1988 and Blum, 1999 among others). *Capital* represents equity-holders' risk preferences (McShane and Sharpe, 1985 and Maudos and De Guevara, 2004) and banks with a higher capital ratio may require a higher spread to compensate for the higher cost of equity compared to debt finance. We also control for cost inefficiency represented by the ratio of non-interest expense to total operating revenue (*Inefficiency*) in our models. Less efficient banks are expected to have lower loan quality due to poorer monitoring. They might even have greater incentives for risk-taking (Kwan and Eisenbeis, 1997). More inefficient banks are expected to increase their spread to cover their higher costs (Altunbas et al., 2001).

We include the ratio of the face value of unused credit lines and loan commitments to total assets (*Loan Commitment*) in our analysis. Borrowers of banks with higher *Loan Commitment* face, on average, lower liquidity shocks and have the capacity to be more leveraged. As such, we expect a negative relationship between *Loan Commitment* and *Credit Risk*. Berg et al. (2013) show that credit lines act as 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). As such, higher *Loan Commitment* may represent greater borrowing cost smoothing and lower *Spread*.

In our *Credit Risk* model (1) we control for *Risk Weighted Assets,* as non-performing loans depend on the riskiness of portfolio structure and *Risk Weighted Assets* captures a

number of risk factors such as borrowers' type and the existence of collateral (Berger and DeYoung, 1997).

We add the quarterly growth rate of gross loans (*Loan Growth*) to the *Credit Risk* model, since the literature shows a negative relationship between credit expansion and loan quality (Clair, 1992; Dell'Ariccia and Marquez, 2006; Ogura, 2006; Foos, et al., 2010).

In the *Spread* model (model 2), we introduce a proxy for credit risk *(Loan Loss Provision)*, the ratio of liquid assets to total liabilities (to capture liquidity risk) and the difference between the annualized federal funds rate and the implicit interest rate on customer deposits as a measure of interest rate risk. We expect higher credit, liquidity or interest rate risk to translate into higher *Spread* (Angbazo, 1997; Carbo and Rodriguez, 2007 and Saunders and Schumacher, 2000 among others). The share of core deposits in total liabilities (*Core Deposit*) is also included in Equation (2), as *Spread* depends on the structure of debt financing. We also consider the salaries and employee benefits divided by number of full time equivalent employees (*Wage*) as a proxy for employees' expertise. Banks with greater expertise are expected to have a higher *Spread*, since they are expected to offer more specialized and higher valued services.

We also control for bank size by including the logarithm of total assets (*Size*) in both models. *Size* can have several impacts on *Credit Risk* and *Spread*: 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 which 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 and lower spreads. The logarithm of the bank's age (*Log(Age)*) is expected to capture the impact of longevity and hence experience on the bank's *Credit Risk* and *Spread*.

In both models, we attempt to capture state-level heterogeneity by including indexes for banking market concentration (*HHI*), house prices (*House Price Growth*) and growth in personal income (*Income Growth*). Finally, yearly fixed effects are controlled for by introducing seven year dummies. Table A1 in the appendix outlines the variables used in our models.

3. Data and Descriptive Statistics

Our empirical investigation is based on a sample of 8,287 commercial banks domiciled in the U.S. The sample is constructed on a quarterly basis between 2003 and 2010[8], providing a total of 211,161 bank-quarter observations. Bank-level data is collected from the web-site of the Federal Reserve Bank of Chicago, the annualized federal funds rate is obtained from the Federal Reserve Bank of New York, state-level home price indexes and personal income data are retrieved from the Office of Federal Housing Enterprise Oversight and the Bureau of Economic Analysis, respectively. The data on market capitalization is collected from the SNL database. We exclude banks that have been in operation for less than 3 years and banks with no loans and deposits. Outliers are removed from the sample by winsorizing up to 2% of each tail[9]. All the variables are de-seasonalized[10] and income statement figures have been

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[8] The time frame starts from 2003, since U.S. banks provide detailed information on various non-interest income activities since then. The Federal Reserve Bank of Chicago has not posted the CALL report data on its web-site from 2011 onward.

[9] We winsorize the data to the extent that the sample lies in the (mean - 6×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.

[10] 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.

annualized. We also remove banks with negative non-interest income ratios[11]. We also study two samples of banks: 3,116 very small banks (80,277 observations) with less than $100 million in total assets (*Micro Commercial Banks*). The second sample consists of the remaining 5,171 commercial banks (*Non-Micro Commercial Banks*) with 130,884 observations. The reason for examining the smallest banks separately is that the U.S. banking system is dominated by small banks with a relatively different business model. As banks become larger their funding strategy, loan composition and income structure tend to change.

Table I (PANEL A) presents the descriptive statistics for *Micro* and *Non-Micro Commercial Banks*. The mean equality tests show a significant difference between the two groups of banks. The figures show that *Non-performing Loans* of *Non-Micro Commercial Banks* equals 1.12% which is significantly higher than that of *Micro Commercial Banks* (0.92%); nevertheless, *Non-Micro Commercial Banks* hold on average less *Loan Loss Reserve* (1.44% vs. 1.55%) than *Micro Commercial Banks*. Our flow proxy of *Credit Risk*, *Loan Loss Provision*, is also higher for *Non-Micro Commercial Banks* (0.56% vs. 0.35%).

Non-Micro Commercial Banks have on average more *Risk Weighted Assets* (71.73%) but lower *Spread* (3.54%) than *Micro Commercial Banks* (with 65.32% *Risk Weighted Assets* and 3.67% *Spread*). *Non-Micro Commercial Banks* are on average less capitalized and more efficient than *Micro Commercial Banks*. *Non-Micro Commercial Banks* are also less reliant on core deposits. Moreover, *Non-Micro Commercial Banks* hold on average less liquid assets and also pay more interest to deposit holders than *Micro Commercial Banks*.

Loan Commitment is on average higher for *Non-Micro Commercial Banks*. Their gross loans grow at a faster rate and they pay on average a higher salary to their employees as compared to *Micro Commercial Banks*. The average age of *Non-Micro Commercial Banks* is about 66 years, which is approximately 10 years lower than the average age of *Micro*

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[11] Totally, 195 observations on non-interest income scaled by total operating income are excluded from our sample. 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.

Commercial Banks. The average state-level assets market share of *Micro* and *Non-Micro Commercial Banks* are 0.08% and 0.7%, respectively. The share of non-interest income activities in total operating income of *Non-Micro Commercial Banks* is 17.53%, whereas the share is 14.08% for *Micro Commercial Banks* which rely significantly more on interest income[12].

[TABLE I]

The second part of the table illustrates the income shares of our variables of interest in total operating income, i.e. *Fiduciary*, *Life Insurance*, *Other Insurance Services*[13], *Loan Servicing, Loan Sale*[14] and *Service Charge*. The descriptive statistics show that the income share for *Fiduciary* is 0.90% for *Non-Micro Commercial Banks*, while it is merely 0.06% for *Micro Commercial Banks*. *Life Insurance, Loan Servicing* and *Loan Sale* have a greater income share in total operating income of *Non-Micro Commercial Banks*, whereas the income share of *Other Insurance Services* and *Service Charge* is higher for *Micro Commercial Banks*.

The third part of the table exhibits other components of non-interest income. Income share of *Securities Brokerage*, *Investment Banking* and *Trading* have greater share in total operating income of *Non-Micro Commercial banks*; whereas *Other Assets Sale* has, on average, a negative weight in total operating income of *Non-Micro Commercial Banks* and almost zero weight for *Micro Commercial Banks*. Other non-interest income activities account for 4.45% and 3.11% of total operating income of *Non-Micro* and *Micro Commercial banks*, respectively. The last part of the table illustrates our proxies for bank franchise value. The *Market to Book Value* of *Non-Micro Commercial Banks* is on average 127%, whereas the

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[12] Stiroh (2006) quotes 23.9% as the *Noninterest Income* of traded BHCs operating between 1997 and 2004. Elyasiani and Wang (2009) report 24% as the *Noninterest Income* of listed BHCs operating between 2001-2005 period. The average bank considered in their studies is larger and hence more diversified than the average bank studied in our paper.

[13] Consisting underwriting income and income from other insurance activities. The former accounts for less than 5% of the income classified as *Other Insurance Services*.

[14] This represents net gains (losses) on the sales of loans and leases, plus net securitization income. The former accounts for 98% of the income classified as *Loan Sale*.

market capitalization of *Micro Commercial Banks* is on average slightly lower than the book value of their equity capital. *Tobin's Q* of *Non-Micro Commercial Banks* stands marginally above 100% (102.9%) and it almost equals 100% for *Micro Commercial Banks*.

PANEL B of the table presents the state-level indicators including the market concentration index represented by *HHI, Home Price Index Growth* and *Income Growth*. The home price index, on average, has experienced a 0.55% quarterly growth during the study period. Personal income has also grown, on average, at the rate of 1.06% in the 2003-2010 time period.

4. Empirical Results

4.1. CREDIT RISK

We estimate the *Credit Risk* model (Equation (1)) using our quarterly panel data to investigate whether non-interest income activities have any significant impact on banks' loan quality. We apply the fixed effect technique with standard errors clustered at the bank level. Table II presents the estimation results for the 5,106 *Non-Micro Commercial Banks* and the 2,792 *Micro Commercial Banks* during the period under study.

Columns (1) to (7) display the results for *Non-Micro Commercial Banks*. Column (1) illustrates the estimation where we regress *Non-performing Loans* as the *Credit Risk* proxy on non-interest income activities, namely *Fiduciary, Life Insurance, Other Insurance Services, Loan Servicing, Loan Sale* and *Service Charge* while controlling for *Capital*, *Inefficiency*, *Risk Weighted Assets* and year fixed effects. In column (2), we try to capture heterogeneities caused by loan portfolio characteristics by adding *Loan Commitment* and *Loan Growth* to our model. We introduce *Size* and *Log(Age)* to the model in column (3). Finally, state-level variations represented by *HHI*, *Home Price Growth* and *Income Growth* are controlled for in the fourth column. In all specifications the results show significant and negative coefficients

for *Fiduciary, Other Insurance Services* and *Service Charge* implying that income from these businesses appears to lower *Credit Risk*. As a robustness check, in columns (5) and (6) we use *Loan Loss Reserve* and *Loan Loss Provision* as proxies for *Credit Risk* in lieu of *Non-performing Loan*. The results support our finding for *Fiduciary Activities*; however, the coefficients of *Other Insurance Services* and *Service Charge* appear insignificant in column (6) where we use *Loan Loss Provision*. Moreover, we scale the non-interest income items by total assets in lieu of total net operating income and re-estimate our model. The results are in line with our previous findings: *Fiduciary* negatively affects *Credit Risk*. Column (7) displays the result when we use a more generic proxy for *Credit Risk*, i.e. *Risk Weighted Assets* which depicts a negative association with *Fiduciary* and *Service Charge*. As a further robustness check and following Thompson (2011)[15], the standard errors are clustered by quarter. The results support our previous findings[16].

