

REVENUE DIVERSIFICATION, PERFORMANCE AND RISK: EVIDENCE FROM BANK HOLDING COMPANIES

Abstract This paper investigates the effect of revenue diversification on bank risk adjusted performance. Using a panel dataset which includes 309 bank-year observations corresponding to 56 Italian Bank Holding Companies for the period 2006-2011, the core question is to analyse the effect of diversification across and within both interest and non-interest income and their effect on some principal risk adjusted measures. The results have strategic implications both for bank managers, regulators and supervisors for the consequences on banks' performance and stability.

keywords: Revenue diversification, Commission diversification, Risk adjusted performance, Panel data

JEL classification G21

1. Introduction

The paper addresses the question of diversification in the banking sector. The transformation of European banking systems in the last three decades has been intense and strictly related to the effects of deregulation and innovation on the competitive environment. The deregulation process has largely been based on the view that income diversification reduces the volatility of bank earnings and makes banks more resilient to financial distress. After the financial crisis, the argument gains ground that the banking industry should be less diversified and refocus on lending activities (Vallascas et al., 2012).

Theoretically, the literature on bank diversification primary rests on the assumption that diversification may lead to cost savings or revenue improvements due to spreading of fixed costs, economies of scope from using the same information, customer cost economies (Berger et al, 1987). Second banks may also reduce their risks by engaging in a wide range of activities exploiting the diversification benefit (Diamond, 1984) and by reducing the agency costs of managerial discretion by lowering cash-flow volatility (Stulz, 1990; Amihud and Lev, 1981).

As in previous studies, rather than attempting to measure economies of scope and agency problems directly, we investigate whether the range of activities conducted by banks influences their performance and risk. This is particularly interesting given the turmoil period investigated.

The paper is structured as follows. Section 2 reviews the theoretical and empirical literature on the nexus between both type of diversification and bank performance. Section 3 presents the econometric methodology and the data used. Section 4 describes the results. Finally, Section 5 concludes.

2. Literature Review

2.1. Theoretical literature

Theoretically, the literature on bank diversification analyses the benefit and costs associated to the strategy developed. Among the former are the results of the portfolio theory that postulate that as long as the revenue streams from different financial activities are less than perfectly correlated, income diversification should offer banks opportunities to grow their risk-adjusted profits. Thanks to economies of scope, diversification may lead to an increase in performance through cost savings or revenue improvements due

to the joint production of a wide range of financial services (Teece, 1980 and 1982; Llewellyn, 1996; Klein and Saidenberg, 1997); moreover, diversified banks should realize revenue efficiencies when cross-selling various (fee-based) financial products alongside traditional lending-based services (Herring e Santomero, 1990). Given information asymmetry, banks gain valuable information on their clients by providing a service that might grant advantages in the provision of other services (Diamond, 1984; Sharpe, 1990; Diamond, 1991; Rajan, 1992; Saunders and Walter, 1994; Stein, 2002). Finally, for some agency theories diversification reduces the agency costs of managerial discretion by lowering cash-flow volatility (Stulz, 1990; Amihud and Lev, 1981) or by creating internal capital markets (Stein, 1997; Gertner et al. 1994; Matsusaka and Nanda, 2002).

Alongside the positive effects, adverse implications on performance have been identified. Diversification can intensify agency problems between corporate insiders and small shareholders making it more difficult to design efficient managerial incentive contracts and more difficult to align the incentives of outsiders with insiders (Aron, 1988; Stulz, 1990; Rotemberg and Saloner, 1994). Increasing the size and scope of a bank's activities introduces the "cost of complexity", which at some point may dominate the benefits that can be achieved (Rajan et al, 2000); diversified banks can use their advantage to operate with greater leverage, since several fee-based activities can be performed holding little or no regulatory capital, and to pursue riskier lending (Demsetz and Strahan, 1997; DeYoung and Roland, 2001). Diversified institutions can be characterized (DeYoung and Roland, 2001) by volatile earnings (i.e.: investment banking activities), lower switching costs for clients (i.e.: non-traditional banking services are based on transaction-based bank-client relationships) and higher operational leverage (given the heavy fixed investments in technology and human resources required) increasing in this way volatility of earnings and hampering risk adjusted performance measures. Specific to the topic of geographic diversification, when a bank enters into a new market can incur in higher risk given the adverse selection problems to the extent that existing intermediaries abandon the riskiest and least profitable customers (Salas and Saurina, 2002).

