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Bank Diversification and Overall Financial Strength: International Evidence Around the Crisis

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Bank diversification and overall financial strength: International evidence around the crisis

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Abstract

Using a rigorous overall financial strength indicator constructed along the dimensions of the CAMEL framework, this study examines the impact of income, earning assets, and on-and-off balance sheet diversity on banks' financial strength. We find that income diversification can be more beneficial for banks operating in less developed countries compared to banks in advanced and major advanced economies. However, we observe the opposite in the case of diversification between off-balance sheet and on-balance sheet activities. Furthermore, the results reveal that income and earning assets diversification can mitigate the adverse effect of the financial crisis on bank financial strength. We continue to find a positive relationship between diversification and financial strength while accounting for nesting effects, endogeneity, self-selection, as well as when using an alternative approach for the construction of the financial strength indicator.

Keywords: Banks, Diversification, Financial strength

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1. Introduction

In recent years we have witnessed great changes in the composition of banks' earning assets portfolio, the relative importance of on-and off-balance sheet activities, and a general shift away from traditional interest income generating activities into non-interest income related services. Barth et al. (2004) outline several theoretical reasons for restricting bank activities as well as alternative reasons for allowing banks to participate in a broad range of activities. For example, on the negative side they emphasize among other things the conflicts of interest that arise when banks engage in diverse activities, and the moral hazard problems that are associated with greater opportunities to increase risk through an engagement in a broader range of activities. On the positive side, they discuss the utilization of economies of scale and scope, the potential increase in the franchise value of banks, and the diversification of income sources that could result in more stable banks. The existing empirical evidence on the diversification of banking institutions also provides conflicting views. Some studies support the view that diversification has a positive impact on bank outcomes (e.g. Elsas et al., 2010), while others raise doubts about the potential diversification benefits or provide mixed results (e.g. Fomby et al., 2012). In general, existing studies examine bank performance or risk-taking using individual ratios and to some extent the results depend on the employed measure (e.g. Stiroh, 2004; Demirgüç-Kunt and Huizinga, 2010).

Motivated by the above discussion, this study asks a straightforward question: does the overall financial strength of diversified banks differ from that of more specialized ones? In other words, does diversification improve (worsen) the overall financial strength of banks? To answer this question we adopt a somewhat different framework than the one used in earlier studies, and we rely on a two-stage analysis. First, we construct a novel Overall Financial Strength Indicator

(OFSI) that draws on the components of the CAMEL framework that is used by US regulators.[1] Thus, our indicator assesses the financial condition of banks over five dimensions, namely capital adequacy, asset quality, management, earnings and liquidity. In the second stage of the analysis, we examine whether and how the overall financial strength of banks, as measured by OFSI, is influenced by bank diversification decisions.

Using this overall indicator has at least three advantages over the use of single financial ratios employed in earlier studies (e.g. ROA). First, this indicator provides a general picture about the overall financial strength of banks, rather than focusing on individual aspects like performance or risk, which provide only partial views.[2] Second, the multicriteria, scenario-based evaluation approach that we use for the construction of the OFSI, allows us to simultaneously take into account the conflicting objectives of managers, and examine multiple scenarios with respect to the way that these objectives contribute to bank financial strength. For instance, managers could increase the bank's interest income in the short-run by approving a high interest loan to a borrower with low creditworthiness. However, this strategy will most likely be

[1] Building on the CAMEL framework, supervisory agencies in the United States estimate the CAMEL ratings to assess a bank's overall condition. This particular rating that is on a scale from 1 to 5 is based on financial statements of the bank and on-site examination by regulators like the Federal Reserve and the Federal Deposit Insurance Corporation. It is said, that the US government used these confidential ratings to decide which banks would receive special support during the capitalization program authorized by the Emergency Economic Stabilization Act of 2008 (e.g. see Semiannual report to the Congress, 2009). In 1997, a sixth component was added to the US regulatory rating, namely the Sensitivity to market risk. Thus, this specific rating is also known as CAMELS.

[2] One indicator of risk that is commonly used in recent studies is the Z-score, calculated as the equity to assets ratio plus the return on assets ratio divided by the standard deviation of the return on assets. Despite its popularity this indicator has at least three drawbacks. First, there is no guidance as for the number of years that have to be used for the calculation of the standard deviation, with many studies relying on just two or three years. In addition, the requirement of having data for numerous continuous years reduces the observations to be used in subsequent analysis. Third, the Z-score focuses on profitability and capitalization ignoring other aspects like liquidity risk and asset quality. Given the second and third point, a direct comparison of the regression results obtained under the Z-score and the OFSI may not be appropriate, whereas a horserace between the two methods falls outside the scope of the present paper. However, to test whether the two indicators move in the same direction, we calculated the Z-score for a reduced sample of 4,397 bank-year observations, using banks for which we had data for at least four continuous years (see Demirgüç-Kunt and Huizinga, 2010; Bertay et al., 2013). The correlation of the natural logarithm of the Z-score (see Demirgüç-Kunt et al., 2008; Laeven and Levine, 2009; and in particular Strobel, 2013 for the advantages of the log-transformed measure) with the OFSI is positive and statistically significant with the coefficients being 0.406 (Pearson's r) and 0.375 (Spearman's rho).

associated with problems appearing in the form of non-performing loans. Alternatively, they may try to increase bank returns, by decreasing the liquid assets that they hold. However, this may result in liquidity risk. Nonetheless, prudent managers should aim for profit maximization, while minimizing the non-performing to loans ratio, and maintaining liquidity, capital adequacy, etc. As discussed above, the adopted multicriteria approach allows us to consider these conflicting goals during the estimation process. Third, the decision of managers to diversify, affects various bank attributes, and not only profitability. For example, changing the earning assets portfolio mix, to include more loans and less other earning assets, will impact liquidity since loans are generally considered to be illiquid assets. This decision will also change the total capital ratio of the bank, as loans and let us say bonds are assigned different weights in risk-weighted ratios. Finally, a bank that holds higher proportions of loans may have to devote more resources on the screening and monitoring of the quality of its portfolio compared to a bank that invests in bonds and other earning assets, a strategy than can be associated with higher expenses.[3,4]

Another interesting aspect of our work is that, in contrast to the vast majority of the banking studies that focus on the US, we follow a recent strand of the literature that examines cross-country datasets (e.g. Baele et al., 2007; Elsas et al., 2010). Using a sample of 1,204 commercial banks operating in 111 countries between 2001 and 2010, allows us to examine the relationship between financial strength and diversification under different regulatory and institutional regimes. It also provides an interesting basis for testing this relationship around the financial crisis on a global basis.

[3] We discuss here the shift from loans to other earning assets. Similar arguments can be made for a shift from interest income to non-interest income. The reason is that in order to generate higher interest income relative to non-interest income, the bank must first change the composition of its assets. Similarly, a bank may change the composition of its balance sheet through a higher (lower) involvement in OBS activities.

[4] Berger and DeYoung (1997) provide a detailed discussion on the relationship between the quality of the loan portfolio and cost efficiency.

Our results indicate that diversification improves the overall financial strength of banks. This holds irrespectively of whether we examine diversification related to income, earning assets portfolio mix, or on- and off-balance sheet activities. Furthermore, the findings are robust to the inclusion of various country-specific variables that control for macroeconomic conditions, regulations, financial intermediation development, institutional development, and concentration in the banking sector, among others. The results also reveal that income diversification can be more beneficial for banks operating in less developed countries (i.e. developing and transition economies). However, we observe the opposite in the case of diversification between off-balance sheet and on-balance sheet activities. Additionally, the results show that income and earning assets diversification can mitigate the adverse effect of the financial crisis on bank financial strength. Finally, the results hold when using alternative techniques for the estimation of both the overall financial strength indicator and the second stage regressions. These findings have important implications suggesting that managers and policymakers should ensure an adequate bank diversification.

The rest of the paper of the paper is structured as follows. Section 2 provides a review of the literature. Section 3 describes the methodological framework used in the present study, and Section 4 presents the variables and the data. Section 5 discusses the results and Section 6 concludes.

2. Literature Review

Our paper attempts to fill a gap in the literature because (to our knowledge) no empirical studies have considered the impact of a bank's diversification on its overall financial strength. However, our work is broadly related to various country-specific studies, mainly from USA, that examine

the implications of mixing various bank activities for bank profitability and risk. Furthermore, it is closely related to a strand of the banking literature that emerged recently and focuses on diversification while using cross-country samples.[5] Most of these studies cover European banks, while only very few have a wider orientation. In general, the existing evidence does not allow us to have a clear picture for the impact of diversification on bank outcome, simply because the results differ across studies or because they differ between individual indicators within single studies. In the following sections we first refer to some key studies that provide evidence from individual countries (mainly the US), and we then move to a discussion of the cross-country studies.[6]

2.1 Country-specific evidence

Using a sample of US bank holding companies over the period 1980-1993, Demsetz and Strahan (1997) find that better diversification does not translate into reductions in risk. In contrast, Allen and Jagtiani (2000) find that securities and insurance activities reduce overall risk; however, their results also show that this increases systematic risk. DeYoung and Roland (2001) examine the association between shifts in product mix and earnings volatility for a sample of 472 U.S. commercial banks over the period 1988-1995. They conclude that replacing traditional lending activities with fee-based activities results in both higher revenue volatility and higher total leverage.

In another U.S. study, that covers the period 1978 to 2000, Stiroh (2004) finds that greater proportion of non-interest income is associated with lower risk-adjusted profits, higher

[5] The use of cross-country samples is not limited to banking studies. For example, Chakrabarti et al. (2007) and Mitton (2012) examine the relationship between diversification and performance of non-financial firms while drawing their sample from a number of countries.

[6] See Stiroh (2010) for a more general discussion on the potential explanations for why banks diversify along with a broader review of the literature.

standard deviation of profits, and higher insolvency risk; however, there is no relationship between non-interest income and the return on equity. The positive association between higher proportion of non-interest income and risk is also supported by the findings of a later study by Stiroh (2006) that examines publicly traded US bank holding companies from 1997 to 2004. Focusing on the period 1997-2002, Stiroh and Rumble (2006) reach two interesting conclusions. First, diversification benefits exist between financial holding companies, but these gains are offset by the increased exposure to non-interest activities, which are more volatile but not necessarily more profitable than interest-generating activities. Second, within financial holding companies, marginal increases in revenue diversification are not associated with better performance, whereas marginal increases in non-interest income are still associated with lower risk-adjusted profits.

Geyfman and Yeager (2009) examine the difference in risk measures between universal banks and traditional banks. They find that universal banks have similar systematic risk but sharply higher total and unsystematic risk than more traditional banks. More recently, Fomby et al. (2012) adopt Copula-GARCH models to study the dependence between bank returns and insurance underwriting, securities brokerage, and mortgage finance. They find that this dependence increased during the recent crisis, raising doubts about the ability of financial conglomerates to diversify effectively.

However, another recent study by Shim (2012) provides evidence of diversification benefits. In particular, using data from U.S. bank holding companies over the period 1992-2011, Shim (2012) shows that the probability of insolvency risk decreases for diversified banks and banks with high revenue diversity achieve capital savings. Evidence from a sample of Italian

banks over the period 1993-2003, by Chiorazzo et al. (2008), provides additional support to the view that income diversification has a positive influence on risk-adjusted returns.

Pennathur et al. (2012) find that fee-based income in the case of India banks increases risk (measured by volatility of profitability ratios) in the case of private banks, and decreases risk in the case of public banks. Yet, when focusing on credit risk (measured with the loan loss provisions to total assets ratio) they find that fee income significantly increases credit risk for public banks but not for private banks. Their results for the impact of diversification on leverage risk and insolvency risk also differ across the groups of banks that they examine.