Overall, the outcome implies that income from *Fiduciary Activities* 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* in total net operating income lowers *Non-performing Loans* on average, by 0.010%. The average *Non-performing Loans* is 1.12%, so the effects are economically significant and equal to a 0.9% (0.9%=$\frac{0.010\%}{1.12\%}$) fall in the average *Non-performing Loans*.

Among the control variables, we find that more capitalized or inefficient banks have, on average, greater *Credit Risk*. We also observe a positive effect of *Risk Weighted Assets* on *Credit Risk*. *Loan Commitment* and *Loan Growth* are associated with lower *Credit Risk*, (except for *Risk Weighted Assets* for which we find positive coefficients in-line with

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[15] Petersen (2009) and Thompson (2011) both claim that when the dimensions of panel are extremely unbalanced, there is no need to double cluster at all; however, the former believes that single-clustering on the more frequent dimension (bank in our case) is almost identical to clustering by both dimensions, whereas the latter argues that in this case, single-clustering on the less frequent dimension (time in our case) removes the bias.

[16] The results are not reported here, but are available from the authors upon request.

expectations). Larger or older banks have higher *Credit Risk* whereas younger or older banks have greater *Risk Weighted Assets*. We find that an increase in *Home Price Growth* or *Income Growth* appears to lower *Credit Risk*. Finally, column (8) reports the estimation of our model for *Micro Commercial Banks* where we find no significant relationship between any of our non-interest income activities and credit risk.

[TABLE II]

4.2. SPREAD

In this sub-section, we investigate the relationship between non-interest income activities (*Fiduciary Activities, Life Insurance, Other Insurance Services*, *Loan Servicing, Loan Sale and Service Charge*)[17] and *Spread*. We use the fixed effect technique with standard errors clustered at the bank level. Table III presents the estimation results of the Equation (2) using quarterly data of 5,106 *Non-Micro Commercial Banks* and 2,788 *Micro Commercial Banks*.

Columns (1) to (5) illustrate the regression results for *Non-Micro Commercial Banks*. In the first column, we regress *Spread* on non-interest income activities, while controlling for *Capital*, *Inefficiency* and year dummies. The result shows a positive association of *Fiduciary*, *Life Insurance* and *Other Insurance Services*, *Loan Sale* and *Service Charge* with *Spread*; however, the coefficient of *Fiduciary* appears insignificant in the second column where we control for *Loan Loss Provision*, *Liquid Asset* and *Interest Rate Risk*. In column (3), we introduce *Core Deposit*, *Loan Commitment* and *Wage* in our model. In this specification, *Other Insurance Services* appears insignificant. Size and banks' age are added to the model in the fourth column. Column (5) displays the estimation result when we include *HHI*, *Home Price Growth* and *Income Growth*. In all five specifications, the results show a positive

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

association of *Life Insurance, Loan Sale* and *Service Charge* with *Spread*. We study our *Micro Commercial Banks* sub-sample in column (6) and find a positive relationship of *Fiduciary* (at the ten percent significance level) and *Service Charge* with *Spread*.

The results also show that more capitalized or efficient banks have a higher *Spread*. A higher *Loan Loss Provision* translates into a higher *Spread*. Banks with more *Liquid Asset* (i.e. lower liquidity risk) have a lower *Spread*. *Core Deposit* depicts a positive association with *Spread*. We find a positive relationship between *Loan Commitment* and *Spread* which is contrary to our expectation. A higher *Wage* is associated with a higher *Spread*. Larger banks have, on average, lower *Spread*, whereas older banks have, on average, a higher *Spread*. *Spread* is higher in states with a faster *Home Price Growth*. Finally, we observe a negative relationship between *Income Growth* and *Spread*.

Overall, we find no evidence to support the cross-subsidization conjecture, but also we find that an increase in *Life Insurance, Loan Sale* or *Service Charge* is associated with an increase in *Spread*.

[TABLE III]

4.3. CRISIS AND POST CRISIS PERIODS

We find a robust relationship between fiduciary activities and banks' credit risk. As a further analysis, in this sub-section, we explore the relationship between *Fiduciary* and our dependent variables, namely *Credit Risk* proxies and *Spread*, during the crisis and afterwards. Using the dates provided by the Bank for International Settlements (2010) for each sequence of the crisis, we split our sample period to three sub-samples: pre-crisis (January 2003 to June 2007), acute-crisis (July 2007 to March 2009) and post-crisis periods (April 2009 to December 2010). Table IV presents the results of our analysis for the three sub-periods, using quarterly data of 4,371 *Non-Micro Commercial Banks*.

Column (1) illustrates the estimation of the *Credit Risk* Model (Equation (1)), using *Non-performing Loans* as the dependent variable. We use three dummy variables of *Pre*, *Acute* and *Post*[18] and replace *Fiduciary* with its interaction terms with the three dummies. We also replace our year fixed effects with *Acute* and *Post* dummy variables. The result shows that the impact of *Fiduciary* on *Non-performing Loans* is slightly stronger during the post-crisis period. In the second column, we use *Loan Loss Reserve* in lieu of *Non-performing Loans* and find almost the same impact across acute and post crisis periods. In column (3), we use *Loan Loss Provision* as another proxy for *Credit Risk* and also find that the impact of *Fiduciary* on *Credit Risk* is more pronounced during the post-crisis period. Column (4) displays our analysis when *Risk Weighted Assets* is used as the dependent variable. Similar to our previous findings, we find a stronger effect of *Fiduciary* during the post-crisis period. Finally, in the fifth column we estimate our *Spread* model (Equation (2)), where we replace *Fiduciary* with its three interaction terms with *Pre*, *Acute* and *Post*. The analysis shows that during the post-crisis period banks with more *Fiduciary* income have on average a lower *Spread*.

[TABLE IV]

4.4. FRANCHISE VALUE

We find that fiduciary activities lower banks' credit risk. One plausible channel for explaining this finding is a bank's franchise value. In commercial banking, the relationship with clients forms a core part of intangible assets known as franchise or charter value. Banks' clients can be classified into two main groups: '*core*' deposit holders / loan takers and clients of fee-based services such as fiduciary. The relationship with these clients is valuable for banks since they provide stable financial resources and income as well as soft information.

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[18] *Pre* takes the value of one for the period before the third quarter of 2007 and zero otherwise. *Acute* takes the value one for the period between the third quarter of 2007 and the first quarter of 2009 and zero otherwise. *Post* takes the value of one for the period after the first quarter of 2009 and zero otherwise.

In this section, we explore the relationship between non-interest income activities and franchise value. We adopt the following model for our analysis based on De Jonghe and Vennet (2008):

$$\text{Franchise\_Value}_{i,t} = f(\sum_{k=1}^{6} \alpha_k \times \text{Non-interest\_Income\_Activities}_{k,i,t}, \text{Core\_Deposit}_{i,t},$$
$$\text{Credit\_Risk}_{i,t}, \text{Inefficiency}_{i,t}, \text{Capital}_{i,t}, \text{Market\_Share}_{i,t},$$
$$\text{HHI}_{j,t}, \text{Home\_Price\_Growth}_{j,t}, \text{Income\_Growth}_{j,t}) + \varepsilon_{i,t} \qquad (3)$$

Where individual banks, time dimension and states are represented by i, t and j subscripts, respectively. We use the market to book value of equity capital (*Market to Book Value*) as the primary proxy for bank franchise value and Tobin's Q (*Tobin's Q*) as an alternative indicator (Keeley, 1990 and Gonzalez, 2005). *Tobin's Q* is defined as the market value of equity capital plus the book value of total liabilities divided by the book value of total assets. Variations in franchise value (*Franchise Value*) are modelled in Equation (5) as a function of our variables of interest, namely income shares from non-interest income activities, and a set of bank and state-level controls. At the bank level, we control for *Core Deposit, Credit Risk, Inefficiency, Capital* and *Market Share.* Core deposits are a stable source of funding representing clients' relationships and these are expected to increase bank charter value. Banks with higher credit risk and inefficiency are expected to have lower franchise values. We also control for capital strength using the equity capital to assets ratio as banks with less capital are likely to be more risky and hence have lower franchise value. Market share is expected to be positively linked to charter value (Opler and Titman, 1994). We also include *HHI*, *Home Price Growth* and *Income Growth* to control for state-level heterogeneity.

We estimate the *Franchise Value* model (Equation (3)) using 1,882 quarterly panel data of 187 listed *Non-Micro Commercial Banks* and the fixed effects technique. Since the dimensions of our panel data are not extremely unbalanced, following Petersen (2009) and Thompson (2011) we cluster standard errors at both bank and time levels. Table V presents the estimation results.

In the first column we regress *Market to Book Value* on our variables of interest, namely *Fiduciary, Life Insurance, Other Insurance, Loan Servicing, Loan Sale* and *Service Charge*. We attempt to capture bank-level heterogeneity by including *Core Deposit, Credit Risk, Inefficiency, Capital* and *Market Share* in columns (2) to (6), respectively. In column (7), we include state-level control variables, namely, *HHI, Home Price Growth* and *Income Growth*. Column (8) displays the result when we scale the non-interest income items by total assets in lieu of total operating income as a robustness check. In all specifications, among various non-interest income activities, *Fiduciary* depicts a positive relationship with our proxy for *Franchise Value*. The relationship is also economically significant. Fiduciary activities on average account for about 0.9% of total operating income. A one percent increase, evaluated at the mean, in the income share of *Fiduciary* in total net operating income increases *Market to Book Value* on average, by 15.81%. The average *Market to Book Value* is 126.7%, so the effect is economically significant and equal to a 12.5% ($12.5\% = \frac{15.81\%}{126.7\%}$) rise in the average *Market to Book Value.*

The results also show that *Core Deposit* has a positive association with charter value. Banks with more *Credit Risk* or *Inefficiency* have on average lower *Franchise Value*. Moreover, we observe that *Franchise Value* is higher in states with less concentrated markets, or those which experience greater home price or personal income growth. In columns (9) and (10), we use *Tobin's Q* as the alternative proxy in lieu of *Market to Book Value* and re-estimate our model with the same specifications as of columns (7) and (8). The results support our previous finding: an increase in the income share of fiduciary activities increases banks' franchise value.

[TABLE V]

4.5. COST COMPLEMENTARITIES

The linkage of the non-interest income activities with loan quality and spreads may be due to informational and/or cost synergies. In this section, we investigate whether pair-wise cost complementarity exists between lending and the non-interest income activities that might contribute to joint production[19]. As such, we examine whether the marginal cost of producing loans decreases when they are generated jointly with non-interest income activities. Appendix A2 illustrates our multi-product cost function from which marginal costs are derived.