2.2. Empirical literature

Despite extensive research on the economic consequences of diversification, the empirical literature does not provide clear evidence on whether diversification generates net benefits or costs; this could be linked to the fact that it is extraordinarily difficult to unequivocally measure economies of scope or agency problems empirically. Given this, a more recent strand of empirical literature rather than attempting to measure economies of scope and agency problems directly, investigate whether the range of activities conducted by financial institutions influences their performance.

The empirical analysis centred on the profile of the diversification between interest and non-interest bearing activities has largely concerned the US banking system. With few exceptions¹ the results conclude that the costs of diversification outweigh the benefits (Stiroh 2004a,b; Stiroh and Rumble, 2006; Laeven and Levine, 2007; Goddard et al. (2008)) and the result is valid both for financial holding companies and smaller institutions such as credit unions.

Fewer studies deal with European banks. Among them, Mercieca et al. (2007) explores the economic impact of diversification on average profitability by calculating the effect of an increase in the non-interest share on a sample of 755 for small European banks for the period 1997–2003. The analysis evidences that an increase in non-interest activities has two main effects, that are a direct impact from shifting into non-interest activities and, an indirect effect arising from changes in diversification. Moreover, a negative net effects for average profitability and a corresponding positive effects on volatility are detected. The results are robust with respect to several controls, suggesting that over the investigated period the higher volatility of net-interest income outweighs diversification benefits. Lepetit et al. (2008) focusing on the relationship between bank risk and product diversification for a set of European banks belonging to 14 countries during the period 1996-2012 find that a shift into non-interest activities involves higher risk and this is particular true for smaller banks and driven by commission and fee activities.

¹ See Stiroh (2009) for a recent review of the literature

Turning to the Italian situations, Acharya et al. (2006) analyse the relationship between industrial loan diversification and performance using data from 105 Italian banks over the period 1993-1999 concluding that diversification of bank assets is not guaranteed to produce superior performance and/or greater safety for banks. Chiorazzo et al. (2008) using annual data from 85 Italian banks over the period 1993–2003 find that income diversification increases risk-adjusted returns and that diversification gains diminish with bank size. Cotugno and Stefanelli (2012) using a panel dataset comprising 4038 observations relative to Italian banks for the period 2005-2010 find a positive relationship between product diversification and bank performance also in terms of risk adjusted measures. Vallascas (2012) on a sample of 145 Italian banks during the period 2006-2008, using detailed data on the composition of bank income verifies that institutions that were diversified within narrow activity classes before the crisis experienced large declines in performance during the financial crisis. By contrast, diversification across broad activity classes, such as lending and capital market activities, did not cause performance losses during the crisis.

Following the above literature in the paper, we consider the effects of revenue diversification on performance. The aim is to investigate whether, and to what extent, bank propensity toward non-interest income affects some principal risk adjusted performance measures.

2.3. Model specification

The review of the literature provided above suggests the following hypotheses to be tested in the remainder of the paper:

H1 – diversification effects between interest and non-interest bearing activities

H2 – diversification effects within commission income

Respect the previous work on bank diversification, our paper represents the first attempt to directly assess the risk/return implications of different types of product mixes. Commission and fee activities are in fact split into different components. Second a large amount of additional explanatory variables have been included in the model in order to avoid potential omitted variables bias. Finally we consider a large set of diversification and risk adjusted performance measures at the bank individual level using consolidated balance sheet when available and unconsolidated if not. This latter choice is of particular importance for several reasons: on one hand banks tend to reserve the making of non traditional innovative activities to non-banking subsidiaries whose contribution can be more precisely evaluate if consolidated financial statements are available; furthermore, diversification benefits may exist for the institution as a whole and not for the single subsidiary. On the other hand, since financial holding company represents the relevant unit of observation for regulators on extremely important topic such as the level of systemic risk (Stiroh and Rumble, 2006).