Finally, DeYoung and Torna (2013) differentiate their study from the above ones by focusing on the failure of US banks during the recent financial crisis. They conclude that the probability of failure falls with pure fee-based nontraditional activities (e.g. securities brokerage and insurance sales); however, it increases with asset-based nontraditional activities (e.g. venture capital, investment banking and asset securitization).

2.2. Cross-country evidence

Laeven and Levine (2007) examine a sample of 867 banks operating in 43 countries over the period 1998–2002. They conclude that there is a diversification discount. In particular, their results show that the market values of financial conglomerates that engage in multiple activities are lower than if those financial conglomerates were broken into financial intermediaries that specialize in the individual activities.

In contrast, Baele et al. (2007) find that a higher share of non-interest income affects European banks' franchise values positively over the period 1989-2004. Yet, their results provide a conflicting view on the relationship between diversification and risk. The authors report that

diversification of revenue streams from distinct financial activities increases the systematic risk of banks; however, it decreases the idiosyncratic risk. Further evidence from Mercieca et al. (2007) makes it even harder to draw conclusions on the impact of diversification on bank outcomes. Focusing on a sample of small European banks for the period 1997-2003, they conclude that there are no direct diversification benefits within and across business lines, while there is evidence of an inverse association between non-interest income and bank profitability. The results of another European study over the period 1996-2002, by Lepetit et al. (2008), show that banks expanding into non-interest income activities present higher risk and higher insolvency risk than banks which mainly supply loans.

In a more recent study, Elsas et al. (2010) examine a sample of banks operating in nine developed countries over the period 1996-2008 to conclude that diversification increases bank profitability, and as a consequence it enhances market valuations.[7] This finding is robust to the use of alternative measures of diversification, alternative subsamples, and while accounting for the issues of endogeneity and selectivity.

Demirgüç-Kunt and Huizinga (2010) provide additional evidence from a large international sample that includes 1,334 banks operating in 101 countries between 1999 and 2007. They conclude that expansion into non-interest income-generating activities (e.g., trading) increases the return on assets, and it could offer some risk diversification benefits. A closer look at their results reveals that while an increase in the proportion of fee income is associated with an increase in the return on assets, it is also associated with a decrease in the Sharpe ratio that serves as a measure of risk-adjusted return.

[7] The sample of Elsas et al. (2010) includes the following countries: Australia, Canada, France, Germany, Italy, UK, USA, Spain, and Switzerland.

In contrast to the vast majority of the above studies that focus on European and other developed markets, Sanya and Wolfe (2011) examine 226 listed banks operating in 11 emerging economies over the period 2000-2007. They conclude that diversification across and within both interest and non-interest income generating activities decrease insolvency risk and enhance profitability.

3. Methodology

3.1. Estimating the overall financial strength indicator

To examine the impact of diversification on bank financial strength we use a two-stage approach. In the first stage, we construct the OFSI using a scenario-based multicriteria approach, combining five financial criteria: the total capital adequacy ratio (TCAR),[8] the problem loans to total loans ratio (PLR), the cost to income ratio (COST), [9] return on assets (ROA), and the liquid assets to deposits and short term funding ratio (LIQR). We select these ratios considering their use by international regulators (e.g., total capital adequacy ratio) and most importantly their association to the categories of the CAMEL framework.[10]

[8] We rely on the total capital ratio as this is the main capital ratio used worldwide under the Basel guidelines. Alternatively, one could consider using the Tier 1 ratio or simple non-risk weighted ratios like the equity to assets. The correlation between the three ratios is in general high with the coefficients being equal to: 0.925 (total capital ratio and tier 1 ratio), 0.753 (total capital ratio and equity to assets ratio), and 0.753 (Tier 1 ratio and equity to assets ratio). Thus, we do not believe that the selection of an alternative indicator of capital strength could influence our results. In any case, given the somewhat lower correlation coefficient between the total capital ratio and the simple equity to assets ratio, we re-estimate the OFSI while using the equity to assets ratio and we conduct two tests. First, we examine the correlation between the OFSI scores obtained under the two approaches. The Pearson's correlation coefficient is as high as 0.979 (Spearhman's rho = 0.977) providing further support to our initial belief. Second, we re-estimate the base models presented in Tables 5-7, while using the OFSI estimated with the use of the equity to assets ratio. In all the cases, our main results are the same with the reported ones. So, we do not pursue this issue further.

[9] Apparently, one could use qualitative indicators of managerial quality (e.g. experience, education, etc.) However, such data were not available in our case. Furthermore, one could use an indicator of efficiency derived from frontier function techniques. Nonetheless, this could complicate our analysis, possibly without having a major impact on the final results. Therefore, as in Barth et al. (2002) and Poghosyan and Čihák (2009) we use the cost to income as a proxy for managerial quality.

[10] We refer to CAMEL as a general framework and not to the ratings used by US regulators which are confidential, being disclosed only to senior bank management and to the appropriate supervisory personnel. Thus, in the present

In the adopted multicriteria framework, the banks are evaluated through an additive value function of the five aforementioned ratios, i.e.:

$$V = w_{TCAR} f_{TCAR} + w_{PLR} f_{PLR} + w_{COST} f_{COST} + w_{ROA} f_{ROA} + w_{LIQR} f_{LIQR} \quad (1)$$

where w_{TCAR}, w_{PLR}, w_{COST}, w_{ROA}, and w_{LIQR} are non-negative tradeoffs of the five ratios, representing their relative importance in the evaluation model (the tradeoffs are assumed to sum up to one) and f_{TCAR}, f_{PLR}, f_{COST}, f_{ROA}, f_{LIQR} are monotone marginal value functions of the ratios normalized in [0, 1]. The overall performance score (global value) ranges in [0, 1] with higher values indicating higher overall performance. The marginal value functions decompose the overall performance of the banks into its five dimensions, thus indicating the performance of the banks at the ratio level. The additive model is well founded from a theoretical point of view (Keeney and Raiffa, 1993) and has been used in a wide range of evaluation problems under multiple criteria.

The specification of the ratios' tradeoffs and the marginal value functions is a subjective process that depends on the context of the analysis. However, simulation methods have become popular in multiple criteria decision analysis for handling the uncertainties involved with respect to the set of preferential parameters of evaluation models and/or the data (Lahdelma and Salminen, 2001; Tervonen and Figueira, 2008). In this study, we follow this approach in order to build a comprehensive evaluation of the banks under different scenarios for both the ratios' tradeoffs and the marginal value functions of the additive evaluation model. The process is based on sampling different evaluation models, uniformly distributed over the set of all additive value functions, which can be obtained with non-negative tradeoffs that sum up to one and monotone

study we estimate a new overall financial strength indicator that considers bank capital adequacy, asset quality, earnings, management, and liquidity. Cole and White (2012) conclude that traditional proxies for the CAMEL components do an excellent job in explaining the recent failures of U.S. banks, as they did in the banking crisis of 1985–1992.

marginal value functions defined in [0, 1]. Each of the sampled models provides an evaluation of the banks from a different point of view, with respect to the relative importance of the financial ratios and their aggregation. Taking into consideration the distribution of the results over multiple evaluation scenarios enables the construction of a comprehensive index of the overall financial strength of the banks, taking into account the evaluations' distribution under different evaluation assumptions. Following the suggestions of Tervonen and Lahdelma (2007) on the implementation of such simulation-based approaches to multicriteria evaluation problems, we consider a large set of 10,000 scenarios, which is sufficient to achieve robust results. The details for the scenario generation process (i.e., the sampling of random evaluation model) are given in Appendix I.

Under each scenario *k*, the banks are evaluated with a randomly generated additive model V_k and are classified into five rating (financial strength) classes: very strong, strong, medium, weak, very weak. The classification is performed so that the banks are approximately normally distributed in the classes. In particular, let V_{ik} denote the global value (overall financial strength score) of bank *i* according to the additive model under scenario *k*, and p_k^t the t% percentile of the global values (i.e., V_{1k}, V_{2k}, …) for all banks under the same scenario. Then, a bank *i* with $V_{ik} \le p_k^{10}$ is assigned to the class of very weak performers, to the class of weak banks if $p_k^{10} < V_{ik} \le p_k^{32.5}$, to the medium class if $p_k^{32.5} < V_{ik} \le p_k^{67.5}$, to the class of strong banks if $p_k^{67.5} < V_{ik} \le p_k^{90}$, or to the class of very strong performing banks if $V_{ik} > p_k^{90}$.

The final OFSI for each bank i is constructed by aggregating its ratings under all specifications (scenarios) for the evaluation model (1), as follows:

$$OFSI_i = \underbrace{\sum_{r=1}^{r} \pi_{ir} r}_{\bar{r}_i} + \underbrace{\sum_{r=1}^{5} \pi_{ir} [1 - e^{-a_i (r - \bar{r}_i)}]}_{F_i} \quad (2)$$

where π_{ir} is the percentage of evaluation scenarios under which bank i is classified in category r (1-very weak, 2-weak, 3-medium, 4-strong, 5-very strong). The OFSI for a bank i consists of two components: the expected rating ($\bar{r}_i$) of the bank and the risk component F_i. The risk component introduces a risk adjustment to the expected rating, taking into consideration the variability of the distribution of the ratings of the banks over all evaluation scenarios. The introduction of the risk component is in accordance with the volatile global banking environment, and enables the distinction between adverse scenarios that put a bank at risk and positive scenarios. The risk component is modeled as a weighted average of partial risk factors specified by the negative exponential function $1 - e^{-a_i (r - \bar{r}_i)}$ on the basis of the deviations of the banks ratings (over all evaluation scenarios) from the expect rating, with a_i being a risk aversion constant. The negative exponential function is commonly used for modeling risk aversion (Kirkwood, 2004). It is bounded by above by one and its concave form implies that the penalty assigned to negative deviations from the expected rating ($r < \bar{r}_i$) outweighs the "premium" associated with positive deviations ($r > \bar{r}_i$). For a bank that is consistently classified in the same rating throughout all evaluation scenarios, the risk component equals zero.

In accordance with common practices on bank rating systems (Sahajwala and Van den Bergh, 2000), the OFSI is scaled between 1 and 5, with higher values indicating better performance. Under this scaling scheme, the risk aversion parameter a_i is specified for each bank so that at the worst possible evaluation case, $OFSI_i$ equals one, i.e.:

$$\overline{r} + [1 - e^{-a_i(r-\overline{r_i})}] = 1 \Rightarrow a_i = -\frac{\ln(\overline{r_i})}{1-\overline{r_i}}$$

With this specification the risk adjustment component for bank i ranges in $[1-r_i, 0]$. Furthermore, given that the risk aversion parameter is a decreasing function of $\overline{r_i}$, decreasing absolute risk aversion is assumed. Thus, the risk adjustment is higher for banks that perform poorly on average (i.e., low values of r_i), whereas for banks that perform better on average the risk adjustment is reduced. Finally, the OFSI is consistent with the second-order stochastic dominance principle (Levy, 2010). In particular, assuming two banks A and B, such that A second-order stochastically dominates B according to the distributions of the banks' ratings over all evaluation scenarios, then $OFSI_A > OFSI_B$.

As a sensitivity check, we have also estimated an additional overall financial strength indicator, using an outranking (relational) evaluation model, instead of the additive function (1). We discuss this technique and sensitivity check in Section 5.3.3.