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 as follows:

$$PCC(Y_A, Y_B) = \frac{\partial^2 TC}{\partial Y_A \partial Y_B} = \left(\frac{TC}{Y_A Y_B}\right) \times \left[\frac{\partial^2 LnTC}{\partial LnY_A \partial LnY_B} + \left(\frac{\partial LnTC}{\partial LnY_A}\right) \times \left(\frac{\partial LnTC}{\partial LnY_B}\right)\right] \quad (4)$$

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:

$$NC\_PCC = \frac{\partial^2 LnTC}{\partial LnY_A \partial LnY_B} < 0 \quad (5)$$

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, non-jointness requires:

$$\left[\frac{\partial^2 LnTC}{\partial LnY_A \partial LnY_B} + \left(\frac{\partial LnTC}{\partial LnY_A}\right) \times \left(\frac{\partial LnTC}{\partial LnY_B}\right)\right] = 0 \quad (6)$$

PCC > 0 implies existence of diseconomy of joint production.

Table VI illustrates the empirical results on cost complementarity between the non-interest income activities and lending (secured and unsecured loans (Y1 & Y2)) for *Micro* and *Non-Micro Commercial Banks*. In the first two rows we use stochastic frontier analysis to estimate our cost function which is defined on the basis of the intermediation approach that

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

assumes banks as intermediaries (Berger and Mester, 1997 among others). The first three columns display the analysis of *Non-Micro Commercial Banks*.

In column (1), the first row, the result shows that the necessary condition for the existence of diseconomies of joint production between non-interest income activities and secured loans is realized, whereas in the second row, we find the necessary condition for the existence of cost complementarity between non-interest income activities and unsecured loans. However, column (2) shows that the sufficiency condition for the existence of diseconomy of joint production or cost complementarity is not fulfilled and highlights non-jointness[20]. In column (3) we observe that the marginal cost of secured loans is around 9.7% which is greater than the marginal cost of unsecured loans equal to 2.2%.

Columns (4) to (6) exhibit the study of *Micro Commercial Banks*. In column (4), the findings indicate that the necessary condition for diseconomies of joint production of non-interest income activities with secured and unsecured loans is realized. Column (5) shows that the sufficiency condition for diseconomies of joint production of non-interest income activities with secured and unsecured loans is fulfilled. The marginal cost of secured and unsecured loans of *Micro Commercial Banks*, displayed in column (6), is equal to 5.33% and 5.15%, respectively. The effect of diseconomies of joint production is economically meaningful. One dollar increase in non-interest income equals 0.12% ($0.12\% = \frac{0.000063}{0.0533}$) and 0.09% ($0.09\% = \frac{0.000048}{0.0515}$) increase in the marginal cost of secured and unsecured loans, respectively.

[TABLE VI]

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

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[20] Normally total cost is much less than the products of loans (whether *Secured* or *Unsecured*) with other financial services (in our case the 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.

results are presented in rows (3) and (4) and are similar to our previous findings, except for the secured loans of *Non-Micro Commercial Banks*, where we find that the necessary condition for cost complementarity between secured loans and non-interest income is realized.

In rows (5) to (8), we replicate our analysis in the first four rows using the fixed effect technique for estimation of total cost function in lieu of stochastic frontier analysis. The results are in line with our previous findings. Overall, we find that *Micro Commercial Banks* suffer from diseconomies of joint production, whereas *Non-Micro Commercial Banks* do not benefit (or suffer) from economies (or diseconomies) of scope.

4.6. SMALL, LARGE, SYSTEMICALLY IMPORTANT AND DISTRESSED BANKS

We split our sample of *Non-Micro Commercial Banks* into three sub-samples on the basis of their size. Commercial banks with total assets below $1 billion ("*Small Commercial Banks*"), commercial banks with total assets between $1 billion and $50 billion ("*Large Banks*") and commercial banks with total assets more than $50 billion ("*Systemically Important Banks*")[21]. Moreover, we also study the sample of failed banks ("*Failed Commercial Banks*") collected from the web-site of the FDIC. Table A3 of the appendix illustrates the estimation of the *Credit Risk* model (Equation (1)) for the aforementioned sub-samples.

Columns (1) to (4) display our analysis of *Small Commercial Banks*. In the first column we use *Non-performing Loans* as our *Credit Risk* proxy and find that *Fiduciary* and *Service Charge* are negatively associated with *Credit Risk*. We use *Loan Loss Reserve*, *Loan Loss Provision* and *Risk Weighted Assets* as the proxy in columns (2) to (4), respectively. The results show a negative relationship between *Fiduciary* and *Credit Risk* in columns (3) & (4). *Service Charge* also depicts a negative link with *Credit Risk* in columns (2) and (4). In

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[21] For simplicity we merely consider size to define *Systemically Important Banks*. The $50 billion threshold is based on Federal Reserve Board proposed rules to define "*significant*" firms issued on February 11, 2011: http://www.federalreserve.gov/newsevents/press/bcreg/20110208a.htm.

columns (5) and (6), we study the *Large Commercial Banks* sub-sample, where we find a negative relationship between *Other Insurance Services* and our *Credit Risk* proxy. Columns (7) and (8) present our analysis of *Systemically Important Banks* with no significant link between our variables of interest and the *Credit Risk* proxy. Finally, columns (9) and (10) show our investigation of *Failed Commercial Banks* where we find no significant relationship. Overall, we observe that the negative relationship between *Fiduciary* and *Credit Risk* disappears gradually with bank size.

In table A4 of the appendix we re-estimate our *Spread* model (Equation (2)) using the aforementioned sub-samples. Columns (1) to (4) illustrate our analysis for *Small, Large, Systemically Important* and *Failed Commercial Banks*, respectively. We find evidence to support cross-subsidization between *Loan Servicing* and *Spread* for *Systemically Important Banks* (at the 10 percent significance level). Moreover, we observe that *Service Charge* is positively associated with *Spread* across different sub-samples other than for *Systemically Important Banks*. The analysis of *Small Banks* shows that a higher income from *Life Insurance* and *Loan Sales* is also associated with a wider *Spread*.

4.7. FURTHER ROBUSTNESS CHECKS

We find that an increase in income share of fiduciary activities lowers credit risk. As a further robustness check and in order to address endogeneity issues, we estimate our model (Equation (1)) using the two step system GMM technique introduced by Roodman (2006). The technique also performs the Windmeijer (2005) finite-sample correction to the stated standard errors. For this purpose, we focus on the post-crisis period, since we have relatively small time periods which are suitable for application of difference and system GMM techniques. Table A5 of the appendix presents the results, where we define *Fiduciary* as an endogenous variable.

In the first column we observe that *Fiduciary* appears 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[22]. The A.B. test result does not reject the null hypothesis. We also carry out the Sargan test of over-identification, where the null hypothesis is the joint validity of moment conditions. The Sargan (1958) test result rejects the null hypothesis. 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 416 to 234. This time, the Sargan test rejects the null merely at the ten percent significance level, whereas our finding in the previous column remains almost unchanged. In column (3), we scale the non-interest income items by total assets in lieu of total net operating income. In this specification the result persists and the Sargan test of over-identification does not reject the null hypothesis.

5. Summary and Conclusion

This paper analyzes the impact of non-interest income activities on banks' lending in terms of credit quality and spread. Agency problems and a potential loss of focus associated with diversification into non-interest income businesses may cause deterioration in loan quality. Alternatively, expanding client relationships can improve the quality of banks' credit by, providing relatively stable financial resources, more soft information, greater cross-selling opportunities and (ultimately) improved franchise value. Banks with a wider scope of relationships are able to reach more potential borrowers. Moreover, non-interest earnings may also influence banks' interest spread through possible cross-subsidization effects.

Using quarterly data on 8,287 U.S. commercial banks between 2003 and 2010 we show that an increase in the income share of fiduciary activities in total operating income

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[22] 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.

lowers credit risk for banks with total assets ranging between $100 million and $1 billion. The impact is more pronounced during the post-crisis period. The results suggest that fiduciary activities induce banks' managers to behave more prudently in lending, because such activities increase banks' franchise value as shown by our further investigation. We do not find any significant evidence of a negative impact of diversification into non-interest income activities on loan quality.

We obtain little evidence to support the prevalent view in the literature that there is cross-subsidization between traditional intermediation and non-interest income activities except for fiduciary activities of banks with total assets above $100 million in the post-crisis period and also loan servicing of systemically important banks where we observe that a higher income share of fiduciary activities and loan servicing is associated with narrower lending-deposit spreads.

The analysis of *micro* commercial banks (banks with total assets below $100 million) provides us with little evidence of any link between our non-interest income variables and credit risk. Finally, we investigate whether pair-wise cost complementarity or alternatively diseconomies of joint production exist between lending (both secured and unsecured) and non-interest income activities. We do not find any evidence to support the existence of cost complementarity. Our results even show that *micro* commercial banks actually suffer from diseconomies of joint production.

Appendices

Table A1. Variable Description

This table presents description of variables used in this study.

Dependent Variables	Description
Non-performing Loans	The ratio of non-performing loans to gross loans. Non-performing loans consist of non-accrual loans and loans which are past due for 90 days or more and still accruing.
Loan Loss Reserve	The ratio of loan loss reserves to gross loans. Loan loss reserve is determined by managers for the loan portfolio, including both performing and impaired loans.
Loan Loss Provision	The ratio of loan loss provision to average gross loans. Loan loss provision is the expense that banks incur to increase the loan loss reserve or writing off a loan. It can be negative, when the required loan loss reserve is lower than the existing level.
Risk Weighted Assets	The ratio of risk weighted assets to total assets. Risk weighted assets are defined by the Basel Accord to measure the riskiness of banks' assets, including off balance sheet items.
Spread	Net interest spread equals to (Interest income / average earning assets) – (interest expense / average interest-bearing liabilities).
Market to Book Value	The market value of equity capital divided by total book value of equity capital.
Tobin's Q	The market value of equity capital plus the book value of total liabilities divided by the book value of total assets.
Variable of Interest	
Fiduciary	Income from fiduciary activities.
Life Insurance	Earnings on/increase in value of cash surrender value of life insurance plus fees and commissions from annuity sales.
Other Insurance Services	Underwriting income from insurance and reinsurance activities and income from other insurance activities.
Loan Servicing	Net servicing fees.
Loan Sale	Net gains (losses) on sales of loans and leases and net securitization income.
Service Charge	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.
Control Variables	
Capital	Equity capital to asset ratio.
Inefficiency	Total non-interest expense divided by total operating revenue.
Core Deposit	The share of core deposits in total liabilities.
Liquid Asset	The ratio of liquid assets to total liabilities.
Interest Rate Risk	The difference between the annualized federal funds rate and the implicit interest rate of deposits.
Loan Commitment	The ratio of face value of unused credit lines and loans commitment to total assets.
Loan Growth	Quarterly growth rate of gross loans.
Wage	The salaries and employee benefits divided by number of full time equivalent employees.
Market Share	The share of a bank's total assets in the total assets of banks aggregated at the state-level.
Size	Logarithm of total assets.
Log(Age)	Logarithm of bank's age.
HHI	Hirschman-Herfindahl index (HHI) is a proxy for market concentration: $HHI_{s,t} = \sum_{i=1}^{n}\left(Total\_Assets_{i,t,s}/\sum_{i=1}^{n} Total\_Assets_{i,t,s}\right)^2$ where individual banks, time dimension and U.S. states in which they operate are represented by i, t and j subscripts, respectively. It has a value between zero and one. Higher values show that the market is more concentrated.
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.
Other Non-interest Income Activities	
Venture Capital	Venture capital revenue.
Securities Brokerage	Fees and commission from securities brokerage.
Investment Banking	Investment banking, advisory, and underwriting fees and commissions.
Trading	Trading revenue and net change in the fair values of financial instruments accounted for under a fair value option.