3. Methodology and data

3.1. Data

Bank-level data come from ABI, which contains detailed financial information on Italian banks. We exclude banks with missing data on basic accounting variables, including assets, loans, deposits, equity, interest income, non-interest income and commission. Finally, we exclude extreme outliers, which we define as banks with all performance measures outside the first and 99th percentile. We use the last six years for which ABI has data in line with our research question, 2006–2011. The starting date is 2006 since Italian banks report unconsolidated accounting data based on IFRS from that date. The final dataset includes 309 bank-year observations corresponding to 56 BHC.

Differently from DeYoung and Roland (2001), Chiorazzo et al. (2008) and Vallascas et al. (2012) we analyze the relationship between diversification strategies and bank performance using consolidated accounting data when available and unconsolidated otherwise.

3.2. Measure of banks' revenue diversification

To determine the degree of bank diversification asset-based measure and/or income-based indicator can be used. Ideally to measure the diversification of bank activities, detailed data on the degree to which each bank underwrites, operates mutual funds, insurance, etc should be used. The dataset available do not provide information with this type of detailed information on the different type of activities engaged. So several authors construct revenue based measure that suffers from larger measurement problems than the asset-based measure (Laeven, Levine 2007). In fact, loans and in general more traditional activities can yield fee income; in this way the income-based measure could overestimate the degree to which some lending institutions engage in non-lending activities. For instance, DeYoung and Rice (2004) show that payment services linked to traditional banking activities are the largest source of non-interest income for U.S. banks.

To mitigate the overestimation problem, the ABI dataset enable us to disaggregate fee income in relation to the type of activities developed.

In line with our research question, we construct several measures detailed in the remainder of the section.

The first type of diversification analysed is the one related to the **diversification across different sources of income**. Traditionally in literature (Stiroh, 2004a,b; Lepetit et al., 2008) one way to capture the degree of diversification of bank activities is to consider the net interest income generated by traditional activities and non-interest income produced by non-traditional. To this end, several authors have used an adjusted Herfindahl–Hirshman index (HHI) to account for diversification between major activities (among the others Acharya et al., 2006; Stiroh and Rumble, 2006; Mercieca et al., 2007; Elsas et al., 2010). As the HHI rises, the bank becomes more concentrated and less diversified. To have a direct measure of diversification (DIV) the sum of squared revenue shares have been subtracted from unity so that DIV increases in the degree of revenue diversification. Moreover, following DeYoung and Roland (2001) and Elsas et al. (2010) that argue that the use of gross revenues is preferable to net revenues because allocating expenses (especially interest expenses) to different lines of bank business is somewhat arbitrary and may lead to biased diversity measures, as in Vallascas (2012), we use gross measures. Analytically:

$$DIV_REV = 1 - \left(\left(\frac{INT}{TOP} \right)^2 + \left(\frac{COM}{TOP} \right)^2 \right)$$

INT is gross interest revenue², COM denotes gross commission revenue and TOP – Total operating revenue is the sum of the two (TOP = INT+ COM). By definition DIV can take on values between zero (the bank is fully specialized in one business area) and 0.5 (the bank generates a fully balanced revenue mix from the two business areas).

The second set of indicators enable to verify the degree of **diversification between different sources of commision revenues**. Following the seminal work of DeYoung and Roland (2001), Stiroh (2004a,b), Mercieca et al. (2007) and Lepetit et al. (2007) to allow for deeper insights we have in fact to distinguish the different components of non-interest income. As in Vallascas (2012) we identify gross commission components. In particular, we divide commission revenue along four principal dimensions; the first three identify a productive diversification profile the last one a distributive diversification strategy followed by the banks in the sample. The four categories are the following:

² Gross interest revenues are computes as Interest and similar income - Interest and similar income on Financial assets held for trading; impaired financial assets - Interest and similar income on Financial assets held for trading; other assets - Interest and similar income on Hedging derivatives: total

- Traditional Banking Commission (TBC) that comprise commission income from guaranties given, collection and payment services, services related to factoring, tax collection services, current accounts management and other services;
- Market and Trading Commission (MKT) fee and commission revenue from credit derivatives, trading operations in financial instruments and foreign exchange, custody and administration of securities, underwriting operations, servicing related to securitization, placement of securities, Multilateral Trading Facilities management, financial structure consultancy service;
- Asset management commission (AM) from portfolio management services, depositary bank services, investment consultancy service;
- Fee based revenues from the distribution of third party products and services (DIS).