3.2. Examining the impact of diversification on OFSI

In the second stage, the OFSI serves as the dependent variable in the estimation of the following equation:

$$OFSI_{ijt} = \alpha + \beta X_{ijt} + \gamma Z_{jt} + \varepsilon_{ijt}$$

where the OFSI of bank *i* that operates in country *j* at time *t* is written as a function of a vector of bank-level variables (including diversification), *X*; variables that capture the macroeconomic, regulatory, banking sector and other country conditions common to all banks in country *j* at time *t, Z*; and the error term ε_{ijt}. Given that we have a panel dataset, we estimate a fixed effects model with robust standard errors clustered at the bank level. The use of the fixed-effects over the

random-effects estimator is supported by the robust version of a Hausman type test which is more appropriate with robust or cluster robust standard errors (Schaffer and Stillman, 2010).

To examine the robustness of our results, we conduct sensitivity analysis using three alternative techniques. First, considering that individual banks are nested in countries over a number of years we employ a Hierarchical Linear Modeling (HLM) or else known as Multi-Level Modeling (MLM). This approach has been used widely in studies that examine firm and business segment performance (Hough, 2006; Goldszmidt et al., 2011), and more recently capital structure decisions (Li et al., 2011) and IPOs underpricing (Engelen and van Essen, 2010). However, to the best of our knowledge, there are no applications of multi-level modeling in the cross-country literature on bank diversification. The advantage of this technique is that it accounts for the fact that the data have different levels of aggregation and it provides error terms that control for the potential dependency due to nesting effects (e.g., Newman et al., 2010). Second, based on recent developments on dynamic panel data econometrics, we use the limited information maximum likelihood (LIML) method (Baltagi, 2005). Third, we use a Heckman-type treatment effect model. The last two approaches allow us to control for the potential endogeneity of diversification.

4. Variables and Data

4.1 Diversification indices

As in previous studies, the construction of our diversification indices is restricted by data availability (e.g., Laeven and Levine, 2007; Baele et al., 2007). As discussed in detail in Laeven and Levine (2007), ideally one would like detailed data on each bank's underwriting of securities, brokerage services, assets securitization, etc. However, such data are not available.

Furthermore, for the vast majority of banks, no data exist for the gross revenues per category, other than interest income and we have to rely on net figures consistent with earlier studies (e.g., Laeven and Levine, 2007; Elsas et al., 2010). Therefore, we construct three Herfindhal-Hirshman type diversification indices that provide a general indication about the diversity of banks, in terms of income, earning assets, and balance sheet composition. In general higher values indicate higher diversification.

Following Elsas et al. (2010), our income-based diversification indicators captures diversification across the four main types of bank income, namely interest income, commission income, trading income, other operating income. It is calculated as follows:

$$DIV_{inc} = 1 - \left[\left(\frac{INT}{TOR} \right)^2 + \left(\frac{COM}{TOR} \right)^2 + \left(\frac{TRAD}{TOR} \right)^2 + \left(\frac{OTH}{TOR} \right)^2 \right]$$

where: INT is the gross interest revenue, COM is the net commission revenue, TRAD is the net trading revenue, OTH stands for other net operating income, and TOR is the total operating income. Consistent with Elsas et al. (2010) we: (i) calculate TOR as the summation of the absolute values of INT, COM, TRAD and OTH[11], and (ii) we use gross interest revenue so that the income diversity measure is not unduly distorted by the profitability of income related activities. Theoretically this index takes values between zero (fully specialized bank) and 0.75 (i.e., fully balanced revenue mix from the four business segments).

The earning assets-based diversification index is constructed by considering the two major categories of bank earning assets, namely net loans and other earning assets (e.g., Laeven

[11] Elsas et al. (2010) suggest this approach as otherwise the use of negative net revenue values would result in negative shares for some revenue streams and shares greater than one for other revenue streams. Therefore, DIV_{inc} would be strongly influenced by business segment performance and could take values much higher than 0.75.

and Levine, 2007; Baele et al., 2007; Elsas et al., 2010). Again, we opt for a Herfindhal-Hirshman index of the following form:

$$DIV_{asset} = 1 - \left[\left(\frac{LOAN}{LOAN + OEA} \right)^2 + \left(\frac{OEA}{LOAN + OEA} \right)^2 \right]$$

where LOAN denotes the net loans and OEA stands for other earning assets (e.g., securities, bonds, etc.). A higher value indicates a more diversified mix. A value of zero reveals a complete concentration, while a value of 0.5 illustrates an even split between loans and other earning assets.

Finally, the balance sheet based diversification index takes into account the values of total assets, and off-balance sheet activities, and it is constructed as follows:

$$DIV_{bs} = 1 - \left[\left(\frac{TAOB}{TAOB + OBS} \right)^2 + \left(\frac{OBS}{TAOB + OBS} \right)^2 \right]$$

where TAOB denotes the total assets on balance sheet, and OBS stands for off-balance-sheet items such as managed securitized assets reported off-balance sheet, guarantees, acceptances and documentary credits reported off-balance sheet, committed credit lines, and other contingent liabilities. The interpretation of DIV_{bs} is same as the one of DIV_{asset}.

4.2. Control Variables

In all the second stage regressions, we use the natural logarithm of total assets (LNAS) to control for bank size.[12] Furthermore, we use numerous country-level control variables that capture the macroeconomic environment, regulatory policies, banking and financial sector conditions, and

[12] We do not include financial ratios as these where considered during the first stage for the construction of the OFSI.

institutional development. Most of them are standard control variables in the banking literature so in what follows we provide only a very brief discussion. Some additional control variables that are used in sensitivity regressions are discussed in section 5.3.1, whereas further information about the definition, construction, and sources for the collection of all the data is available in Appendix II.

First, we control for the impact of macroeconomic conditions using the real GDP growth (GDPGR) and the inflation rate (INFL). Problems in the financial sector are more likely to emerge when the growth is low and past studies indicate that countries with high inflation have underdeveloped financial systems and experience financial crises (Boyd et al., 2001; Demirgüç-Kunt and Detragiache, 1998).

Second, we use indices for regulations that relate to the three pillars of Basel II as well as to restrictions on bank activities. These indices, constructed on the basis of information from Barth et al. (2001, 2006, 2008), have been recently used in many papers that focus on performance and risk (e.g., Barth et al., 2004; Gonzalez, 2005; Delis et al., 2011). CAPRQ is an index of capital requirements that accounts for both initial and overall capital stringency. The first component of this index reveals whether the sources of funds counted as regulatory capital can include assets other than cash or government securities and borrowed funds, as well as whether the regulatory or supervisory authorities verify these sources. The second component indicates whether risk elements and value losses are considered while calculating the regulatory capital. Higher values of CAPRQ indicate higher stringency. OFFPR is a measure of the power of supervisory agencies indicating the extent to which supervisors can change the internal organizational structure of the bank and/or take specific disciplinary action against bank management and directors, shareholders, and bank auditors (suspend the distribution of

dividends or bonuses, take legal action, etc.). PRMON is an indicator of market discipline and shows the degree to which banks are forced to disclose accurate information to the public (e.g., risk management procedures, off-balance-sheet activities) and whether there are incentives to increase market discipline (subordinated debt, absence of deposit insurance scheme, etc.). Higher values of PRMON indicate greater private monitoring. Finally, ACTRS is a proxy for the level of restrictions on banks' activities in each country. It is determined by considering whether participation in securities, insurance, real estate activities, and ownership of non-financial firms, are unrestricted, permitted, restricted or prohibited. ACTRS can take values between 1 and 4, with higher values indicating higher restrictions.

Third, we control for the general level of economic freedom and institutional development using the composite indicator of the Heritage Foundation (ECONFR), as in Demirgüç-Kunt et al. (2004) and Delis et al. (2011) among others. This is an overall index calculated on the basis of the following ten factors: (1) business freedom, (2) trade freedom, (3) fiscal freedom, (4) freedom from government, (5) monetary freedom, (6) investment freedom, (7) financial freedom, (8) property rights, (9) freedom from corruption, (10) labor freedom. ECONF takes values from 0 to 100 with higher values indicating higher freedom.

Fourth, we control for various conditions in the banking sector using: (i) the private credit by deposit money banks to GDP ratio (CREDIT), as an indicator of the banking sector's development, (ii) the assets concentration of the three largest banks (CONC), and (iii) the country-level Z-score of the banking sector (TBANKZ), as an indicator of stability.

4.3. Data

We collect data from various sources. Bank-specific data are obtained from OSIRIS database of Bureau van Dijk. This database contains information on listed and large unlisted (or delisted) banks from around the world. Given the international coverage of our study, we focus on commercial banks so as to obtain a more homogenous sample. We start with a sample of approximately 1,600 banks. After excluding banks with missing data and erroneous information we end up with a sample of 1,204 commercial banks operating in 111 countries between 2001 and 2010. This results in an unbalanced panel dataset of 8,051 observations.

Information for macroeconomic conditions is from the Global Market Information Database (GMID), whereas information from the construction of the regulatory indices is from the World Bank Database on Bank Regulation and Supervision (Barth et al., 2001, 2006, 2008). The economic freedom index is obtained from the Heritage Foundation. Data for credit to GDP, concentration, and the banking sector Z-score are collected from the 2012 update of the Beck et al. (2000) World Bank database on Financial Development and Structure. We use the same database to collect information on additional control variables that we use in section 5.3.1 and are related to central bank assets, stock market capitalization, and bond market capitalization. In the same section we use information from the latest update of the Worldwide Governance Indicators database (see Kaufmann et al., 2010) to construct alternative variables for institutional development.

Table 1 presents descriptive statistics about the variables that we use in both stages. Table 2 presents the correlation coefficients.

[Insert Tables 1 and 2 Around Here]

5. EMPIRICAL RESULTS

5.1. Overall Financial Strength Indicator

Table 3 presents summary statistics for the OFSI over all years of the analysis. For comparison purposes, except for the overall results, separate statistics are also given for different country types (major advanced - MADV, advanced - ADV, transition - TRANS, developing - DEVG). The annual averages are presented, together with the corresponding coefficients of variation. The coefficient of variation provides a measure of the OFSI dispersion among the banks in each year. However, the coefficient of variation does not indicate the diversity of the banks' ratings over the different scenarios considered for the calculation of the OFSI, as explained in section 3.1. In that regard, for each bank we have also calculated the Herfindahl-Hirschman index (HHI) to measure the diversity of its ratings over the 10,000 specifications of the additive evaluation model (i.e., evaluation scenarios). Following the notation introduced in section 3.1, the HHI for a bank-year observation *i*, is expressed as follows:

$$HHI_i = \sum_{r=1}^{5} p_{ir}^2$$

The HHI equals one when the bank-year observation *i* is consistently assigned into a specific rating class across all evaluation scenarios, whereas when there is complete uncertainty on the ratings (i.e., $p_{i1} = \ldots = p_{i5} = 0.2$), then HHI equals 0.2. Table 3 presents the average HHI for all bank observations in each year.

[Insert Tables 3 Around Here]

The results show that over the period 2001-2007 the overall OFSI of the banks in the sample increased by 16.7%, from 2.69 in 2001 to 3.14 in 2007. Banks from major advanced,

advanced, and transition countries achieved their best performance in 2006, whereas the financial strength of banks from developing countries improved further in 2007 (achieving an increase by 24.3% compared to 2001). As expected, there is an evident decrease in the OFSI over the subsequent period (by 8.4% overall in 2010 vs. 2007). Banks from transition countries were most affected by the crisis, with their overall OFSI deteriorating by 33.1% in 2010 compared to 2006. Over the same period, the decrease in the OFSI for banks from major advanced and advanced countries was 12.9% and 8.4%, respectively. The financial strength of banks from developing countries also declined by about 5% in 2010 compared to their peak in 2007.[13]

The sample variability of the OFSI followed a declining trend up to 2007 (25.9% decrease compared to 2001), but peaked up in the subsequent period (2007-2010) by 18.7% for banks from major advanced countries, 29.1% for banks from advanced countries, and 68% for transition countries. On the other hand, the variation for the banks from developing countries increased by a modest 6%. Thus, due to the crisis the discrepancies between the banks' financial characteristics increased, most notably for banks from advanced and transition countries.