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.

Appendix A2. Cost Complementarities Analysis – Cost Function & Descriptive Statistics

Using the intermediation 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):

$$LnTC = C_0 + \sum_{i=1}^{6} \alpha_i LnY_i + \sum_{j=1}^{3} \beta_j LnW_j + \gamma_1 LnZ + \tau_1 Trend$$

$$+ \frac{1}{2}\left[\sum_{i=1}^{6}\sum_{k=1}^{6} \delta_{i,k} LnY_i LnY_k + \sum_{j=1}^{3}\sum_{l=1}^{3} \theta_{j,l} LnW_j LnW_l + \gamma_2 (LnZ)^2 + \tau_2 Trend^2\right]$$

$$+ \sum_{i=1}^{6}\sum_{j=1}^{3} \mu_{i,j} LnY_i LnW_j + \sum_{i=1}^{6} \vartheta_i LnY_i\, LnZ + \sum_{i=1}^{6} \pi_i LnY_i\, Trend + \sum_{j=1}^{3} \varphi_j LnW_j\, LnZ$$

$$+ \sum_{j=1}^{3} \sigma_j LnW_j\, Trend + \varepsilon \qquad\qquad (A2-1)$$

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 = the income from the non-interest income activities (*Fiduciary*, *Life Insurance*, *Other Insurance Services* and *Loan Servicing*),

Y6 = the income from service charges on deposit accounts;

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).

We consider the homogeneity and symmetry assumptions which require:

$$\sum_{j=1}^{3} \beta_j = 1, \sum_{j=1}^{3} \sum_{l=1}^{3} \theta_{j,l} = 0, \quad \sum_{i=1}^{6} \sum_{j=1}^{3} \mu_{i,j} = 0, \sum_{j=1}^{3} \varphi_j = 0 \qquad (A2-2)$$

$$\delta_{i,k} = \delta_{k,i} \text{ and } \theta_{j,l} = \theta_{l,j} \text{ for all } i, k, j \text{ and } l \qquad (A2-3)$$

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 ith panel and η is the parameter to be estimated. Table A2 presents the descriptive statistics of the total costs, output and input price vectors and total equity capital for *Micro* and *Non-Micro Commercial Banks*.

TABLE A2. 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 Commercial Banks*. *Micro Commercial Banks* are defined as banks with less than $100 million in total assets. *Non-Micro Commercial Banks* are commercial banks with total assets above $100 million.

Variables	Non-Micro Commercial Banks					Micro Commercial Banks				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
TC	96,467	73,245	419,831	2,240	5,958,665	37,668	3,112	1,404	331	9,753
Y1	96,467	610,398	2,858,554	1,948	37,300,000	37,668	25,814	15,838	375	86,568
Y2	96,467	264,756	1,974,595	3	29,100,000	37,668	4,723	5,959	2	37,054
Y3	96,467	322,192	1,784,309	575	25,200,000	37,668	16,673	11,261	62	68,285
Y4	96,467	417,532	4,549,868	10	74,000,000	37,668	1,401	2,077	1	15,817
Y5	96,467	7,717	79,940	1	1,418,112	37,668	73	169	1	3,680
Y6	96,467	6,840	41,682	9	586,454	37,668	263	199	3	1,321
Y7	96,467	136,053	616,435	452	8,637,374	37,668	15,820	8,587	143	53,050
W1 (%)	96,467	56.44	16.32	26.91	179	37,668	50.22	12.09	22.86	126
W2 (%)	96,467	30.33	35.49	4.81	588	37,668	37.51	51.97	3.74	1,067
W3 (%)	96,467	2.46	0.87	0.38	5.08	37,668	2.41	0.80	0.45	5.00
Z	96,467	168,069	1,035,367	4,123	14,800,000	37,668	6,702	3,155	705	23,550

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 = the non-interest income activities, including *Fiduciary*, *Life Insurance*, *Other Insurance Services* and *Loan Servicing*; Y6 = *Service Charge*; Y7 = Total transaction accounts (including total demand deposits); 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 A3. Credit Risk Analysis – Small, Large, Systemically Important and Distressed Banks

This table reports estimations of *Credit Risk* model (Equation (1)) using quarterly data of 3,991 *Small Commercial Banks*, 662 *Large Commercial Banks*, 28 *Systemically Important Banks* and 206 *Failed Commercial Banks* during 2003-2010 timespan. *Small Commercial Banks* are defined as commercial banks with total assets between $100 million and $1 billion, *Large Commercial Banks* are banks with total assets between $1 billion and $50 billion and *Systemically Important Banks* are defined as banks with total assets above $50 billion. We use dynamic panel setting and fixed effect technique for our estimation.

In columns (1) to (4), we estimate the model for *Small Commercial Banks*. In the first column we use *Non-performing Loans* as a proxy for *Credit Risk* and regress it on its lagged value, our variables of our interest, i.e. *Fiduciary*, *Life Insurance*, *Other Insurance Services, Loan Servicing, Loan Sale* and *Service Charge* while controlling for bank-level (*Capital*, *Inefficiency*, *Risk Weighted Assets*, *Loan Commitment*, *Loan Growth, Size* and *Log(Age)*), state-level (*HHI*, *Home Price Growth* and *Income Growth*) heterogeneities and year fixed effect controls. We use *Loan Loss Reserve*, *Loan Loss Provision* and *Risk Weighted Assets* as the proxy in columns (2) to (4), respectively. Columns (5) and (6) display our analysis of *Large Commercial Banks* using *Non-performing Loans* and *Risk Weighted Assets* as the *Credit Risk* proxy, respectively. In columns (7) and (8), we study *Systemically Important Banks* using the same *Credit Risk* proxies as of columns (5) and (6). Finally, columns (9) and (10) show our investigation of *Failed Commercial Banks*, using the same specifications of columns (7) and (8). Year dummies are included in the model, but not reported in the table.

	Small Banks				Large Banks		Systematically Important Financial Institutions		Distressed Banks	
	Non-performing Loans	Loan Loss Reserve	Loan Loss Provision	Risk Weighted Assets	Non-performing Loans	Risk Weighted Assets	Non-performing Loans	Risk Weighted Assets	Non-performing Loans	Risk Weighted Assets
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
L. Credit Risk (α_1)	0.864***	0.843***	0.639***	0.789***	0.905***	0.754***	0.966***	0.428***	0.824***	0.729***
	(188.81)	(128.97)	(78.03)	(144.80)	(64.58)	(46.13)	(36.86)	(3.69)	(42.45)	(37.89)
Fiduciary (α_{21})	-0.011**	-0.002	-0.009**	-0.047**	0.012	-0.062	0.003	0.056	-0.063	0.170
	(-2.25)	(-0.87)	(-2.19)	(-1.99)	(1.05)	(-0.96)	(0.33)	(0.78)	(-0.54)	(0.74)
Life Insurance (α_{22})	-0.008	0.001	0.006	-0.007	-0.011	-0.003	-0.004	-0.644	0.071	0.063
	(-1.49)	(0.38)	(1.37)	(-0.38)	(-0.67)	(-0.05)	(-0.11)	(-1.27)	(1.27)	(0.67)
Other Insurance (α_{23})	-0.006	-0.002	-0.004	0.012	-0.028***	0.096**	0.034	0.996*	-0.042	-0.207
	(-1.15)	(-1.10)	(-0.79)	(0.46)	(-2.65)	(2.14)	(0.80)	(1.75)	(-0.32)	(-1.33)
Loan Servicing (α_{24})	0.000	-0.001	-0.002	-0.009	0.013	0.023	0.008	0.086	0.029	-0.064
	(0.07)	(-0.50)	(-0.48)	(-0.33)	(0.85)	(0.43)	(1.15)	(0.40)	(0.48)	(-0.68)
Loan Sale Income (α_{25})	-0.003	-0.001	0.002*	0.007	0.003	-0.010	-0.002	-0.119	0.004	0.031*
	(-1.63)	(-1.47)	(1.67)	(1.01)	(0.57)	(-0.54)	(-0.46)	(-0.88)	(0.32)	(1.76)
Service Charge (α_{26})	-0.004*	-0.001*	-0.000	-0.047***	-0.005	-0.026	0.009	-0.267*	0.023	-0.121***
	(-1.72)	(-1.67)	(-0.21)	(-5.04)	(-0.73)	(-0.90)	(1.18)	(-2.02)	(1.18)	(-3.11)
Capital (α_3)	-0.022***	-0.012***	-0.032***	0.104***	-0.020***	0.076*	0.011	0.434*	-0.043*	0.086*
	(-7.22)	(-9.36)	(-11.21)	(7.16)	(-2.80)	(1.70)	(1.54)	(1.88)	(-1.74)	(1.86)
Inefficiency (α_4)	0.008***	0.002***	0.006***	0.002	0.003**	0.000	-0.004**	0.001	0.003	0.006**
	(15.20)	(11.93)	(14.92)	(0.86)	(2.57)	(0.07)	(-2.20)	(0.04)	(1.62)	(2.43)
Risk Weighted Assets (α_5)	0.003***	-0.000	0.002***		-0.002		-0.001		-0.006	
	(2.97)	(-0.29)	(2.65)		(-0.71)		(-0.29)		(-0.81)	
Loan Commitment (α_6)	-0.020***	-0.004***	-0.012***	0.265***	-0.014***	0.285***	-0.001	1.091***	-0.061***	0.291***
	(-9.22)	(-5.94)	(-8.50)	(30.29)	(-2.76)	(8.54)	(-0.15)	(4.27)	(-4.82)	(11.93)
Loan Growth (α_7)	-0.008***	-0.009***	-0.007***	0.155***	0.001	0.033***	0.004	-0.007	-0.028***	0.158***
	(-10.30)	(-23.23)	(-12.43)	(34.37)	(0.24)	(2.87)	(1.62)	(-0.44)	(-2.93)	(9.65)
Size (α_8)	0.139***	0.019*	0.073***	-1.767***	0.221***	-2.771***	0.059	-3.593**	0.467**	-1.541***
	(5.21)	(1.92)	(3.32)	(-11.04)	(3.05)	(-5.64)	(0.52)	(-2.49)	(2.55)	(-3.52)
Log(Age) (α_9)	0.317***	0.098***	0.210***	1.397***	-0.159	2.918***	-0.494	-13.772	0.535	1.408**