To construct measures of diversification within gross revenue we compute the measure DIV_{COM}

$$DIV_COM = 1 - \left(\left(\frac{TBC}{COM} \right)^2 + \left(\frac{MKT}{COM} \right)^2 + \left(\frac{AM}{COM} \right)^2 + \left(\frac{DIS}{COM} \right)^2 \right)$$

where $COM = TBC + MKT + AM + DIS$ higher values indicate greater concentration

3.3. Risk adjusted performance measures (VV)

Four alternative proxies of bank performance are employed to investigate the relation between diversification and bank performance: the return on assets (ROA) defined as the ratio of net profits to total assets. As an alternative profitability measure, we use the return on equity (ROE), which is the ratio of net profits to equity. To adjust these measures for risk (volatility), following Stiroh (2004) and Chiorazzo (2007) we compute the ratio between the annual return (ROA or ROE) and its standard deviation calculated over the entire sample period. Analytically:

$$SHROE_{i,t} = \frac{ROE_{i,t}}{\sigma ROE_i} \quad SHROA_{i,t} = \frac{ROA_{i,t}}{\sigma ROA_i}$$

where $SHROE_{i,t}$ and $SHROA_{i,t}$ indicate risk-adjusted returns, respectively, in terms of ROE and ROA, for the bank i in the year t .

Finally as in Stiroh 2004 we introduce a measure of insolvency risk computed in terms of the Z-score. The Z-score measures the distance to default and is calculated as follows.

$$Z - score_{i,t} = \frac{\left(ROA_{i,t} + \frac{E_{i,t}}{TA_{i,t}} \right)}{\sigma(ROA_{i,t})}$$

3.4. Control variables

The banking sector all around the world has experienced major transformations in its environment, resulting in significant impacts on its performance. Thereby, both external and internal factors have been affecting the profitability of banks over time. The internal determinants include bank-specific variables. The

external variables reflect environmental variables that are expected to affect the profitability of financial institutions.

This section describes the control variables that we use in the econometric model distinguish between bank specific and external determinants

Bank specific determinants

To capture the effects of bank size we use the continuous variable SIZE which is equal to the \ln (assets) where assets is the year end Total asset; to control for the potential nonlinear relationship between size and performance; as in Berger et al. (2010) we also include the squared term of \ln (assets) – SIZE_SQ. We do not use this control variable in the equation of ROA and SHROA since the indicators are inversely correlated with the level of bank assets.

As a proxy for bank capital we use the ratio between Total capital and Risk weighted assets – CAPITAL_RATIO.

To proxy bank's credit quality we use the ratio of loan loss provisions over total loans (LLP) and the variable Non-performing loans over Total loans (NPL).

To evaluate if loans are more profitable than other earning assets and in this way affects risk-adjusted returns we use the variable LOAN, which is the ratio between total loans and bank assets (DeYoung and Rice, 2004a; Stiroh, 2004a).

To proxy for managers risk attitude, we insert the variable GROWTH computed as the growth rate of bank total asset. Risk-loving bank managers usually prefer fast growth to more stable profits (Stiroh 2004a). GROWTH could be also interpreted as a control variable for growth-by-acquisition (Chiorazzo et al., 2008).

To measure the effect of efficiency on bank profitability (COST_INCOME) we introduce in the analysis the cost income ratio computed as the ratio between personnel expenses and other administrative expenses over intermediation margin.

To take into consideration the liability diversification we compute the ratio Customer Deposits/Total asset (FUNDING_DIV).

To proxy for ownership dispersion we use a dummy variable (OD) that equals 1 if the bank is listed in a stock market, and zero otherwise (Iannotta et al., 2007). The sign can be either positive or negative. When ownership is dispersed incentive problems are more acute thus reducing performance; on the other hand the market discipline mechanism can enhance positively the performance measures.