Finally, with respect to the diversity among the scenarios' ratings, the overall HHI has some minor fluctuations during the period 2001-2006, but shows an increasing trend in the subsequent period. The HHI is almost consistently higher for banks from advanced countries,

[13] As a side note it should be mentioned that the average OFSI of banks operating in less developed countries is in several occasions higher than the one of banks operating in developed countries (Table 3). While at first this appears to be surprising, it can be explained once having a closer look at the descriptive statistics of the individual ratios. More detailed, the average bank ROA equals 1.85% in the case of developing economies and 1.16% in the case of transition economies. In contrast, banks in major advanced and advanced economies operate with considerably lower ratios, being equal to 0.15% and 0.74%, respectively. We also observe important differences in the liquidity position of banks with the average LIQR being: 15.25% (major advanced), 21.91% (advanced), 33.62% (transition), 30.67% (developing). Banks in transition and developing countries traditionally operate with higher capitalization ratios. For example, the average total capital ratio in transition countries is 16.59% compared to 12.55% in advanced countries. In the case of the cost to income ratio the picture is mixed, since the two best performing groups are developing (55.72%) and advanced (59.10%) economies. Thus, they only case where banks in major advanced and advanced countries clearly outperform their peers from less developed economies is the dimension of asset quality with the average PLR being: 2.97% (advanced), 3.03% (major advanced), 6.19% (developing), and 6.34% (transition).

thus indicating that their ratings are less diverse (compared to banks from other countries) with respect to different specifications of the evaluation model. The HHI for banks from major advanced and advances countries decreased during 2001-2006, but increased in the subsequent period (the increase being larger for the group of major advanced countries). Thus, during the crisis the diversity in the ratings of these banks' across different assumptions on the evaluation model, decreased. The situation is different for banks from transition and developing countries, for which the HHI decreased during the crisis.

Table 4 and Figure 1 provide some insight into the relationship between the OFSI and the financial ratios that constitute its building blocks. Table 4 shows the averages of the ratios for different ranges of the OFSI, together with the Pearson's correlation coefficient between the ratios and the OFSI. Figure 1 provides a more detailed graphical illustration of the relationship between the OFSI and the financial ratios (the figures show the average OFSI at 20 bins of the ratios defined by their 5, 10, …, 95, 100% percentiles). The results indicate that ROA is the ratio most strongly related to the OFSI, followed by PLR. The averages of the ratios for different OFSI ranges follow a monotonic trend, which is confirmed from the illustrations in Figure 1.

[Insert Table 4 & Figure 1 Around Here]

5.2. Second stage regressions – Base results

Tables 5 to 7 present the regression results of the fixed effects model with robust standard errors clustered at the bank level.[14] We start with a simple model (column 1) that includes the natural

[14]The robust version of a Hausman type test (Schaffer and Stillman, 2010) equals 126.94 (p-value = 0.000) in the case of the specification that includes all the variables and the DIV_{inc} (i.e. column 5), 141.38, in the case of the model with DIV_{assets}, and 128.50 (p-value =0.000) in the case of the model wiith DIV_{bs}. Thus, the fixed effects

logarithm of a bank's total assets, real GDP growth and inflation, so that we can make maximum use of our sample. Then, we estimate additional models, where we control for alternative country-specific factors. Note that the number of observations varies along the regressions, depending on the missing values for the country-level variables.

All three measures of diversification, namely DIV_{inc} (Table 5), DIV_{asset} (Table 6), and DIV_{bs} (Table 7), enter the regressions with a positive and statistically significant coefficient. Thus, diversification in terms of income, earning assets portfolio mix, and on-and off-balance sheet activities tends to improve the overall financial strength of the banks. We also observe that both real GDP growth and inflation have a positive and statistically significant impact on OFSI. While this was expected for GDP, the finding for inflation contradicts our expectations. However, it should be mentioned that this is not the first study to reveal that inflation is positively associated with bank outcomes.[15]

[Insert Tables 5-7 Around Here]

In column (2), we add the four regulatory variables. The inclusion of these variables in the regressions has no impact on the relationship between diversification and OFSI. With regards to the regulatory variables, we observe that private monitoring and capital requirements have a positive and statistically significant impact on financial strength. However, supervisory power and restrictions on activities do not appear to influence the OFSI. Furthermore, it should be mentioned that the inclusion of additional variables in the regression in column 5 results in an insignificant CAPRQ. The insignificance of most of the regulatory variables poses some

model is preferred over the random effects model. We obtain similar figures in all other cases. While we do not present them here, they are available from the authors upon request.

[15] For example, Laeven and Levine (2007) report that inflation is positively related to excess value.

questions as for the effectiveness of regulations. However, it should be stressed out that while there are studies revealing a significant association of these variables with bank outcomes (e.g., Fernandez and Gonzales, 2005; Pasiouras et al., 2009) others mention that many of them, and especially capital requirements and supervisory power are not significant determinants of bank stability, development, net interest margin or performance (see Barth et al., 2004; Demirgüç-Kunt et al., 2004). One potential reason is that these indices capture regulations at the books and not what actually happens in practice. Thus, these indices cannot reveal potential shortcomings in the actual implementation of the regulations.[16] Nonetheless, one could also easily argue that our results, which cover the period 2001-2010, illustrate exactly what we observed during the financial crisis. That is the existing regulations did not serve their purpose in safeguarding against excessive risk taking in banking institutions around the world.

In column (3) we add the index of economic freedom. This variable enters the regression with a positive coefficient; however, this is statistically insignificant in most of the specifications and it has no impact on our main findings. The specification in column (4) includes three additional variables that account for various conditions in the banking sector. We observe that lower credit to GDP ratio, lower concentration, and higher stability of the banking sector as measured with the Z-score increase the OFSI. The impact of diversification on OFIS remains positive and statistically significant. Finally, the specification in column (5) includes all the variables in the regression, to account for potential omitted variables bias. Our findings remain the same. Thus, it appears that the impact of diversification on bank financial strength is not influenced by the control variables that we use. Despite this observation, we continue our

[16] Further regressions in section 5.3.2 show that some of them appear to have a significant influence when we consider the dynamic model or the multi-level model; however, with the exception of PRMON their impact on OFSI is not robust across the estimations.

analysis by considering some additional country-variables that we discuss in our sensitivity tests in Section 5.3.1.

5.3 Sensitivity analysis

This section presents a variety of additional estimates to examine the robustness of our results. In particular, we present: (i) the use of additional variables in the regressions, including a dummy variable for the crisis, (ii) alternative estimation approaches that account for nesting effects and endogeneity, and (iii) the results when using alternative approaches to construct the OFSI.

5.3.1 Exploring the impact of the crisis and additional country-specific attributes

In this sub-section, we consider some country-level variables that may be correlated with diversification and OFSI, by adding them one at a time to the equation of column (5) in Tables 5 to 7. We present the results in Tables 8 to 11.

First, we include a dummy variable for developing and transition countries (DEVGTRANS =1) in an attempt to account for potential characteristics that differentiate them from major advanced and advanced countries (DEVGTRANS=0), and we interact this variable with the diversification indices (DEVGTRANS*DIV). This results in a positive and statistically significant interaction in the case of income, a positive but insignificant interaction in the case of assets, and a negative and statistically significant interaction in the case of OBS. [17] Thus, banks in less developed countries benefit more than the ones in developed countries from income

[17] The dummy variable (DEVGTRANS) was automatically dropped from this equation during the estimation of the model. To ensure that the presented results are not driven by omitted variable bias, we re-estimated this specification using the multi-level mixed- model that we discuss in section 5.3.2. This model does not drop the dummy variable from the analysis and we continue to find a positive and statistically significant coefficient for the interaction term in the case of income, a negative and statistically significant coefficient in the case of OBS, and an insignificant effect in the case of earning assets diversification.

diversification but they benefit less when they diversify their activities in terms of on-balance-sheet and off-balance sheet activities.[18] To some extent this finding could be explained by the potential inexperience of bank managers in developing and transition countries in handling OBS activities, and it is partially consistent with the results of Lozano-Vivas and Pasiouras (2010) who find that OBS activities improve the profit efficiency of banks in major advanced countries; however, they worsen the profit efficiency of banks in developing countries.

[Insert Table 8 Around Here]

Then, we consider the ratio of central bank assets to GDP (CBASSET). The rationale for its inclusion lies on the expectation that central banks with a higher relative size will have more resources to devote to the supervision of the financial and banking sector, with potentially favorable outcomes for banks. The results show that CBASSET has no impact on financial strength, while its inclusion in the regressions does not influence the impact of diversification on OFSI.

The third variable that we consider is the stock market capitalization to GDP (MCAPGDP). Demirgüç-Kunt and Huizinga (1999) mention that financial intermediation and stock markets can be complements or substitutes. In particular, as they discussed, the Miller-Modigliani theorem considers debt and equity finance as substitutes; however, evidence suggests that the ability to obtain equity finance may also enhance borrowing capacity (Demirgüç-Kunt and Maksimovic, 1996) and as such easier equity finance may increase the demand for debt finance. The findings of Demirgüç-Kunt and Huizing (1999) confirm the latter showing a

[18] The positive relationship between income diversification and financial strength is partially consistent with evidence for non-financial firms by Chakrabarti et al. (2007). Using a sample manufacturing firms operating in six Asian countries, they conclude that diversification improves performance only in the least developed environments.

positive relationship between stock markets development and bank net interest margins. They interpret this as evidence that more developed stock markets are associated with better availability of information which increases the potential pool of borrowers, making it easier for banks to identify and monitor them. This results in higher volume of business and higher margins for banks. Our results are consistent with this view, revealing a positive and statistically significant relationship between MCAPGDP and OFSI. The inclusion of this variable in the equation does not influence the main results with all three indicators of diversification retaining their statistical significance.

Next we consider the ratio of bond market capitalization to GDP (BONDGDP).[19] The rationale for its inclusion is similar to the one of MCAGDP. On the one hand bonds can be seen as an alternative source of funds for corporations. On the other hand, they can enhance the availability of information in the market through a closer monitoring of firms by investment and credit analysts. BONDGDP enters the regression with a positive but insignificant coefficient that does not influence the main variable of interest of the present study.

[Insert Table 9 Around Here]

The fifth variable that we consider is an alternative indicator of institutional development (INSTEDV) that replaces ECONFR in the specification in column (5).[20] INSTDEV incorporates information on the following six factors, taken by the WGI database: (1) voice and accountability, (2) political stability and absence of violence, (3) government effectiveness, (4) regulatory quality, (5) rule of law, (6) control of corruption. The score for each one of these

[19] We use the total bond capitalization calculated as the summation of private and public bonds capitalization.
[20] The correlation between ECONFR and INSTDEV is 0.846 (p-value: 0.000). Therefore we do not include them simultaneously in the regression.

factors ranges between -2.5 and 2.5, with higher scores corresponding to better outcomes. We calculate the overall index, INSTDEV, as the average over the six factors. This index enters with a positive but insignificant coefficient in all three regressions. Our results remain robust to the inclusion of INSTDEV in the regressions.