	(7.21)	(6.92)	(6.93)	(7.99)	(-0.90)	(3.26)	(-0.62)	(-1.28)	(1.59)	(1.99)
HHI (α_{10})	-0.029	-0.028	-0.152***	0.098	0.098	0.873	0.076	1.879	-0.160	1.475
	(-0.52)	(-1.39)	(-3.42)	(0.38)	(0.66)	(1.45)	(0.68)	(0.88)	(-0.33)	(1.31)
Home Price Growth (α_{11})	-0.019***	-0.003***	-0.011***	-0.043***	-0.024***	0.001	0.011	0.033	-0.024	-0.008
	(-6.99)	(-3.48)	(-5.56)	(-4.89)	(-3.07)	(0.05)	(0.81)	(0.26)	(-1.07)	(-0.21)
Income Growth (α_{12})	-0.014***	-0.003***	0.002	-0.011	-0.027***	-0.013	-0.024*	-0.232	-0.035	0.065
	(-5.26)	(-3.85)	(0.94)	(-1.16)	(-4.06)	(-0.46)	(-2.05)	(-1.50)	(-1.00)	(1.16)
Constant (α_0)	-0.002	-0.001	-0.034**	-1.195***	-0.397***	3.881***	-0.065	0.902	-0.178	-1.426***
	(-0.12)	(-0.21)	(-2.50)	(-12.36)	(-2.98)	(4.58)	(-1.25)	(1.13)	(-1.39)	(-4.55)
Observations	96,558	96,558	96,560	96,572	11,384	11,384	659	659	4,555	4,555
R-squared	0.829	0.767	0.558	0.718	0.869	0.737	0.958	0.698	0.886	0.723
Number of Banks	3,991	3,991	3,991	3,991	662	662	28	28	206	206

See Table A1 for variable definitions. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

TABLE A4. Spread Analysis – Small, Large, Systemically Important and Distressed Banks

This table reports estimations of *Spread* model (Equation (2)) using quarterly data of 3,986 *Small Commercial Banks*, 658 *Large Commercial Banks*, 28 *Systemically Important Banks* and 206 *Failed Commercial Banks* during 2003-2010 timespan. *Small Commercial Banks* are defined as commercial banks with total assets between $100 million and $1 billion, *Large Commercial Banks* are banks with total assets between $1 billion and $50 billion and *Systemically Important Banks* are defined as banks with total assets above $50 billion. We use *Non-performing Loans* as our primary *Credit Risk* proxy and regress it on its lagged value, our variables of interest and a set of control variables, using dynamic panel setting and fixed effect technique.

In column (1), we estimate the model for *Small Commercial Banks*. We regress *Non-performing Loans* on its lagged value, our variables of our interest, i.e. *Fiduciary, Life Insurance, Other Insurance Services, Loan Servicing, Loan Sale* and *Service Charge* which are scaled by total assets in lieu of total operating income, while controlling for bank-level (*Capital, Inefficiency, Loan Loss Provision, Liquid Assets, Interest Rate Risk, Core Deposit, Loan Commitment, Wage, Size* and *Log(Age)*) and state-level (*HHI, Home Price Growth* and *Income Growth*) heterogeneities and year fixed effect controls. Column (2) displays our analysis of *Large Commercial Banks*. In column (3), we study *Systemically Important Banks*. Finally, column (4) shows our investigation of *Failed Commercial Banks*, using the same specification of column (1). Year dummies are included in the model, but not reported in the table.

	Small Banks	Large Banks	Systematically Important Banks	Distressed Banks
Variables	(1)	(2)	(3)	(4)
L. Spread (β_1)	0.728***	0.720***	0.662***	0.722***
	(106.18)	(30.49)	(7.27)	(37.87)
Fiduciary (β_{21})	0.031	-0.057	0.093	-0.666
	(0.61)	(-0.49)	(0.98)	(-0.96)
Life Insurance (β_{22})	0.080**	0.082	0.675	0.155
	(2.04)	(0.66)	(0.62)	(0.46)
Other Insurance (β_{23})	0.102	0.111	0.189	0.671
	(1.51)	(1.03)	(0.27)	(0.71)
Loan Servicing (β_{24})	0.031	0.157	-0.352*	0.103
	(0.63)	(0.90)	(-1.78)	(0.31)
Loan Sale Income (β_{25})	0.032**	-0.043	0.055	0.074*
	(2.46)	(-0.78)	(0.61)	(1.83)
Service Charge (β_{26})	0.176***	0.163**	-0.417	0.266**
	(10.08)	(2.26)	(-1.26)	(2.46)
Capital (β_3)	0.014***	0.019***	0.015	0.003
	(12.45)	(4.83)	(1.31)	(0.61)
Inefficiency (β_4)	-0.005***	-0.002***	-0.008**	-0.002***
	(-26.68)	(-5.54)	(-2.11)	(-5.93)
Loan Loss Provision (β_5)	0.018***	0.014	0.173	0.014***
	(6.52)	(1.62)	(1.51)	(2.69)
Liquid Assets (β_6)	-0.006***	-0.005***	-0.013	-0.012***
	(-22.38)	(-6.12)	(-1.69)	(-8.88)
Interest Rate Risk (β_7)	0.007*	-0.017	0.043	-0.076**
	(1.82)	(-1.13)	(0.52)	(-2.59)
Core Deposit (β_8)	0.001***	-0.000	-0.002	0.000
	(4.77)	(-0.46)	(-0.38)	(0.45)
Loan Commitment (β_9)	0.003***	0.005***	-0.002	0.003
	(4.76)	(2.69)	(-0.44)	(0.96)
Wage (β_{10})	0.004***	0.002*	-0.001	0.003***
	(10.75)	(1.71)	(-0.37)	(2.89)
Size (β_{11})	-0.155***	-0.054	0.180	-0.185***
	(-13.10)	(-1.46)	(1.45)	(-3.67)
Log(Age) (β_{12})	0.067***	0.028	-0.569	0.058
	(4.90)	(0.36)	(-0.72)	(0.90)
HHI (β_{13})	0.027	0.139**	-0.309*	0.044
	(1.06)	(2.21)	(-1.99)	(0.52)
Home Price Growth (β_{14})	0.003***	0.001	0.008	-0.003
	(4.39)	(0.33)	(0.36)	(-0.88)
Income Growth (β_{15})	-0.006***	0.010***	-0.018	0.017**
	(-5.57)	(2.77)	(-0.54)	(2.20)
Constant (β_0)	-0.005	0.047	0.145	-0.061
	(-0.56)	(0.65)	(1.48)	(-1.27)
Observations	96,431	11,288	659	4,550
R-squared	0.753	0.653	0.715	0.843
Number of Banks	3,986	658	28	206

See Table A1 for variable definitions. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

Table A5. Credit Risk Model – Further Robustness Checks

This table reports estimations of *Credit Risk* model (Equation (1)) using dynamic panel setting and quarterly data on 3,489 *Non-Micro Commercial Banks* during the post-crisis period. *Non-Micro Commercial Banks* are defined as commercial banks with total assets above $100 million. We use *Non-performing Loans* as our *Credit Risk* proxy and regress it on its lagged value, our variables of interest and a set of control variables. We estimate our model using two step system GMM technique introduced by Roodman (2006) and define our variable of interest, i.e. *Fiduciary*, as endogenous.

The first column illustrates the estimation of *Credit Risk* model where we regress the *Non-performing Loans* on *Fiduciary*, *Life Insurance*, *Other Insurance Services, Loan Servicing, Loan Sale* and *Service Charge* while controlling for bank-level (*Capital*, *Inefficiency*, *Risk Weighted Assets*, *Loan Commitment*, *Loan Growth, Size* and *Log(Age)*) and state-level (*HHI*, *Home Price Growth* and *Income Growth*) heterogeneities and year 2010 dummy.

We perform the Arellano and Bond (AB) test (1991) for serial correlation in the error terms and Sargan test of over-identification, where the null hypothesis is joint validity of moment conditions. The Sargan (1958) J test result rejects the null hypothesis. In column (2), we limit the instruments of system GMM estimators to the second lag of dependent variable to reduce the number of instruments from 416 to 234. The results show that Sargan test rejects the null merely at 10 percent significance level. In column (3) we scale the non-interest income items by total assets in lieu of total net operating income and estimate our model the same specifications and techniques used in the column.

	(1)	(2)	(3)
L. Credit Risk (α_1)	0.924***	0.921***	0.916***
	(90.88)	(76.00)	(75.16)
Fiduciary (α_{21})	-0.029**	-0.032***	-0.902***
	(-2.48)	(-2.65)	(-3.56)
Life Insurance (α_{22})	-0.020**	-0.013	-0.454**
	(-2.28)	(-1.57)	(-2.16)
Other Insurance (α_{23})	-0.020***	-0.018***	-0.259**
	(-3.44)	(-3.16)	(-2.21)
Loan Servicing (α_{24})	-0.007	-0.009	-0.117
	(-0.92)	(-1.18)	(-0.73)
Loan Sale Income (α_{25})	-0.008***	-0.006**	-0.096*
	(-2.88)	(-2.03)	(-1.65)
Service Charge (α_{26})	-0.005***	-0.005***	-0.169***
	(-2.65)	(-2.89)	(-5.50)
Capital (α_3)	-0.030***	-0.030***	-0.031***
	(-6.50)	(-6.96)	(-7.06)
Inefficiency (α_4)	0.006***	0.006***	0.006***
	(7.29)	(6.44)	(6.21)
Risk Weighted Assets (α_5)	0.004***	0.003***	0.003***
	(3.59)	(3.15)	(3.44)
Loan Commitment (α_6)	-0.013***	-0.012***	-0.012***
	(-4.49)	(-3.89)	(-3.94)
Loan Growth (α_7)	0.012***	0.013***	0.012***
	(3.76)	(4.12)	(3.79)
Size (α_8)	0.104***	0.099***	0.106***
	(8.03)	(7.56)	(8.30)
Log(Age) (α_9)	-0.050***	-0.050***	-0.049***
	(-4.45)	(-4.75)	(-4.72)
HHI (α_{10})	0.201***	0.179***	0.164***
	(3.41)	(3.25)	(2.97)
Home Price Growth (α_{11})	-0.021***	-0.022***	-0.020***
	(-3.57)	(-3.78)	(-3.58)
Income Growth (α_{12})	-0.076***	-0.059***	-0.064***
	(-12.58)	(-9.01)	(-9.73)
Year 2010 ($\alpha_{13,7}$)	0.086***	0.125***	0.125***
	(4.63)	(6.69)	(6.66)
Constant (α_0)	0.204***	0.182***	0.185***
	(14.34)	(11.37)	(11.49)
Observations	23,211	23,211	23,211
Number of Banks	3,489	3,489	3,489
AB test for AR (1)	-21.97***	-20.71***	-20.65***
AB test for AR (2)	-0.17	-0.10	-0.13
Sargan Test	762***	242*	238
Number of Instruments	416	234	234