To catch the effect of bank nature of owners we use a dummy variable (MB) that equals 1 if the bank is a mutual bank (cooperative and mutual), and zero otherwise (commercial). Mutual banks are generally considered as relatively less profitable (i.e.: expectation of a negative coefficient) nonetheless, the low risk preferences of Mutuals would suggest a positive sign (Iannotta et al., 2007)

As in Chiorazzo (2008) we use a the variable REGIONS which is a dummy variable equal to one if the bank operates its branches in only one of the Italian regions, and equal to zero otherwise.

To account for the nationality of the bank's ultimate owner we introduce the dummy variable FOREIGN which is equal to 1 if the ultimate owner is a foreign entity and zero otherwise.

External determinants

In addition to the bank-specific variables described above, our analysis includes a set of macroeconomic and industry-specific characteristics.

Real GDP growth rate: because the demand for lending increases during cyclical upswings. The GDP_INDEX measures the GDP growth rate calculated in respect to the i-bank, weighting the indicator at the province level with the ratio of branches in the province in respect to the total amount of branches of the i-bank. The

procedure allows to take into account of the different impact that each macro-indicator has on the bank, in respect to the presence of that bank in that province.

$$GDP_INDEX_i = \sum_{z_p} \frac{Branches_{iz_p}}{Branches_i} * (GDP_RATE)_i$$

where i refers to the bank and z_p to the province where the bank operates.

To control for the effect of geographic diversification – as suggested by Alessandrini et al., 2008 - we introduce the following index:

$$GEO_{i,t} = \frac{\sum_{j=1}^K \left(\frac{Bank\ branches\ in\ provinces_{i,j,t}}{Total\ bank\ branches_{i,t}} \right)}{P_i}$$

i =banks

j =provinces.

Year dummies. Five individual dummy variables which equal either one or zero for each year from 2007 to 2011, with 2006 being the excluded year

Structural break dummy. To account for the consequences from financial crisis we insert a dummy variable equals to zero for the years 2006, 2007 and 2008 and equals to one otherwise.

3.5. Empirical methodology

We use the econometric model shown in Eq. (a) to examine the link between diversification and the level and volatility of the banks' profitability. This regression uses $Y = [ROE, SHROE, ROA, SHROA, Z-Score]$ as dependent variables:

$$y_{i,t} = \alpha_i + \beta_1 DIV_REV_{i,t} + \beta_2 PRP_COM_{i,t} + \beta_3 DIV_COM_{i,t} + \beta_4 PRP_MKT_{i,t} + \beta_5 PRP_AM_{i,t} + \beta_6 PRP_DIS_{i,t} + \sum_{i=1}^n \beta_i \lambda_{i,t} + \varepsilon_i \quad (a)$$

where i identifies the individual bank-observation belonging to the sample ($i = 1, 2, 3, \dots, 3060$); t expresses the time variable ($t = 2006, \dots, 2011$); β_s are the parameters to be estimated, λ is a matrix of control variable. Both the constant and the error terms are also indicated in the model.

DIV_{REV} is revenue diversification, PRP_{NON} is the proportion of gross commission in the sum of commission income and gross interest revenue. Then we differentiate within the gross commission revenue, whereby DIV_{COM} is the commission diversification, PRP_{MKT} is the proportion of market and trading commission, PRP_{AM} is the proportion of asset management commission and PRP_{DIS} is the proportion of third party products and services distributive commission.

The other variables control for factors potentially affecting the level and volatility of profits.

It is important to note that the regression coefficients on the individual component shares in the revenue shares measure the effect of a shift from the omitted category of the component share into an alternative since one component share has to be excluded to avoid perfect collinearity. Positive values of β_1 indicate that income diversification improved performance. β_2 denotes the effect on performance due to variations in the share of commission income on the sum of commission income and gross interest revenue

holding the effects of diversification (DIV) constant; positive values of β_2 show that increases in noninterest income share are associated with higher risk-adjusted returns.

The coefficients obtained with Eq. (a) are not to be interpreted in a causal sense as we estimate a reduced-form model. Thus, our coefficients show conditional correlations between the various measures of bank performance and the pursued diversification strategies.

A list of the variable used is presented in Table 1.