We also use a sub-index of INSTDEV, that serves as an enforcement index (ENFIND) and is calculated by taking into accounting the dimensions of regulatory quality, rule of law and control of corruption (see Li et al., 2006). ENFIND has a positive and statistically significant impact on financial strength; however, this does not influence our main results.

[Insert Table 10 Around Here]

Then, we include a dummy variable that takes the value of one for the years 2007 to 2010 (CRISIS=1) and the value of zero for the rest of the years (CRISIS=0). Thus, we aim to capture the impact of the crisis. Furthermore, to examine the role of diversification over this period, we also use the interaction of CRISIS with the diversification indices. As expected we find that CRISIS has a negative impact on OFSRI. What is interesting though is the positive and statistically significant impact of the interaction of the crisis dummy with DIV_{inc} and DIV_{asset}. Thus, income and earning asset diversification appears to mitigate the adverse effect of the crisis on bank financial strength.

[Insert Table 11 Around Here]

In the so far presented results, consistent with earlier studies, we included the diversification indices in the analysis one at a time. The main reason for this is that the

simultaneous inclusion of all the indices in the regressions could result in some form of double counting. For example, the share of interest income and non-interest income will depend upon the decision of banks to diversify between loans (i.e. interest income generating activities) and other earning-assets (i.e. non-interest income generating activities) or more generally on the diversification between on- and off-balance sheet (i.e. fee income generating) activities. However, considering that the correlation coefficients between the three indices turned out to be rather low, we also estimated our base model while including them simultaneously in the regressions. The results shown in Table 12 are similar to the ones presented earlier.

[Insert Table 12 Around Here]

5.3.2. Accounting for nesting effects

In this section, we employ a multi-level approach, which simultaneously models regressions at both the bank- and country-level. Thus, by modeling each level of the hierarchy, multilevel models consider that banks within a country are more similar to one another than banks from different countries (Hough, 2006). Furthermore, the country-level regression is weighted by the precision of the bank-level data, which is inversely related to the sample size within a country. In the words of Li et al. (2011) "*The power of multilevel models comes from their ability to pool firm-level effects across countries while also examining country-level relations*" (p. 488). The model is fitted using an interactive maximum likelihood algorithm in which the fixed and random effects are estimated simultaneously until the model converges.[21] In its combined form the model can be written as follows:

[21] We also estimated the model using maximum restricted likelihood (REML). Our main results hold. These unreported regressions are available from the authors upon request.

$$OFSI_{ijt} = \underbrace{a + \beta X_{ijt} + \gamma Z_{jt}}_{\text{fixed components}} + \underbrace{u_{ij} + e_j + \varepsilon_{ijt}}_{\text{random components}}$$

Where *OFSI, X* and *Z* are defined as before. The random variables $u_{i,j}$ and e_j allow the intercept ($\alpha+u_{ij}+e_{,j}$) to be random and unique to every bank and country. The term $\varepsilon_{i,jt}$ is the residual. So, the above model assumes that the intercept is random and all slope coefficients are fixed, implying that all slope parameters are identical across banks and countries. However, this model can be extended so that some coefficients can be specified to differ across banks and/or countries in a stochastic manner. As the main question of the present study is to explore the relationship between diversification and financial strength at the bank-level, it could be argued that this relationship is not identical across banks. Therefore, we estimate one more specification which incorporates, in addition to the random intercepts, a random coefficient for the effect of DIV_{ijt} on $OFSI_{ijt}$, while all other coefficients remain fixed. Thus, this approach yields both fixed and random effects estimates for the bank-level diversification index. In this case, the above equation becomes:

$$OFSI_{ijt} = a + \beta X_{ijt} + \gamma W_{jt} + u_{0ij} + u_{1ij} DIV_{ijt} + e_j + \varepsilon_{ijt}$$

The first three columns in Table 13 present the results of the model that includes only the random intercepts and the fixed slope coefficients. The next three columns present the results of the model that accounts for the hypothesis that the impact of diversification on OFSI may not be identical across banks, by adding a random coefficient for DIV.[22] In all the cases, the diversification index enters with a positive and statistically significant coefficient, indicating that controlling for potential dependency due to nesting effects does not influence our main findings.

[22] The results of a likelihood-ratio test favor the model that allows for a random bank-specific regression line over the model that allows only for a bank-specific shift.

[Insert Table 13 Around Here]

5.3.3. Accounting for endogeneity

The potential endogeneity of diversification has been recently discussed in both the banking and the strategic management literature (e.g., Goddard et al., 2008; Berger et al., 2010; Miller, 2006). The underlying idea is that diversification itself might be an endogenous choice, and some of the observed association between income, earning assets and on-off balance sheet diversification and OFSI could be due to the reason that safer banks choose to diversify more across the various categories. In other words, so far we have assumed that diversification influences bank safety, but not vice versa. To control for this issue, we re-estimate our model using two alternative techniques.

First, we use instrumental variable regressions to control for the endogeneity between OFSI and diversification. More detailed, we follow numerous earlier studies and we use lagged variables as instruments (e.g. Elsas et al., 2010) while employing the limited information maximum likelihood method that is well suited for dynamic panel estimations. Therefore, the OFIS is now regressed on its lag and the lagged diversification as the instrument for current diversification.[23] As can be seen in Table 14 the instrumented diversification indicators continue to enter the regressions with a positive and statistically significant coefficient. Thus, our results are not driven by potential endogeneity, and there is still evidence that diversification improves overall financial strength.

[Insert Table 14 Around Here]

[23] In the case of the model with DIV_{inc}, the underidentification test (Kleibergen-Paap rk LM statistic) equals 162.45 (p-value: 0.000), whereas the weak identification test (Kleibergen-Paap rk Wald F statistic) equals 166.42 (Stock-Yogo weak ID test critical value at 10% maximal LIML size equals16.38). We obtain even higher figures in the case of the model with DIV_{asset} (320.69 and 437.93) as well as in the model with DIV_{bs} (252.39 and 330.27)

As a second exercise, we follow recent studies to model the impact of diversification on bank outcome (in our case the overall financial strength) and the determinants of a bank's degree of diversification simultaneously, using a Heckman type treatment effects model with maximum likelihood estimates and standard errors corrected for clustering at the bank-level (see e.g. Laeven and Levine, 2007; Elsas et al., 2010). The model consists of: (i) a selection equation that uses a dummy variable for diversification to model the banks' propensity to be diversified, and (ii) a regression equation that models the effect of the difersification treatment membership variable on the OFSI. The variables in the two equations can be the same, different, or partially the same (see Guo and Fraser, 2010). To define the dummy variable for diversification we follow an approach that is similar to the one in Laeven and Levine (2007) and Elsas et al. (2010). More detailed, the diversification dummy equals one if the Herfindahl index of diversification (income, asset, or balance sheet) exceeds the 75^{th} percentile of the empirical distribution, and zero otherwise.

We use various explanatory variables to model the diversification status. MERG is a bank-specific indicator of merger and acquisition activity. As discussed in Laeven and Levine (2007) and Elsas et al. (2010), mergers can be related to diversification since they constitute an important strategic instrument for banks to manage their level of diversification. Accordingly, as in Elsas et al. (2010) we use mergers and acquisitions (MERG) as an exogenous instrument in the selection equation.[24] We also use the LNAS as diversification decisions may relate to bank size (e.g. Laeven and Levine, 2007; Dastidar, 2009).

[24] As in Laeven and Levine (2007) we use information from the Bureau van Dijk database to trace the history of each bank in our sample, and we create a dummy that indicates whether a bank merged with or acquired at least one other bank in a given year ($MERG_{ijt} = 1$) or not ($MERG_{ijt} = 0$). Furthermore, to account for the fact that M&As may have a more permanent (long-term) effect on diversification decisions we also follow an alternative approach, assigning the value of one on the year t and all the years that follow, and zero otherwise (i.e. years prior to the M&A and cases with no M&A activity). The main results are not influenced by the approach that we use for the

The firm's decision to diversify may also depend upon industry and country specific characteristics (Campa and Kedia, 2002; Laeven and Levine, 2007; Dastidar, 2009). Therefore, we include in the selection equation four country-level variables. The first is the country level bank net interest margin (NIM). To the extent that NIM can serve as a proxy for the interest spread, it could influence banks' incentives to diversify away from traditional banking. Following Laeven and Levine (2007) the second country-level variable that we include is the index of regulatory restrictions on bank activities (ACTRS). We also include the real GDP growth (GDPGR) as in Dastidar (2009) and Mackey and Barney (2013), among others. Finally, as in Laeven and Levine (2007) we include the share of diversified banks in the country (SHDIV) to control for overall country effects in the diversification decision. In principle, this approach is similar to the one followed by studies that examine various non-financial industries and control for the attractiveness of a given industry with the fraction of all firms in the industry that are diversified (e.g. Campa and Kedia, 2002; Dastidar, 2009; Kuppuswamy and Villalonga, 2010).

The results in Table 15 show that that the self-selection model confirms the earlier findings. In all the cases, the variable for the propensity to be diversified (i.e. treatment membership variable) has a positive and statistically significant coefficient. Thus, we continue to find that diversification improves the overall financial strength of banks.

[Insert Table 15 Around Here]

construction of the dummy MERG. We present the estimations under the assumption that M&As have a long-term relation to the diversification decision, whereas the unreported regressions are available upon request.

5.3.3 Alternative approaches for the estimation of the OFSI

One could argue that when using a composite index of overall financial strength like the one of the present study, the results can be sensitive to the modeling approach employed to formulate the index. Despite its simplicity and popularity for constructing evaluation indices, the additive model used in this study is clearly not the only option available to formulate the OFSI. Therefore, we re-estimate the OFSI while replacing the additive utility functions in equation (1) by the PROMETHEE outranking multicriteria method (Brans and Vincke, 1985). The latter is an adaptation of Borda count to evaluation problems with multiple criteria. In contrast to a value-based model expressed in functional form, a PROMETHEE model evaluates each bank by aggregating its relative strengths and weaknesses compared to its peers. For each bank, the comparisons are first performed for each individual financial ratio, and then they are combined with the weights of the ratios to form the final evaluation, which ranges in [-1, 1], with positive values indicating that the bank under consideration performs better than its peers. Despite the differences between the additive value model adopted in the analysis and the above technique, the obtained OFSIs are highly similar (Pearson and Spearman correlations: 0.96; root-mean-square deviation: 0.27). As a consequence, the results of the second stage analysis remain the same even if a different approach is used to build the OFSI.[25]

6. Conclusions

The question of whether banks should focus on traditional banking (i.e., loans and deposits) or whether they should offer a wide array of services has generated a lively debate among

[25] Given the similarities in the results, we do not present the second stage regressions to conserve space. All the estimations are available from the authors upon request.

academics, policy makers, and practitioners. Theory and existing empirical evidence provide conflicting views.

In practice, we observed that over the last decade numerous banks around the world tented to diversify and enhance the portfolio of services that they offer. This diversification may influence various bank attributes; nonetheless, one of the most important questions is how it influences the overall financial strength of banks.