See Table A1 for variable definitions. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

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Table I. Descriptive Statistics

PANEL A. Bank-level Indicators

This table illustrates general descriptive statistics of U.S. commercial banks for the period of 2003-2010. *Non-Micro Commercial Banks* are defined as commercial banks with total assets above $100 million. *Micro Commercial Banks* are defined as banks with less than $100 million in total assets.

| | Variable | Non-Micro Commercial Banks | | | | | Micro Commercial Banks | | | | | T-Stat.† |
		Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	
General Descriptive Statistics	Total Assets (mil. $)	130,884	1,364	8,203	6.06	126,000	80,277	55	27	5.96	816	57.7***
	Non-performing Loans (%)	130,868	1.12	2.13	0.00	13.86	80,188	0.92	1.65	0.00	10.44	24.3***
	Loan Loss Reserve (%)	130,868	1.44	0.75	0.00	5.46	80,188	1.55	0.89	0.00	6.85	-28.8***
	Loan Loss Provision (%)	130,871	0.56	0.98	-0.81	6.18	80,188	0.35	0.75	-1.88	4.74	53.6***
	Risk Weighted Assets (%)	130,884	71.73	12.97	1.23	106.24	80,277	65.32	13.99	0.39	126.69	104.9***
	Spread (%)	130,884	3.54	0.87	0.69	7.71	80,267	3.67	0.85	0.62	8.05	-31.5***
	Capital (%)	130,884	10.07	3.06	0.01	25.71	80,277	11.46	3.97	0.11	30.41	-84.9***
	Inefficiency (%)	130,727	67.10	18.89	0.80	167.16	80,237	72.14	20.56	0.00	194.28	-56.4***
	Core Deposits (%)	130,884	71.24	15.03	0.00	99.99	80,277	78.56	12.72	0.00	100.00	-120***
	Liquid Assets (%)	130,884	25.95	16.17	0.00	95.08	80,277	32.47	19.93	0.00	122.10	-78.2***
	Interest Rate Risk (%)	130,687	-0.15	1.52	-3.71	5.26	80,144	-0.09	1.59	-3.49	5.25	-9.13***
	Loan Commitment (%)	130,884	3.47	4.50	0.00	26.13	80,277	1.42	2.58	0.00	14.74	132.5***
	Loan Growth (%)	130,860	2.02	5.37	-19.09	30.00	80,262	1.25	6.11	-24.27	33.13	29.2***
	Wage (thou. $)	130,739	58.31	18.30	0.04	150.18	80,194	51.50	14.20	0.44	126.09	95.6***
	Age	130,884	65.59	44.77	3.00	227.00	80,277	75.99	37.11	3.00	171.75	-57.7***
	Market Share (%)	130,884	0.70	1.73	0.00	10.92	80,277	0.08	0.09	0.00	0.64	129.9***
	Non-interest Income (%)	130,729	17.53	11.68	-21.75	80.71	80,237	14.08	8.91	-15.18	62.23	76.6***
Non-interest Income Activities	Fiduciary Activities (%)	130,729	0.90	2.48	0.00	15.06	80,237	0.06	0.29	0.00	1.79	120.7***
	Life Insurance (%)	130,729	0.64	1.06	0.00	6.47	80,237	0.40	1.00	0.00	5.88	51.4***
	Insurance Services (%)	130,729	0.43	1.24	-5.71	7.42	80,237	0.47	1.30	-0.18	7.77	-5.74***
	Loans Servicing (%)	130,729	0.41	1.15	-2.41	6.76	80,237	0.21	0.77	-0.31	4.79	49***
	Loan Sales (%)	130,729	1.46	3.51	-3.03	20.75	80,237	0.36	1.38	-0.64	8.22	101.4***
	Service Charges (%)	130,729	8.40	5.43	-20.23	38.32	80,237	8.62	5.27	-1.32	36.07	-9.02***
Other Non-interest Income Activities	Securities Brokerage (%)	62,787	0.28	0.67	-2.87	4.02	38,065	0.04	0.20	0.00	1.21	81.7***
	Investment Banking (%)	62,787	0.09	0.33	0.00	1.93	38,065	0.01	0.04	0.00	0.26	59.7***
	Trading (%)	130,729	0.01	0.06	-0.06	0.40	80,237	0.00	0.00	0.00	0.00	54.9***
	Other Assets Sales (%)	130,729	-0.14	1.83	-10.01	9.40	80,237	0.01	1.45	-7.87	8.02	-20.6***
	Other Activities (%)	130,729	4.45	5.02	-0.18	32.51	80,237	3.11	3.58	0.00	22.55	71.6***
Franchise Value	Market to Book Ratio (%)	2,836	126.7	60.27	0.01	368.5	615	99.2	52.24	2.53	278.9	11.5***
	Tobin's Q (%)	2,836	102.9	6.56	83.30	137.2	615	100.2	5.85	88.75	123.2	10.0***

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

PANEL B. State-level Indicators

This panel shows the summary statistics of HHI, the growth rate of home price index and personal income across 51 U.S. states during the 2003-2010 period.

Variable	Obs	Mean	Std. Dev.	Min	Max
HHI (%)	1,472	0.19	0.19	0.01	0.96
Home Price Index Growth (%)	1,248	0.55	2.32	-12.94	11.10
Income Growth (%)	1,248	1.06	1.33	-4.30	6.00

See Table A1 for variable definitions.

Table II. Credit Risk Model

This table reports estimations of *Credit Risk* model (Equation (1)) using quarterly data of 5,106 *Non-Micro Commercial Banks* and 2,792 *Micro Commercial Banks* during 2003-2010 timespan. *Non-Micro Commercial Banks* are defined as commercial banks with total assets above $100 million, whereas *Micro Commercial Banks* are banks with less than $100 million in total assets. We use *Non-performing Loans* as our primary *Credit Risk* proxy and regress it on our variables of interest and a set of control variables, using dynamic panel setting and fixed effect technique.

In columns (1) to (7), we estimate the model for *Non-Micro Commercial Banks*. In the first four columns we use *Non-performing Loans* as a proxy for *Credit Risk*. Column (1) illustrates the estimation of *Credit Risk* model where we regress the *Credit Risk* proxy on *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Loan Sale Income* and *Service Charge* while controlling for *Capital*, *Inefficiency* and *Risk Weighted Assets* and year fixed effect controls. In column (2), we try to capture heterogeneities caused by loan portfolio management by adding *Loan Commitment* and *Loan Growth*. *Size* and *Log(Age)* are included in the third column. We introduce state-level variables, i.e. *HHI*, *Home Price Growth* and *Income Growth* in column (4). In columns (5) to (7), we estimate our model, where we use *Loan Loss Reserve*, *Loan Loss Provision* and *Risk Weighted Assets* in lieu of *Non-performing Loans* as alternative proxies for *Credit Risk*. Finally, column (8) displays the estimations of our model for *Micro Commercial Banks*, wherein *Non-performing Loans* is used as the Credit Risk proxy. Year dummies are included in the model, but not reported in the table.

	Non-Micro Banks							Micro Banks
	Non-Performing Loans	Non-Performing Loans	Non-Performing Loans	Non-Performing Loans	Loan Loss Reserve	Loan Loss Provision	Risk Weighted Assets	Non-Performing Loans
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L. Credit Risk (α_1)	0.884***	0.876***	0.872***	0.877***	0.860***	0.668***	0.790***	0.710***
	(222.97)	(216.50)	(213.42)	(204.57)	(153.41)	(91.09)	(157.77)	(86.18)
Fiduciary (α_{21})	-0.013***	-0.013**	-0.012**	-0.010**	-0.004**	-0.011***	-0.039*	-0.019
	(-2.59)	(-2.53)	(-2.36)	(-2.02)	(-2.17)	(-2.73)	(-1.77)	(-0.76)
Life Insurance (α_{22})	-0.003	-0.004	-0.003	-0.006	0.001	0.005	-0.004	0.003
	(-0.67)	(-0.85)	(-0.58)	(-1.13)	(0.55)	(1.35)	(-0.22)	(0.38)
Other Insurance (α_{23})	-0.009**	-0.008**	-0.008*	-0.008**	-0.003*	-0.006	0.023	-0.009
	(-2.07)	(-1.98)	(-1.89)	(-1.98)	(-1.79)	(-1.52)	(1.00)	(-1.51)
Loan Servicing (α_{24})	0.001	0.002	0.002	0.001	-0.002	-0.007	-0.003	0.015
	(0.25)	(0.36)	(0.31)	(0.28)	(-0.79)	(-1.43)	(-0.13)	(1.27)
Loan Sale Income (α_{25})	-0.004**	-0.004**	-0.004**	-0.002	-0.001***	0.000	0.008	0.006
	(-2.53)	(-2.55)	(-2.54)	(-1.40)	(-2.59)	(0.24)	(1.28)	(1.01)
Service Charge (α_{26})	-0.008***	-0.008***	-0.005**	-0.004*	-0.001	0.001	-0.044***	0.004
	(-4.10)	(-4.20)	(-2.51)	(-1.76)	(-0.74)	(0.55)	(-4.96)	(1.54)
Capital (α_3)	-0.023***	-0.023***	-0.020***	-0.020***	-0.010***	-0.027***	0.105***	-0.019***
	(-8.97)	(-8.93)	(-7.90)	(-7.48)	(-9.38)	(-10.65)	(7.81)	(-5.01)
Inefficiency (α_4)	0.007***	0.007***	0.007***	0.007***	0.002***	0.006***	0.002	0.005***
	(15.51)	(15.43)	(16.09)	(14.89)	(12.84)	(16.08)	(1.42)	(9.87)
Risk Weighted Assets (α_5)	-0.002**	0.002**	0.002***	0.001	0.000	0.001**		0.002**
	(-1.98)	(2.05)	(2.80)	(1.55)	(0.27)	(1.97)		(2.30)
Loan Commitment (α_6)		-0.020***	-0.019***	-0.019***	-0.004***	-0.012***	0.266***	-0.013***
		(-10.50)	(-10.50)	(-9.83)	(-7.02)	(-8.11)	(28.89)	(-4.21)
Loan Growth (α_7)		-0.008***	-0.007***	-0.006***	-0.009***	-0.006***	0.130***	-0.007***
		(-10.22)	(-9.89)	(-7.94)	(-24.19)	(-11.37)	(29.82)	(-8.89)
Size (α_8)			0.191***	0.183***	0.036***	0.110***	-1.781***	0.048
			(8.21)	(7.49)	(4.25)	(5.86)	(-12.65)	(0.94)
Log(Age) (α_9)			0.276***	0.253***	0.062***	0.143***	1.316***	0.535***
			(7.10)	(6.09)	(4.77)	(5.16)	(7.90)	(6.95)
HHI (α_{10})				0.036	0.010	-0.051	0.106	0.010
				(0.65)	(0.50)	(-1.13)	(0.47)	(0.15)
Home Price Growth (α_{11})				-0.020***	-0.004***	-0.012***	-0.033***	-0.026***
				(-7.85)	(-4.49)	(-6.09)	(-3.90)	(-6.34)
Income Growth (α_{12})				-0.015***	-0.004***	0.001	-0.011	-0.002
				(-6.23)	(-4.78)	(0.34)	(-1.25)	(-0.55)
Constant (α_0)	-0.131***	-0.134***	-0.048***	-0.019*	0.002	-0.033***	-0.782***	-0.035***
	(-24.13)	(-23.96)	(-5.71)	(-1.94)	(0.66)	(-4.55)	(-14.57)	(-2.60)
Observations	125,211	125,211	125,211	108,630	108,630	108,632	108,644	71,094
R-squared	0.830	0.831	0.831	0.837	0.786	0.595	0.726	0.583
Number of Banks	5,106	5,106	5,106	4,371	4,371	4,371	4,371	2,792