[Table 1 around here]

4. Empirical Results

4.1. Descriptive statistics

[Table 2 around here]

[Table 3 around here]

4.2. Multivariate Analysis

[Table 4 around here]

[Table 5 around here]

4.3. Further ccontrols

4.4. Robustness checks

5. Conclusions

References

Acharya V. V., Hasan I. and A. Saunders, 2006. "Should banks be diversified? Evidence from individual bank loan portfolios". *Journal of Business*. 79, 1355-1412.

- Berger A. N., I. Hasan, M. Zhou, 2010. The effects of focus versus diversification on bank performance: Evidence from Chinese banks. *Journal of Banking & Finance*. 34, 1417–1435.
- Chiorazzo V., Milani C., Salvini F., 2008. "Income Diversification and Bank Performance: Evidence from Italian Banks". *Journal of Financial Services Research*. 33, pp. 181–203.
- Cotugno M. and V. Stefanelli, 2012. "Geographical and Product Diversification during Instability Financial Period: Good or Bad for Banks?" Available at SSRN: <http://ssrn.com/abstract=1989919> or <http://dx.doi.org/10.2139/ssrn.1989919>
- DeYoung, R., Roland, K., 2001. Product mix and earnings volatility at commercial banks: Evidence from a degree of total leverage model. *Journal of Financial Intermediation* 10, 54–84.
- Elsas R., A. Hackethal, M. Holzhäuser, 2010. The anatomy of bank diversification. *Journal of Banking & Finance*. 34, 1274–1287.
- Herring R. J., Santomero A. M., 1990, The Corporate Structure of Financial Conglomerates, *Journal of Financial Services Research*, 471-497
- Iannotta, G., Nocera, G., Sironi, A. (2007). Ownership structure, risk and performance in the European banking industry. *Journal of Banking and Finance* 31 (7), 2127-2149.
- Klein P. G., Saldenberg M. R., 1997, Diversification, Organization and Efficiency: Evidence from Bank Holding Companies, mimeo
- Laeven L., and R. Levine, 2007. Is there a diversification discount in financial conglomerates?. *Journal of Financial Economics*, 85, 331–367.
- Lepetit L., E. Nys, P. Rous and A. Tarazi, 2008. Bank income structure and risk: An empirical analysis of European banks. *Journal of Banking & Finance*, 32, 1452–1467.
- Llewellyn D. T., 1996, Universal Banking and the Public Interest: a British Perspective, in *Universal Banking: Financial System Design Reconsidered*, edited by Saunders A. and I. Walter, Irwin, 161-204
- Mercieca S., K. Schaeck and S. Wolfe, 2007. Small European banks: Benefits from diversification?. *Journal of Banking & Finance*. 31, 1975–1998.
- Micco, A., Panizza, U., Yanez, M., 2007. Bank ownership and performance. Does politics matter? *Journal of Banking and Finance* 31 (1), 219-241.
- Stiroh, K., 2004a. Do community banks benefit from diversification?, *Journal of Financial Services Research* Vol. 25, pp. 135–160.
- Stiroh, K., 2004b. Diversification in banking: Is non-interest income the answer? *Journal of Money, Credit and Banking*. 36 (5), 853–882.
- Stiroh K. and A. Rumble, 2006. The dark side of diversification: The case of US financial holding companies. *Journal of Banking and Finance*. 30 (8), 2131–2432.
- Stiroh K., 2009. Diversification in Banking, in Berger A., Molyneux P. and J. O. Wilson (eds), *The Oxford Handbook of Banking*; Oxford University Press.
- Teece D. J., 1980, Economies of Scope and the Scope of the Enterprise, *Journal of Economic Behaviour and Organization*, 223-247
- Teece D. J., 1982, Towards an Economic Theory of the Multiproduct Firms, *Journal of economic behaviour and organization*, pag. 39-63
- Vallascas, F., Crespi, F. and Hagendorff J, 2012. Income Diversification and Bank Performance During the Financial Crisis. Available at SSRN: <http://ssrn.com/abstract=1793232> or <http://dx.doi.org/10.2139/ssrn.1793232>