This study attempted to answer this question by using a sample of over 1,000 banks operating in 111 countries, and a two-step analysis. First, we constructed a novel overall financial strength indicator. Then, we examined the impact of bank diversification in terms of income, earning assets, and on-and-off balance sheet activities diversity on financial strength. Our main finding is that diversification improves the overall financial strength of banks. This holds for different forms of diversification, including income, earning assets portfolio mix, and on- and off-balance sheet activities. Furthermore, we revealed that income diversification can be more beneficial for banks operating in less developed countries. Nonetheless, we observed the opposite in the case of diversification between off-balance sheet and on-balance sheet activities. Additionally, the results showed that the impact of the crisis on financial strength can be less severe with the use of earning assets diversification. We performed a number of robustness tests, by controlling for various country-specific variables, and we also used alternative techniques for the estimation of both the overall financial strength indicator and the second stage regressions. Our main finding remained the same across the various estimations.

These findings have important implications for bank managers and policymakers. For example, at the policy level, the regulatory restrictions on bank activities vary widely across

countries. Our results suggest that decision makers should direct their efforts toward ensuring adequate bank diversification.

References

Allen L., Jagtiani J., (2000), The Risk Effects of Combining Banking, Securities, and Insurance Activities, Journal of Economics and Business, 52, 485–497.

Arrow, K.J, Raynaud, H., (1986), Social Choice and Multicriterion Decision-Making, MIT Press, Cambridge, MA.

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

Baltagi B., (2005), *Econometric analysis of panel data*, New York: John Wiley & Sons.

Barron, F., Barrett, B., (1996), Decision quality using ranked attribute weights, Management Science, 42, 1515–1525.

Barth J.R, Caprio G., Levine R., (2001), The regulation and supervision of bank around the world: a new database. In: R.E. Litan, R. Herring (Eds.). Integrating Emerging Market Countries into the Global Financial System. Brookings-Wharton Papers in Financial Services, Brooking Institution Press, 2001, pp. 183-240.

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

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

Barth J.R., Caprio G., Levine R., (2008), Bank regulations are changing: For better or worse? World Bank Policy Research Working Paper 4646, June.

Barth J.R., Dopico L.G., Nolle D.E., Wilcox J.A., (2002), Bank Safety and Soundness and the Structure of Bank Supervision: A Cross-Country Analysis, International Review of Finance, 3, 163-188.

Beck T., Demirgüç-Kunt A., Levine R., (2000), A new database on financial development and structure, The World Bank Economic Review, 14, 597-605.

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

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

Bertay A.C., Demirgüç-Kunt A., Huizinga H., (2013), Do we need big banks? Evidence on performance, strategy and market discipline, Journal of Financial Intermediation, In press.

Boyd J., Levine R., Smith B., (2001), The impact of inflation of financial sector performance, Journal of Monetary Economics, 47, 221–248.

Brans, J.P., Vincke, Ph., (1985), A preference ranking organisation method: The PROMETHEE method for multiple criteria decision-making, Management Science, 31, 647–656.

Campa J.M., Kedia S., (2002), Explaining the Diversification Discount, Journal of Finance, 57, 1731-1762.

Chakrabarti A., Singh K., Mahmood I., (2007), Diversification and Performance: Evidence From East Asian Firms, Strategic Management Journal, 28, 101-120.

Chiorazzo V., Milani C., Salvini F., (2008), Income Diversification and Bank Performance: Evidence from Italian Banks, Journal of Financial Services Research, 33, 181-203.
Cole R.A., White L.J., (2012), Déjà Vu All Over Again: The Causes of U.S. Commercial Bank Failures *This* Time Around, Journal of Financial Services Research, 42, 5-29.
Dastidar P., (2009), International Corporate Diversification and Performance: Does Firm Self-Selection Matter? Journal of International Business Studies, 40, 71-85.
Delis M., Molyneux P., Pasiouras F., (2011), Regulations and productivity growth in banking: evidence from transition economies, Journal of Money, Credit and Banking, 43, 735-764.
Demirgüç-Kunt A., Detragiache E. (1998), The determinants of banking crises in developing and developed countries, IMF Staff Papers, 45, 81-109.
Demirgüç-Kunt A., Huizinga H., (1999), Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence, The World Bank Economic Review, 13, 379-408.
Demirgüç-Kunt A., Huizinga H., (2010), Bank activity and funding strategies: The impact on risk and returns, Journal of Financial Economics, 98, 626-650.
Demirgüç-Kunt A., Laeven L., Levine R., (2004), Regulations, Market Structure, Institutions, and the Cost of Financial Intermediation, Journal of Money, Credit and Banking, 36, 593-622.
Demirgüç-Kunt A., Maksimovic V. (1996), Stock Market Development and Financing Choices of Firms, The World Bank Economic Review, 10, 341-69.
Demirgüç-Kunt A., Detragiache E., Tressel T., (2008), Banking on the principles: Compliance with Basel Core Principles and bank soundness, Journal of Financial Intermediation, 17, 511-542.
Demsetz R.S., Strahan P.E., (1997), Diversification, Size and Risk at Bank Holding Companies, Journal of Money, Credit and Banking, 29, 300-313.
DeYoung R., Toma G., (2013), Nontraditional banking activities and bank failures during the financial crisis, Journal of Financial Intermediation, 22, 397-421.
DeYoung R., Roland K.P., (2001), Product Mix and Earnings Volatility at Commercial Banks: Evidence from a Degree of Total Leverage Model, Journal of Financial Intermediation, 10, 54-84.
Elsas R., Hackethal A., Holzhäuser M., The anatomy of bank diversification, Journal of Banking and Finance, 34, 1274–1287.
Engelen, P.-J., Van Essen M., (2010), Underpricing of IPOs: Firm-, issue- and country-specific characteristics, Journal of Banking and Finance, 34, 1958-1969.
Fernandez A., Gonzalez F., (2005), How accounting and auditing systems can counteract risk-shifting of safety-nets in banking: Some international evidence, Journal of Financial Stability, 1, 466-500.
Fomby T.B., Gunther J.W., Hu J., (2012), Return Dependence and the Limits of Product Diversification in Financial Firms, Journal of Money, Credit and Banking, 44, 1151-1183.
Geyfman V., Yeager T.J., (2009), On the Riskiness of Universal Banking: Evidence from Banks in the Investment Banking Business Pre- and Post-GLBA, Journal of Money, Credit and Banking, 41, 1649-1669.
Goddard J., McKillop D., Wilson J.O.S., (2008), The diversification and financial performance of US credit unions, Journal of Banking and Finance, 32, 1836-1849.

Goldszmidt R.G.B., Brito L.A.L., de Vasconcelos F.C., (2011), Country effect on firm performance: A multilevel approach, Journal of Business Research, 64, 273-279.

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

Guo S., Fraser M.W., (2010), *Propensity Score Analysis: Statistical Methods and Applications*, SAGE Publications Inc.

Jia, J., Fischer, G.W., Dyer, J.S., (1998), Attribute weighting methods and decision quality in the presence of response error: A simulation study, Journal of Behavioral Decision Making, 11, 85-105.

Hough J.R., (2006), Business segment performance redux: a multilevel approach, Strategic Management Journal, 27, 45-61.

Kaufmann D., Kraay A., Mastruzzi M., (2010), The Worldwide Governance Indicators: Methodology and Analytical Issues, World Bank Policy Research Working Paper 5430, September.

Keeney, R., Raiffa, H., (1993), Decisions with Multiple Objectives: Preferences and Value Trade-offs, Cambridge University Press, Cambridge.

Kirkwood, C.W., (2004), Approximating risk aversion in decision analysis applications, Decision Analysis, 1(1), 51-67.

Kuppuswamy V., Villalonga B., (2010), Does Diversification Create Value in the Presence of External Financing Constraints? Evidence from the 2007–2009 Financial Crisis, Harvard Business School Working Paper 10-101.

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

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

Lahdelma R., Salminen P., (2001), SMAA-2: Stochastic multicriteria acceptability analysis for group decision making, Operations Research, 49, 444–454.

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

Levy, H., (2010), Stochastic Dominance: Investment Decision Making under Uncertainty (2nd edition), Springer, New York.

Li D., Moshirian F., Pham P.K., Zein J., (2006), When Financial Institutions Are Large Shareholders: The Role of Macro Corporate Governance Environments, Journal of Finance, 61, 2975-3007.

Li K., Griffin D., Yue H., Zhao L., (2011), National Culture and Capital Structure Decisions: Evidence from Foreign Joint Ventures in China, Journal of International Business Studies, 42, 477-503.

Lozano-Vivas A., Pasiouras F., (2010), The impact of non-traditional activities on bank efficiency: international evidence, Journal of Banking and Finance, 34, 1436-1449.

Mackey T.B., Barney J.B., (2013), Incorporating opportunity costs in strategic management research: The value of diversification and payout as opportunities forgone when reinvesting in the firm, Strategic Organization, In press.

Mercieca S., Schaeck K., Wolfe S., Small European banks: Benefits from diversification? Journal of Banking and Finance, 31, 1975–1998.

Miller D.J., (2006), Technological diversity, related diversification and firm performance, Strategic Management Journal, 27, 601-619.

Mitton T., (2012), Inefficient Labor or Inefficient Capital? Corporate Diversification and Productivity around the World, Journal of Financial and Quantitative Analysis, 47, 1-22.
Newman D., Newman I., Slzman J., (2010), Comparing OLS and HLM Models and the Questions They Answer: Potential Concerns for Type VI Errors, Multiple Linear Regression Viewpoints, 36, 1-8.
Pasiouras F., Tanna S., Zopounidis C., (2009), The impact of banking regulations on banks' cost and profit efficiency: Cross-country evidence, International Review of Financial Analysis, 18, 294-302.
Pennathur A.K., Subrahmanyam V., Vishwasrao S., (2012), Income diversification and risk: Does ownership matter? An empirical examination of Indian banks, Journal of Banking and Finance, 36, 2203-2215.
Poghosyan T., Čihák M., (2009), Distress in European Banks: An Analysis Based on a New Data Set, IMF Working Paper 09/9, January.
Sahajwala, R., Van den Bergh, P., (2000), Supervisory risk assessment and early warning systems. Tech. Rep. 4, Bank of International Settlements, Basel, Switzerland.
Sanya A., Wolfe S., (2011), Can Banks in Emerging Economies Benefit from Revenue Diversification? Journal of Financial Services Research, 40, 79-101.
Schaffer, M.E., Stillman, S. (2010) xtoverid: Stata module to calculate tests of overidentifying restrictions after xtreg, xtivreg, xtivreg2 and xthtaylor http://ideas.repec.org/c/boc/bocode/s456779.html
Shim J., (2012), Bank capital buffer and portfolio risk: The influence of business cycle and revenue diversification, Journal of Banking and Finance, In press.
Stiroh K.J., (2004), Diversification in Banking: Is Noninterest Income the Answer? Journal of Money, Credit and Banking, 36, (5) 853-882
Stiroh K.J., (2006), New Evidence on the Determinants of Bank Risk, Journal of Financial Services Research, 30, 237–263.
Stiroh K.J., Rumble A., (2006), The dark side of diversification: The case of US financial holding companies, Journal of Banking and Finance, 30, 2131-2161.
Stiroh K.J., (2010), Diversification in Banking. In: Berger, A., Molyneux, P., Wilson, J.O.S. (eds), *Oxford Handbook of Banking*. Oxford: Oxford University Press, Chapter 6, pp 129-150.
Strobel F., (2013), Bank Insolvency Risk and Z-score Measures: A Refinement, Working Paper, Available at SSRN: http://ssrn.com/abstract=1753735
Tervonen, T., Figueira, J., (2008), A survey on stochastic multicriteria acceptability analysis methods, Journal of Multi-Criteria Decision Analysis, 15, (1–2), 1–14.
Tervonen, T., Lahdelma, R., (2007), Implementing stochastic multicriteria acceptability analysis, European Journal of Operational Research, 178, 500–513.
Treasury Office of Inspector General, (2009), Semiannual Report To The Congress, March.