See Table A1 for variable definitions. Standard errors are adjusted for clusters in banks. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

Table III. Spread Model

This table reports estimations of the *Spread* model (Equation (2)) using quarterly data of 5,106 *Non-Micro Commercial Banks* and 2,788 *Micro Commercial Banks* during 2003-2010 period. *Non-Micro Commercial Banks* are defined as commercial banks with total assets above $100 million, whereas *Micro Commercial Banks* are banks with less than $100 million in total assets.

We use net interest spread (*Spread*) defined as [(total interest income/average total earning assets) – (total interest expense/average total interest-bearing liabilities)] for our study. Columns (1) to (5) present our analysis of Non-Micro Banks. In the first column, we regress *Spread* on our variables of interest, i.e. *Fiduciary Activities*, *Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Loan Sale* and *Service Charge* which are scaled by total assets in lieu of total operating income, while controlling for *Capital, Inefficiency* and year fixed effects. In column (2), we introduce *Loan Loss Provision*, *Liquid Assets* and *Interest Rate Risk* to our model. We add *Core Deposit*, *Loan Commitment* and *Wage* to our analysis in column (3). Size and Log(Age) are included in the fourth column. Column (5) displays the result when we control for state-level heterogeneity by introducing *HHI*, *Home Price Growth* and *Income Growth*. In column (6), we analyse the sub-sample of Micro Banks and use the same specification presented in column (5). We estimate our model using fixed effect technique. Year dummies are included in the model, but not reported in the table.

	Non-Micro Banks					Micro Banks
Variables	(1)	(2)	(3)	(4)	(5)	(6)
L. Spread (β_1)	0.766***	0.748***	0.739***	0.736***	0.735***	0.705***
	(136.65)	(132.72)	(126.33)	(126.09)	(114.41)	(91.48)
Fiduciary (β_{21})	0.078*	0.063	0.055	0.011	0.005	0.402*
	(1.88)	(1.57)	(1.36)	(0.24)	(0.10)	(1.86)
Life Insurance (β_{22})	0.142***	0.127***	0.109***	0.075**	0.091**	-0.013
	(3.67)	(3.41)	(2.91)	(2.00)	(2.43)	(-0.25)
Other Insurance (β_{23})	0.146***	0.111**	0.092*	0.076	0.111*	0.117
	(3.06)	(2.25)	(1.71)	(1.36)	(1.88)	(1.35)
Loan Servicing (β_{24})	0.068	0.060	0.041	0.034	0.054	0.075
	(1.60)	(1.45)	(0.93)	(0.76)	(1.13)	(0.86)
Loan Sale Income (β_{25})	0.044***	0.038***	0.032**	0.031**	0.024*	-0.052
	(3.51)	(3.13)	(2.57)	(2.47)	(1.94)	(-1.21)
Service Charge (β_{26})	0.249***	0.239***	0.240***	0.193***	0.183***	0.140***
	(13.74)	(13.73)	(13.66)	(10.99)	(9.89)	(5.71)
Capital (β_3)	0.015***	0.017***	0.016***	0.015***	0.015***	0.013***
	(14.29)	(16.10)	(15.52)	(14.60)	(13.96)	(8.43)
Inefficiency (β_4)	-0.004***	-0.004***	-0.004***	-0.005***	-0.005***	-0.006***
	(-24.56)	(-25.73)	(-26.24)	(-27.60)	(-25.64)	(-24.46)
Loan Loss Provision (β_5)		0.012***	0.012***	0.014***	0.017***	0.021***
		(5.03)	(5.22)	(5.94)	(6.52)	(6.72)
Liquid Assets (β_6)		-0.006***	-0.006***	-0.006***	-0.006***	-0.007***
		(-25.62)	(-25.30)	(-25.40)	(-23.25)	(-14.22)
Interest Rate Risk (β_7)		0.001	0.003	0.000	0.004	0.041***
		(0.38)	(0.87)	(0.14)	(1.10)	(7.17)
Core Deposit (β_8)			0.001***	0.001***	0.001***	0.002***
			(6.41)	(5.27)	(3.97)	(4.22)
Loan Commitment (β_9)			0.003***	0.003***	0.003***	0.001
			(4.98)	(5.42)	(4.90)	(0.70)
Wage (β_{10})			0.003***	0.003***	0.003***	0.004***
			(11.26)	(12.21)	(9.95)	(10.92)
Size (β_{11})				-0.112***	-0.113***	-0.220***
				(-10.67)	(-10.36)	(-11.66)
Log(Age) (β_{12})				0.027**	0.044***	0.054**
				(2.26)	(3.43)	(2.52)
HHI (β_{13})					0.038	0.050*
					(1.64)	(1.82)
Home Price Growth (β_{14})					0.004***	-0.001
					(4.58)	(-1.13)
Income Growth (β_{15})					-0.005***	-0.017***
					(-4.06)	(-12.48)
Constant (β_0)	0.011***	0.042***	0.062***	0.034***	0.027***	0.079***
	(4.70)	(11.10)	(14.26)	(6.74)	(4.05)	(9.16)
Observations	125,225	125,024	124,893	124,893	108,407	70,949
R-squared	0.732	0.739	0.741	0.743	0.742	0.732
Number of Banks	5,106	5,102	5,095	5,095	4,362	2,788

See Table A1 for variable definitions. Standard errors are adjusted for clusters in banks. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

Table IV. Further Issues – Crisis and post-crisis periods

This table reports estimations of *Credit Risk* and *Spread* models (Equations (1) & (2)) using quarterly data of 4,371 *Non-Micro Commercial Banks* during 2003-2010 timespan. *Non-Micro Commercial Banks* are defined as commercial banks with total assets above $100 million. Columns (1) to (4) illustrate our Credit Risk analysis and column (5) displays the estimation of the *Spread* model. We define three dummy variables, representing pre, acute and post-crisis periods (*Pre*, *Acute* and *Post*) and use *Acute* and *Post* in lieu of year dummies. We replace *Fiduciary* with it its interaction terms with *Pre*, *Acute* and *Post*.

In the first column, we use *Non-performing Loans* as our primary proxy for *Credit Risk* and regress it on our variables of interest (*Pre×Fiduciary*, *Acute×Fiduciary* and *Post×Fiduciary*), the rest of non-interest income items (*Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Loan Sale Income* and *Service Charge*) and a set of bank-level state-level control variables, i.e. *Capital*, *Inefficiency, Risk Weighted Assets, Loan Commitment, Loan Growth, Size, Log(Age), HHI, Home Price Growth* and *Income Growth.* In column (2), *Non-performing Loans* is replaced by *Loan Loss Reserve.* We use *Loan Loss Provision* as the *Credit Risk* proxy in the third column. In column (4), *Risk Weighted Assets* as a more generic proxy is studied.

Column (5) displays the regression analysis of our Spread model, wherein the non-interest income items are scaled by total assets in lieu of total net operating income. We regress Spread on *Pre×Fiduciary*, *Acute×Fiduciary* and *Post×Fiduciary*), the rest of non-interest income activities (*Life Insurance*, *Other Insurance Services*, *Loan Servicing*, *Loan Sale Income* and *Service Charge*) and a set of bank-level state-level control variables, i.e. *Capital*, *Inefficiency, Loan Commitment, Loan Loss Provision*, *Liquid Assets*, *Interest Rate Risk*, *Core Deposit*, *Wage*, *Size*, *Log(Age)*, *HHI*, *Home Price Growth* and *Income Growth*. We estimate our model using dynamic panel setting and fixed effect technique.