Table 1 Variables names and definitions

Name	Definition
	<i>Main variables</i>
ROE	$\frac{\text{Net profit}}{\text{Equity}}$
SHROE	$SHROE_{i,t} = \frac{ROE_{i,t}}{\sigma ROE_i}$
ROA	$\frac{\text{Net result from ordinary activity}}{\text{Total asset}}$
SHROA	$SHROA_{i,t} = \frac{ROA_{i,t}}{\sigma ROA_i}$
Z_SCORE	$Z\text{-score}_{i,t} = \frac{\left(ROA_{i,t} + \frac{E_{i,t}}{TA_{i,t}}\right)}{\sigma(ROA_{i,t})}$
DIV_REV	$DIV_{REV} = 1 - \left(\left(\frac{INT}{TOP} \right)^2 + \left(\frac{COM}{TOP} \right)^2 \right)$
PRP_COM	$\frac{COM}{TOP}$
DIV_COM	$DIV_{COM} = 1 - \left(\left(\frac{TBC}{COM} \right)^2 + \left(\frac{MKT}{COM} \right)^2 + \left(\frac{AM}{COM} \right)^2 + \left(\frac{DIS}{COM} \right)^2 \right)$
PRP_MKT	$\frac{MKT}{COM}$
PRP_AM	$\frac{AM}{COM}$
PRP_DIS	$\frac{DIS}{COM}$
CAPITAL_RWA	Total capital over risk weighted assets
COST_INCOME	Personnel and other administrative expenses over intermediation margin
NPL	$\frac{\text{Net Non Performance Loans}_t}{\text{Net Loans}_t}$

Further controls

SIZE_SQ	(Ln Total Asset) ²
SIZE	Ln Total Asset
CAPITAL_RATIO	Equity over Total Asset
LLP	$\frac{\text{Loan Loss Pr ovisions}_t}{\text{Net Loans}_t}$
FUNDING_DIV	Customers loans/Total assets
LIQUIDITY RISK	Cash and Bank loans/Demand deposits and Bank deposits
GEO	$GEO_{i,t} = \frac{\sum_{j=1}^K \left(\frac{\text{Bank branches in provinces}_{i,j,t}}{\text{Total bank branches}_{i,t}} \right)}{P_i}$
GDP_INDEX	$GDP_INDEX_i = \frac{\sum_{z_p} \frac{\text{Branches}_{i,z_p}}{\text{Branches}_i} * (\text{GDP_RATE})_i}{P_i}$
LOAN_GROWTH	$\frac{\text{Net Loans}_t - \text{Net Loans}_{t-1}}{\text{Net Loans}_{t-1}}$

Table 2 Summary statistics for all bank holding companies, on average over the period 2006-2011

	Obs	mean	sd	min	max
<hr/>					
Performance Measure					
ROE	309	0.04	0.11	-0.77	0.28
SHROE	307	1.63	1.95	-2.18	7.75
ROA	309	0.01	0.01	-0.05	0.06
SHROA	307	1.59	1.44	-2.63	6.11
Z-SCORE	309	21.47	12.01	0.80	64.80
Revenue Diversification					
DIV_REV	309	0.33	0.10	0.01	0.50
DIV_COM	309	0.47	0.16	0.00	0.72
Shares of different sources of revenues					
PRP_COM	309	0.30	0.22	0.00	0.91
PRP_MKT	309	0.19	0.16	0.00	0.97
PRP_AM	309	0.14	0.19	0.00	0.94
PRP_DIS	309	0.13	0.18	0.00	0.95
Other variables					
CAPITAL_RWA	309	0.13	0.09	0.00	1.42
COST_INCOME	309	0.85	2.99	0.19	53.08
NPL	309	0.01	0.01	0.00	0.10