Table 1 – Descriptive statistics

	Mean	St. Dev.	N
Panel A: Variables used in first stage			
TCAR	14.95	5.94	8051
PLR	4.47	4.87	8051
COST	66.77	30.94	8051
ROA	0.94	1.87	8051
LIQR	23.43	20.25	8051
Panel B: Variables used in second stage			
DIV*inc*	0.285	0.143	8051
DIV*asset*	0.389	0.105	8051
DIV*bs*	0.206	0.146	8051
LNAS	14.917	2.466	8051
GDPGR	3.158	3.809	8051
INFL	4.186	4.908	8051
CAPRQ	5.250	1.313	7882
OFFPR	11.829	1.904	7852
PRMON	6.411	0.926	7852
ACTRS	2.670	0.513	7882
ECONFR	67.142	10.610	8022
CREDIT	67.371	40.166	7691
CONC	41.570	19.597	7833
TBANKZ	21.158	9.898	7843
CBASSET	6.165	5.594	7297
MCAPGDP	77.273	54.950	7501
BONDGDP	110.002	66.720	6113
INSTDEV	0.548	0.850	8051
ENFIND	0.658	0.921	8051

Note: Variables are defined in Appendix II

Table 2 – Correlation Coefficients

	DIV*inc*	DIV*asset*	DIV*bs*	LNAS	GDPGR	INFL	CAPRQ	OFFPR	PRMON	ACTRS	ECONFR
DIV*inc*	1.000										
DIV*asset*	0.188	1.000									
	(0.000)										
DIV*bs*	0.097	-0.017	1.000								
	(0.000)	(0.136)									
LNAS	0.333	0.265	-0.083	1.000							
	(0.000)	(0.000)	(0.000)								
GDPGR	0.152	0.154	0.193	0.034	1.000						
	(0.000)	(0.000)	(0.000)	(0.002)							
INFL	0.102	0.005	0.203	-0.153	0.261	1.000					
	(0.000)	(0.641)	(0.000)	(0.000)	(0.000)						
CAPRQ	0.022	0.069	0.036	-0.019	0.111	0.180	1.000				
	(0.049)	(0.000)	(0.001)	(0.088)	(0.000)	(0.000)					
OFFPR	-0.286	-0.027	-0.023	-0.305	0.050	0.044	0.172	1.000			
	(0.000)	(0.016)	(0.045)	(0.000)	(0.000)	(0.000)	(0.000)				
PRMON	0.0881	0.123	-0.044	0.256	0.034	-0.059	0.128	0.119	1.000		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
ACTRS	-0.203	0.006	-0.060	-0.143	0.089	0.039	0.056	0.257	-0.003	1.000	
	(0.000)	(0.581)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.828)		
ECONFR	-0.311	-0.174	-0.071	-0.165	-0.380	-0.532	-0.138	0.144	0.008	-0.135	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.471)	(0.000)	
CREDIT	0.030	0.025	-0.165	0.480	-0.326	-0.505	-0.120	-0.319	0.182	-0.224	0.408
	(0.008)	(0.027)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CONC	0.382	0.121	0.112	0.284	0.210	0.163	-0.060	-0.317	0.119	-0.135	-0.329
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TBANKZ	-0.067	0.027	0.078	-0.036	-0.030	-0.188	0.142	0.051	0.011	-0.230	0.276
	(0.000)	(0.019)	(0.000)	(0.001)	(0.009)	(0.000)	(0.000)	(0.000)	(0.354)	(0.000)	(0.000)
CBASSET	-0.184	0.130	-0.414	0.127	-0.148	-0.220	0.041	0.2780	0.227	0.167	0.064
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
MCAPGDP	-0.227	-0.064	0.045	-0.093	-0.078	-0.333	-0.054	0.123	-0.014	-0.180	0.687
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.240)	(0.000)	(0.000)
BONDGDP	-0.266	-0.160	-0.267	-0.197	-0.489	-0.560	-0.185	0.156	0.070	0.084	0.675
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	-0.200	-0.127	-0.122	0.033	-0.417	-0.618	-0.160	-0.049	-0.018	-0.248	0.865
INSTDEV	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.120)	(0.000)	(0.000)
ENFIND	-0.228	-0.126	-0.076	-0.009	-0.395	-0.609	-0.136	-0.015	0.012	-0.234	0.897
	(0.000)	(0.000)	(0.000)	(0.413)	(0.000)	(0.000)	(0.000)	(0.191)	(0.281)	(0.000)	(0.000)

Table 2 – Correlation Coefficients (cont.)

	GREDIT	CONC	TBANKZ	CBASSET	MCAPGDP	BONDGDP	INSTDEV	ENFIND
CREDIT	1.000							
CONC	0.046	1.000						
	(0.000)							
TBANKZ	0.071	-0.064	1.000					
	(0.000)	(0.000)						
CBASSET	0.125	-0.273	-0.064	1.000				
	(0.000)	(0.000)	(0.000)					
MCAPGDP	0.285	-0.243	0.364	0.020	1.000			
	(0.000)	(0.000)	(0.000)	(0.093)				
BONDGDP	0.354	-0.531	0.105	0.411	0.303	1.000		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
INSTDEV	0.604	-0.270	0.239	0.110	0.565	0.708	1.000	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
ENFIND	0.576	-0.285	0.273	0.075	0.616	0.704	0.988	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

Notes: Variables are defined in Appendix II; p-values in parenthesis

Table 3 – Statistics on the OFSI

	Overall	MADV	ADV	TRANS	DEVG
2001	2.69	2.46	2.85	3.49	2.84
	(0.37)	(0.37)	(0.24)	(0.27)	(0.40)
	(0.51)	(0.52)	(0.58)	(0.48)	(0.47)
2002	2.72	2.48	2.80	3.55	2.90
	(0.36)	(0.35)	(0.27)	(0.26)	(0.38)
	(0.51)	(0.52)	(0.58)	(0.50)	(0.46)
2003	2.89	2.56	2.96	3.76	3.13
	(0.33)	(0.32)	(0.26)	(0.21)	(0.33)
	(0.50)	(0.50)	(0.56)	(0.52)	(0.47)
2004	2.98	2.66	3.06	3.49	3.28
	(0.30)	(0.28)	(0.23)	(0.23)	(0.30)
	(0.51)	(0.50)	(0.57)	(0.52)	(0.50)
2005	3.10	2.78	3.18	3.54	3.36
	(0.28)	(0.26)	(0.24)	(0.23)	(0.28)
	(0.50)	(0.48)	(0.54)	(0.52)	(0.51)
2006	3.14	2.82	3.25	3.62	3.36
	(0.27)	(0.25)	(0.25)	(0.22)	(0.27)
	(0.50)	(0.48)	(0.54)	(0.52)	(0.49)
2007	3.14	2.65	3.22	3.49	3.53
	(0.27)	(0.27)	(0.22)	(0.22)	(0.23)
	(0.51)	(0.50)	(0.54)	(0.51)	(0.53)
2008	2.84	2.24	2.88	2.96	3.36
	(0.32)	(0.32)	(0.24)	(0.28)	(0.25)
	(0.53)	(0.52)	(0.55)	(0.51)	(0.54)
2009	2.80	2.31	2.95	2.49	3.32
	(0.33)	(0.33)	(0.26)	(0.37)	(0.26)
	(0.53)	(0.57)	(0.55)	(0.49)	(0.51)
2010	2.88	2.45	2.98	2.42	3.36
	(0.32)	(0.32)	(0.28)	(0.37)	(0.25)
	(0.53)	(0.58)	(0.56)	(0.48)	(0.50)

Notes: This Table presents annual averages, coefficient of variation and, Herfindahl-Hirschman index of the ratings distribution; MADV: Major advanced countries, ADV: advanced countries; TRANS: transition countries, DEVG: developing countries

Table 4 – Relationship of financial ratios to OFSI (averages and correlations)

OFSI range	TCAR	PLR	COST	ROA	LIQR
[1, 1.5]	10.046	12.183	98.077	-1.989	13.529
(1.5, 2.5]	13.264	6.274	79.787	0.025	14.969
(2.5, 3.5]	14.400	3.300	64.281	1.125	20.996
(3.5, 4.5]	17.414	2.565	51.329	2.064	33.859
(4.5, 5]	23.885	2.059	45.452	3.147	52.709
Correlation	0.461	-0.486	-0.468	0.645	0.461

Note: Variables are defined in Appendix II

Table 5 – Base results: income diversification

	(1)	(2)	(3)	(4)	(5)
DIV*inc*	0.596***	0.581***	0.582***	0.545***	0.555***
	(0.132)	(0.133)	(0.132)	(0.136)	(0.137)
LNAS	0.051**	0.058**	0.048**	0.067***	0.071***
	(0.023)	(0.023)	(0.023)	(0.024)	(0.024)
GDPGR	0.044***	0.044***	0.045***	0.040***	0.041***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
INFL	0.011***	0.009**	0.011***	0.012***	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
CAPRQ		0.045**			0.021
		(0.020)			(0.021)
OFFPR		0.013			0.009
		(0.019)			(0.019)
PRMON		0.091***			0.090***
		(0.034)			(0.033)
ACTRS		-0.173*			-0.143
		(0.103)			(0.106)
ECONFR			0.008*		0.006
			(0.004)		(0.004)
CREDIT				-0.005***	-0.005***
				(0.001)	(0.001)
CONC				-0.007***	-0.007***
				(0.002)	(0.002)
TBANKZ				0.012***	0.012***
				(0.001)	(0.002)
Constant	1.811***	1.205**	1.343***	1.985***	1.073*
	(0.344)	(0.474)	(0.387)	(0.344)	(0.557)
R-sq: within	0.076	0.085	0.077	0.116	0.124
between	0.107	0.075	0.092	0.050	0.035
overall	0.106	0.080	0.099	0.089	0.074
Obs.	8051	7852	8022	7677	7506
Banks	1204	1163	1198	1146	1110

Notes: ***Statistically significant at the 1% level, **Statistically significant at the 5% level, *Statistically significant at the 10% level, Robust standard errors in parenthesis; Estimations obtained from a fixed effects model with robust standard errors clustered at the bank level; Variables are defined in Appendix II

Table 6 – Base results: earning assets diversification

	(1)	(2)	(3)	(4)	(5)
DIV*asset*	1.043***	1.066***	1.053***	0.874***	0.927***
	(0.174)	(0.176)	(0.174)	(0.175)	(0. 178)
LNAS	0.081***	0.087***	0.078***	0.093***	0.097***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.025)
GDPGR	0.044***	0.044***	0.045***	0.040***	0.041***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
INFL	0.011***	0.009**	0.011***	0.012***	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
CAPRQ		0.045**			0.022
		(0.020)			(0.021)
OFFPR		0.012			0.010
		(0. 019)			(0.019)
PRMON		0.096***			0.097***
		(0.034)			(0.034)
ACTRS		-0.163			-0.124
		(0.104)			(0.107)
ECONFR			0.008*		0.008*
			(0.005)		(0.004)
CREDIT				-0.005***	-0.006***
				(0.001)	(0.001)
CONC				-0.006***	-0.006***
				(0.002)	(0.002)
TBANKZ				0.012***	0.012***
				(0.001)	(0.001)
Constant	1.132***	0.456	0.639	1.386***	0.262
	(0.381)	(0.502)	(0.434)	(0.381)	(0.589)
R-sq: within	0.082	0.092	0.083	0.120	0.128
between	0.062	0.047	0.045	0.045	0.028
overall	0.067	0.054	0.058	0.080	0.061
Obs.	8051	7852	8022	7677	7506
Banks	1204	1163	1198	1146	1110