	Non-performing Loans	Loan Loss Reserve	Loan Loss Provision	Risk Weighted Assets	Spread
	(1)	(2)	(3)	(4)	(5)
L.Y	0.883***	0.863***	0.669***	0.803***	0.754***
	(210.25)	(155.79)	(89.44)	(175.83)	(127.20)
Pre×Fiduciary	-0.008	-0.006***	-0.016***	-0.001	-0.026
	(-1.63)	(-3.24)	(-3.75)	(-0.04)	(-0.57)
Acute×Fiducicary	-0.014***	-0.004*	-0.010**	-0.029	0.057
	(-2.67)	(-1.92)	(-2.45)	(-1.45)	(1.16)
Post×Fiducicary	-0.015***	-0.004**	-0.019***	-0.051**	-0.091*
	(-2.82)	(-2.00)	(-3.75)	(-2.17)	(-1.69)
Life Insurance	0.005	0.002	0.008**	0.029*	-0.016
	(1.06)	(1.12)	(2.08)	(1.65)	(-0.43)
Other Insurance	-0.010**	-0.003*	-0.006	0.022	0.128**
	(-2.27)	(-1.91)	(-1.43)	(0.97)	(2.19)
Loan Servicing	0.004	-0.001	-0.005	-0.005	0.031
	(0.76)	(-0.60)	(-0.94)	(-0.22)	(0.65)
Loan Sale	-0.000	-0.001	0.002**	-0.005	0.014
	(-0.18)	(-1.57)	(2.05)	(-0.79)	(1.11)
Service Charge	-0.001	0.000	0.003**	-0.040***	0.170***
	(-0.38)	(0.14)	(2.00)	(-4.81)	(9.41)
Capital	-0.018***	-0.010***	-0.027***	0.121***	0.014***
	(-6.71)	(-9.63)	(-10.83)	(9.23)	(12.72)
Inefficiency	0.007***	0.002***	0.006***	0.005***	-0.005***
	(15.63)	(13.01)	(16.73)	(3.16)	(-26.24)
Risk Weighted Assets	0.002***	-0.000	0.002***		
	(2.60)	(-0.33)	(3.14)		
Loan Commitment	-0.020***	-0.005***	-0.013***	0.278***	0.002***
	(-10.40)	(-7.68)	(-8.87)	(31.09)	(3.31)
Loan Growth	-0.007***	-0.009***	-0.006***	0.131***	
	(-8.48)	(-24.14)	(-11.34)	(29.84)	
Loan Loss Provision					0.015***
					(5.51)
Liquid Assets					-0.006***
					(-22.03)
Interest Rate Risk					-0.008***
					(-6.66)
Core Deposit					0.001***
					(5.20)
Wage					0.002***
					(7.51)
Size	0.258***	0.036***	0.115***	-1.268***	-0.149***
	(11.78)	(4.83)	(6.95)	(-11.62)	(-14.08)
Log(Age)	0.286***	0.060***	0.107***	1.688***	0.019
	(7.19)	(4.67)	(3.88)	(10.59)	(1.47)

HHI	0.019	0.012	-0.051	-0.010	0.042*
	(0.36)	(0.61)	(-1.13)	(-0.05)	(1.87)
Home Price Growth	-0.024***	-0.003***	-0.007***	-0.070***	0.009***
	(-10.02)	(-3.58)	(-3.73)	(-8.85)	(12.12)
Income Growth	-0.028***	-0.010***	-0.029***	0.002	-0.002*
	(-12.88)	(-14.92)	(-15.27)	(0.24)	(-1.73)
Acute	0.102***	-0.001	0.034***	0.231***	-0.039***
	(11.67)	(-0.30)	(5.58)	(6.60)	(-9.71)
Post	0.092***	0.059***	0.158***	-0.212***	0.052***
	(7.89)	(15.04)	(18.37)	(-4.91)	(9.47)
Constant	0.056***	0.006***	-0.008*	-0.033	-0.018***
	(9.36)	(3.13)	(-1.92)	(-1.49)	(-7.56)
Observations	108,630	108,630	108,632	108,644	108,407
R-squared	0.836	0.786	0.591	0.723	0.738
Number of Banks	4,371	4,371	4,371	4,371	4,362

See Table A1 for variable definitions. Standard errors are adjusted for clusters in banks. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

Table V. Franchise Value Model

This table illustrates the estimation of the *Franchise Value* model (Equation (5)) using 1,882 quarterly panel data of *Non-Micro Commercial Banks* during 2003-2010 period. *Non-Micro Commercial Banks* are defined as commercial banks with total assets above $100 million.

We use the ratio of market to book value of capital equity (*Market to Book Value*) as the primary proxy for *Franchise Value*. In the first column, we regress *Market to Book Value* on our variables of interest, i.e. *Fiduciary*, *Life Insurance*, *Other Insurance*, *Loan Servicing*, *Loan Sale* and *Service Charge* which are scaled by total operating income. In column (2) we introduce *Core Deposits* to our model. We add *Credit Risk* and *Inefficiency* to our analysis in columns (3) and (4), respectively. *Capital* is included in the fifth column. Column (6) displays the result when we control for *Market Share*. In column (7) we include state-level control variables, i.e. *HHI*, *Home Price Growth* and *Income Growth*. In column (8), we scale non-interest income items by total assets in lieu of total operating income. In columns (9) and (10) we use *Tobin's Q* as the alternative proxy for *Franchise Value* and re-estimate our model with the same specifications of columns (7) and (8). Tobin's Q is defined as the market value of capital equity plus book value of total liabilities divided by book value of total assets. We estimate our model using fixed effect technique and following Petersen (2009) and Thompson (2011) we cluster standard errors at both bank and time levels.

Variables	Market to Book Value	Market to Book Value	Market to Book Value	Market to Book Value	Market to Book Value	Market to Book Value	Market to Book Value	Market to Book Value	Tobin's Q	Tobin's Q
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fiduciary	17.080***	16.994***	14.011***	15.643***	15.356***	15.971***	15.811***	396.775***	1.596***	37.899***
	(2.75)	(2.91)	(2.93)	(3.06)	(3.09)	(3.26)	(3.30)	(3.22)	(3.14)	(3.09)
Life Insurance	-24.074***	-22.133***	-18.641***	-18.017***	-18.161***	-18.332***	-6.747*	-169.125*	-0.575	-15.904*
	(-4.71)	(-4.27)	(-4.31)	(-4.17)	(-4.15)	(-4.17)	(-1.73)	(-1.72)	(-1.59)	(-1.68)
Other Insurance	8.629	8.577	4.062	4.599	5.029	5.229	2.389	52.688	-0.078	1.989
	(1.12)	(1.15)	(0.74)	(0.79)	(0.87)	(0.91)	(0.44)	(0.46)	(-0.12)	(0.17)
Loan Servicing	-11.733*	-9.373*	-6.182	-5.299	-5.143	-5.827	-1.308	45.370	-0.266	7.169
	(-1.93)	(-1.73)	(-1.36)	(-1.18)	(-1.10)	(-1.27)	(-0.30)	(0.35)	(-0.49)	(0.41)
Loan Sale	0.004	-0.139	0.423	0.376	0.369	0.375	0.442	13.253	0.049	2.549
	(0.00)	(-0.08)	(0.28)	(0.26)	(0.25)	(0.26)	(0.29)	(0.55)	(0.29)	(0.93)
Service Charge	-6.551***	-6.722***	-5.054***	-3.933***	-3.843***	-3.941***	-2.589	-51.530	-0.355**	-5.920
	(-3.46)	(-3.55)	(-3.44)	(-2.70)	(-2.62)	(-2.67)	(-1.53)	(-1.34)	(-2.24)	(-1.62)
Core Deposit		0.757*	0.889***	0.981***	0.980***	0.950***	0.681**	0.722**	0.056	0.058
		(1.85)	(2.72)	(2.98)	(2.94)	(2.85)	(2.10)	(2.25)	(1.50)	(1.57)
Credit Risk			-18.832***	-17.545***	-16.811***	-16.981***	-17.639***	-17.626***	-1.496***	-1.495***
			(-7.65)	(-7.11)	(-6.24)	(-6.22)	(-4.32)	(-4.33)	(-3.57)	(-3.59)
Inefficiency				-0.365***	-0.341**	-0.344**	-0.197	-0.260**	-0.017	-0.026
				(-2.84)	(-2.50)	(-2.52)	(-1.44)	(-1.98)	(-1.02)	(-1.53)
Capital					1.213	1.029	-0.422	-0.306	0.221	0.226
					(1.02)	(0.86)	(-0.27)	(-0.20)	(1.18)	(1.21)
Market Share						-5.982	-9.079*	-8.877*	-0.604	-0.573
						(-0.99)	(-1.70)	(-1.66)	(-1.16)	(-1.10)
HHI							-97.505***	-95.357***	-8.049**	-7.632**
							(-2.75)	(-2.67)	(-2.39)	(-2.30)
Home Price Growth							5.056***	5.041***	0.595***	0.594***
							(3.70)	(3.68)	(4.15)	(4.18)
Income Growth							4.815***	4.950***	0.535***	0.556***
							(3.21)	(3.28)	(3.60)	(3.70)

Constant	75.834	-44.622	61.040	56.492	51.817	48.943	-17.946	20.019	-5.780	1.996
	(0.82)	(-0.50)	(0.86)	(0.74)	(0.69)	(0.65)	(-0.26)	(0.97)	(-0.71)	(1.04)
Observations	2,834	2,834	2,834	2,834	2,834	2,834	1,882	1,882	1,882	1,882
R-squared	0.557	0.565	0.628	0.634	0.635	0.637	0.710	0.710	0.710	0.709

See Table A1 for variable definitions. Standard errors are adjusted for clusters in banks. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

Table VI. Cost Complementarities Analysis

This table reports Cost Complementarities analysis (Equation (3)), between the non-interest income activities and loans (secured and unsecured loans (Y1 & Y2)) for *Micro* and *Non-Micro Commercial Banks*. *Micro Commercial Banks* are defined as banks with less than $100 million in total assets. *Non-Micro Commercial Banks* are commercial banks with total assets above $100 million.

The first three columns present the analysis for the *Non-Micro Commercial Banks* and columns (4) to (6) exhibit the results for *Micro Commercial Banks*. Columns (1) and (4) display the necessary condition for the existence of cost complementarities or diseconomy of joint production between the non-interest income activities and secured or unsecured loans. In columns (2) and (5) the measure of cost complementarities (or diseconomy of joint production) are illustrated. See Table A1 for variable definitions. In the first four rows we use stochastic frontier analysis to estimate our total cost function, whereas rows (5) to (8) exhibit the results when we employ the fixed effect technique for our estimations. We adopt two cost functions: intermediation approach (Berger and Mester, 1997 among others) and production approach (Berger and DeYoung, 1997 among others).

				Non-Micro Commercial Banks			Micro Commercial Banks		
				$NC\_PCC(Y_i, Y_5)$	$PCC(Y_i, Y_5)$	Marginal Cost	$NC\_PCC(Y_i, Y_5)$	$PCC(Y_i, Y_5)$	Marginal Cost
				(1)	(2)	(3)	(4)	(5)	(6)
Stochastic Frontier Analysis	Intermediation Approach	(1)	Secured Loans (Y1)	0.000382	0.000000	0.0969	0.008652	0.000063	0.0533
		(2)	Unsecured Loans (Y2)	-0.000586	0.000000	0.0220	0.000132	0.000048	0.0515
	Production Approach	(3)	Secured Loans (Y1)	-0.000870	0.000000	0.1088	0.008577	0.000063	0.0851
		(4)	Unsecured Loans (Y2)	-0.000533	0.000000	0.0250	0.000117	0.000034	0.0573
Fixed Effect Technique	Intermediation Approach	(5)	Secured Loans (Y1)	0.000818	0.000000	0.0953	0.009879	0.000087	0.0614
		(6)	Unsecured Loans (Y2)	-0.000625	0.000000	0.0176	0.000331	0.000071	0.0589
	Production Approach	(7)	Secured Loans (Y1)	-0.000220	0.000000	0.1080	0.009922	0.000093	0.0880
		(8)	Unsecured Loans (Y2)	-0.000576	0.000000	0.0216	0.000302	0.000066	0.0728