Table 3 Correlation Matrix

	ROE	SHROE	ROA	SHROA	Z-SCORE	DIV_REV	PRP_COM	DIV_COM	PRP_MKT	PRP_AM	PRP_DIS	COST_IN COME	CAPITAL _RWA	NPL	BREAK
ROE	1														
SHROE	0.5588*	1													
ROA	0.6802*	0.4743*	1												
SHROA	0.6024*	0.8309*	0.6559*	1											
Z-SCORE	0.1393*	0.5489*	0.2199*	0.5683*	1										
DIV_REV	0.0565	0.0052	0.0552	-0.0536	-0.1435*	1									
PRP_COM	0.1294*	-0.0644	0.2959*	-0.0950*	-0.3351*	0.3646*	1								
DIV_COM	0.1352*	-0.0108	0.0572	0.1433*	0.1378*	0.1445*	-0.1252*	1							
PRP_MKT	-0.2044*	-0.1584*	-0.1439*	-0.1552*	-0.1423*	-0.0135	0.0857	0.2773*	1						
PRP_AM	0.1592*	0.0039	0.2707*	0.0675	-0.1059*	0.1366*	0.6393*	0.2236*	0.1292*	1					
PRP_DIS	0.0546	-0.1240*	0.0732	-0.0786	-0.1766*	0.0597	0.1552*	-0.0112	-0.3442*	-0.1927*	1				
COST_INCOME	-0.4670*	-0.1297*	-0.3501*	-0.1991*	-0.1165*	0.0098	-0.0077	-0.1403*	0.3071*	-0.034	-0.0486	1			
CAPITAL_RWA	-0.0279	-0.0619	0.2882*	0.0308	0.1513*	-0.0049	0.2515*	-0.1111*	0.2324*	0.1599*	-0.0761	0.0003	1		
NPL	-0.2697*	-0.0855	-0.2950*	-0.1341*	0.1474*	0.0313	-0.3534*	0.0079	-0.1671*	-0.2853*	-0.0371	0.0753	-0.1035*	1	
BREAK	-0.3031*	-0.2474*	-0.2991*	-0.3734*	-0.0715	0.2157*	0.1549*	-0.1682*	-0.1096*	-0.0172	-0.0344	0.0629	0.0303	0.3018*	1

* Indicates statistical significance at 10% level, respectively.

Table 4 Diversification, performance and risk

Panel data regression fixed effect. All bank holding companies in the sample

<i>Dependent variable</i>	ROE	ROA	SHROE	SHROA	Z-SCORE
Constant	-0.15**	-0.01*	0.18	-1.387**	12.488***
DIV_REV	0.15*	0.001	-1.18	0.629	0.511
PRP_COM	0.03	0.011	-0.09	0.641	1.136
DIV_COM	0.20**	0.009	1.63*	1.630*	3.812
PRP_MKT	0.08	0.011*	3.26***	4.084***	7.903*
PRP_AM	0.19**	0.013	2.94***	4.709***	11.492***
PRP_DIS	0.23**	0.037***	3.33***	4.918***	15.374***
COST_INCOME	-0.01***	-0.005***	-0.03	-0.028	0.021
CAPITAL_RWA	-0.02	0.021***	-0.43	1.143	22.295***
NPL	-1.99***	-0.191***	-23.30***	-29.740***	-99.991***
<i>Number of observations</i>	309	309	307	307	309
<i>R-squared</i>	0.2041	0.2042	0.2183	0.2791	.2561

***, **, * Indicates statistical significance at the 1%, 5%, and 10% level, respectively.

Table 5 Diversification, performance and risk: the effect of financial crisis
 Panel data regression fixed effect. All bank holding companies in the sample

<i>Dependent variable</i>	ROE	ROA	SHROE	SHROA	Z-SCORE
Constant	-0.136**	-0.008	0.357	-1.192**	12.911***
DIV_REV	0.186*	0.004	-1.173	0.631	1.280
PRP_COM	0.357***	0.046***	5.063***	6.362***	9.770*
DIV_COM	0.166**	0.005	1.264	1.222	2.800
PRP_MKT	-0.062	-0.004	1.129	1.721**	4.222
PRP_AM	0.009	-0.007	0.212	1.682**	6.599
PRP_DIS	0.034	0.015*	0.512	1.795**	10.097**
COST_INCOME	-0.006***	0.000	0.009	0.011	0.081
CAPITAL_RWA	-0.047	0.018***	-0.710	0.835	21.525***
NPL	-0.746	-0.057	-5.271	-9.731*	-67.130**
BREAK	-0.079***	-0.009***	-1.149***	-1.275***	-2.102***
<i>Number of observations</i>	309	309	307	307	309
<i>R-squared</i>	0.3081	0.3614	0.3877	0.4889	0.2918

***, **, * Indicates statistical significance at the 1%, 5%, and 10% level, respectively.