Notes: ***Statistically significant at the 1% level, **Statistically significant at the 5% level, *Statistically significant at the 10% level, Robust standard errors in parenthesis; Estimations obtained from a fixed effects model with robust standard errors clustered at the bank level; Variables are defined in Appendix II

Table 7 – Base results: balance sheet diversification

	(1)	(2)	(3)	(4)	(5)
DIV*bs*	0.421***	0.423***	0.416***	0.470***	0.478***
	(0.125)	(0.127)	(0.125)	(0.131)	(0.134)
LNAS	0.049**	0.053**	0.046**	0.067***	0.067***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.024)
GDPGR	0.045***	0.045***	0.045***	0.040***	0.041***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
INFL	0.009***	0.007*	0.010***	0.010***	0.008**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
CAPRQ		0.041**			0.016
		(0.020)			(0.021)
OFFPR		0.011			0.009
		(0.019)			(0.019)
PRMON		0.096***			0.097***
		(0.034)			(0.033)
ACTRS		-0.135			-0.098
		(0.103)			(0.105)
ECONFR			0.007		0.006
			(0.005)		(0.005)
CREDIT				-0.006***	-0.006***
				(0.001)	(0.001)
CONC				-0.007***	-0.006***
				(0.002)	(0.002)
TBANKZ				0.013***	0.012***
				(0.001)	(0.001)
Constant	1.935***	1.262***	1.518***	2.051***	1.045*
	(0.341)	(0.476)	(0.390)	(0.340)	(0.563)
R-sq: within	0.073	0.082	0.074	0.116	0.123
between	0.102	0.067	0.082	0.045	0.029
overall	0.111	0.081	0.101	0.089	0.072
Obs.	8051	7852	8022	7677	7506
Banks	1204	1163	1198	1146	1110

Notes: ***Statistically significant at the 1% level, **Statistically significant at the 5% level, *Statistically significant at the 10% level, Robust standard errors in parenthesis; Estimations obtained from a fixed effects model with robust standard errors clustered at the bank level; Variables are defined in Appendix II

Table 8 – Robustness results: controlling for country development status

	(1)	(2)	(3)
DIV*inc*	0.079		
	(0.157)		
DIV*asset*		0.904***	
		(0.202)	
DIV*bs*			1.103***
			(0.186)
LNAS	0.078***	0.097***	0.068***
	(0.024)	(0.025)	(0.024)
GDPGR	0.040***	0.041***	0.041***
	(0.003)	(0.003)	(0.003)
INFL	0.011***	0.010***	0.008**
	(0.004)	(0.004)	(0.004)
CAPRQ	0.023	0.022	0.013
	(0.022)	(0.021)	(0.021)
OFFPR	0.006	0.010	0.006
	(0.019)	(0.019)	(0.019)
PRMON	0.093***	0.097***	0.117***
	(0.032)	(0.034)	(0.034)
ACTRS	-0.167	-0.124	-0.059
	(0.106)	(0.107)	(0.106)
ECONFR	0.007	0.008*	0.007
	(0.004)	(0.004)	(0.005)
CREDIT	-0.006***	-0.006***	-0.006***
	(0.001)	(0.001)	(0.001)
CONC	-0.007***	-0.006***	-0.006***
	(0.002)	(0.002)	(0.002)
TBANKZ	0.012***	0.012***	0.012***
	(0.002)	(0.001)	(0.002)
DEVGTRANS	dropped	dropped	dropped
DEVGTRANS*DIV	1.046***	0.062	-1.116***
	(0.282)	(0.375)	(0.262)
Constant	1.011*	0.262	0.806
	(0.555)	(0.589)	(0.570)
R-sq: within	0.128	0.128	0.129
between	0.056	0.030	0.008
overall	0.094	0.064	0.043
Obs.	7506	7506	7506
Banks	1110	1110	1110

Notes: ***Statistically significant at the 1% level, **Statistically significant at the 5% level, *Statistically significant at the 10% level, Robust standard errors in parenthesis; Estimations obtained from a fixed effects model with robust standard errors clustered at the bank level; Variables are defined in Appendix II

Table 9 – Robustness results: controlling for central bank size, stock market development, and bond market development

	Central Banking			Stock market			Bond market		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DIV*inc*	0.613***			0.602***			0.425***		
	(0.142)			(0.140)			(0.140)		
DIV*asset*		0.880***			0.848***			0.963***	
		(0.181)			(0.177)			(0.192)	
DIV*bs*			0.537***			0.359***			0.560***
			(0.141)			(0.133)			(0.143)
LNAS	0.080***	0.103***	0.075***	0.027	0.053**	0.026	0.079***	0.103***	0.072**
	(0.024)	(0.025)	(0.024)	(0.024)	(0.025)	(0.024)	(0.029)	(0.030)	(0.029)
GDPGR	0.042***	0.042***	0.041***	0.029***	0.030***	0.030***	0.041***	0.041***	0.041***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
INFL	0.012***	0.012***	0.010***	0.004	0.004	0.002	0.019***	0.018***	0.016***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.006)
CAPRQ	0.016	0.016	0.010	0.027	0.028	0.023	0.013	0.014	0.008
	(0.023)	(0.022)	(0.023)	(0.021)	(0.021)	(0.021)	(0.023)	(0.023)	(0.022)
OFFPR	0.008	0.010	0.009	0.015	0.017	0.015	-0.003	-0.003	-0.006
	(0.019)	(0.019)	(0.020)	(0.017)	(0.017)	(0.017)	(0.025)	(0.025)	(0.025)
PRMON	0.086**	0.095***	0.094***	0.095***	0.100***	0.100***	0.138***	0.140***	0.147***
	(0.034)	(0.035)	(0.034)	(0.033)	(0.034)	(0.033)	(0.036)	(0.037)	(0.035)
ACTRS	-0.164	-0.148	-0.158	-0.222**	-0.194*	-0.176*	-0.133	-0.122	-0.069
	(0.112)	(0.114)	(0.111)	(0.104)	(0.105)	(0.104)	(0.125)	(0.128)	(0.123)
ECONFR	0.008*	0.009*	0.008	-0.001	0.001	-0.000	0.013**	0.015***	0.014***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
CREDIT	-0.005***	-0.006***	-0.006***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
CONC	-0.007***	-0.006***	-0.006***	-0.005***	-0.004**	-0.004**	-0.007***	-0.006***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
TBANKZ	0.012***	0.012***	0.012***	0.010***	0.009***	0.010***	0.010***	0.009***	0.010***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
CBASSET	0.001	-0.000	-0.001						
	(0.009)	(0.009)	(0.009)						

MCAPGDP				0.006***	0.006***	0.006***			
				(0.001)	(0.001)	(0.001)			
BONDGDP							0.001	0.001	(0.001)
							(0.001)	(0.001)	(0.001)
Constant	0.868	0.169	0.886	1.753***	0.965	1.713***	0.190	-0.628	0.079**
	(0.647)	(0.673)	(0.654)	(0.555)	(0.589)	(0.565)	(0.674)	(0.701)	(0.666)
R-sq: within	0.127	0.130	0.126	0.164	0.166	0.161	0.126	0.135	0.130
between	0.028	0.020	0.027	0.012	0.010	0.007	0.003	0.001	0.001
overall	0.062	0.050	0.068	0.043	0.041	0.038	0.026	0.018	0.027
Obs.	7111	7111	7111	7345	7345	7345	6109	6109	6109
Banks	1057	1057	1057	1084	1084	1084	872	872	872

Notes: ***Statistically significant at the 1% level, **Statistically significant at the 5% level, *Statistically significant at the 10% level, Robust standard errors in parenthesis; Estimations obtained from a fixed effects model with robust standard errors clustered at the bank level; Variables are defined in Appendix II

Table 10 – Robustness results: alternative controls for institutions

	Institutional development index			Enforcement index		
	(1)	(2)	(3)	(4)	(5)	(6)
DIV*inc*	0.558***			0.557***		
	(0.137)			(0.137)		
DIV*asset*		0.911***			0.878***	
		(0.178)			(0.177)	
DIV*bs*			0.481***			0.452***
			(0.134)			(0.134)
LNAS	0.075***	0.101***	0.071***	0.074***	0.099***	0.070***
	(0.024)	(0.025)	(0.023)	(0.024)	(0.025)	(0.023)
GDPGR	0.040***	0.040***	0.040***	0.040***	0.040***	0.040***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
INFL	0.011***	0.010***	0.009**	0.011***	0.010***	0.009**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
CAPRQ	0.019	0.021	0.015	0.016	0.018	0.012
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
OFFPR	0.003	0.005	0.003	0.003	0.005	0.004
	(0.019)	(0.018)	(0.019)	(0.018)	(0.018)	(0.018)
PRMON	0.096***	0.102***	0.103***	0.093***	0.100***	0.100***
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
ACTRS	-0.163	-0.150	-0.118	-0.139	-0.127	-0.098
	(0.103)	(0.104)	(0.103)	(0.101)	(0.103)	(0.101)
INSTDEV	0.175	0.151	0.176			
	(0.127)	(0.128)	(0.127)			
ENFIND				0.379***	0.343***	0.358***
				(0.097)	(0.097)	(0.097)
CREDIT	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
CONC	-0.007***	-0.005***	-0.006***	-0.006***	-0.005***	-0.005***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
TBANKZ	0.012***	0.012***	0.013***	0.011***	0.011***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	1.391***	0.690	1.363***	1.209**	0.548	1.206**
	(0.504)	(0.531)	(0.506)	(0.499)	(0.527)	(0.502)
R-sq: within	0.124	0.128	0.123	0.128	0.132	0.127
between	0.018	0.017	0.014	0.000	0.000	0.000
overall	0.044	0.041	0.045	0.006	0.009	0.008
Obs.	7506	7506	7506	7506	7506	7506
Banks	1110	1110	1110	1110	1110	1110

Notes: ***Statistically significant at the 1% level, **Statistically significant at the 5% level, *Statistically significant at the 10% level, Robust standard errors in parenthesis; Estimations obtained from a fixed effects model with robust standard errors clustered at the bank level; Variables are defined in Appendix II

Table 11 – Robustness results: the impact of the financial crisis

	(1)	(2)	(3)	(4)	(5)	(6)
DIV*inc*	0.564***	0.445***				
	(0.136)	(0.141)				
DIV*asset*			0.862***	0.161		
			(0.178)	(0.206)		
DIV*bs*					0.477***	0.487***
					(0.133)	(0.145)
LNAS	0.150***	0.152***	0.165***	0.171***	0.145***	0.146***
	(0.029)	(0.029)	(0.030)	(0.030)	(0.029)	(0.029)
GDPGR	0.037***	0.037***	0.038***	0.036***	0.037***	0.037***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
INFL	0.012***	0.011***	0.011***	0.011***	0.010**	0.010**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
CAPRQ	0.023	0.024	0.024	0.028	0.019	0.019
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
OFFPR	0.011	0.014	0.012	0.018	0.011	0.011
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
PRMON	0.096***	0.097***	0.101***	0.094***	0.102***	0.103***
	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
ACTRS	-0.116	-0.122	-0.099	-0.111	-0.071	-0.071
	(0.107)	(0.107)	(0.108)	(0.108)	(0.107)	(0.107)
ECONFR	0.009**	0.010**	0.010**	0.009*	0.009**	0.009*
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
CREDIT	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
CONC	-0.006***	-0.006***	-0.005***	-0.004***	-0.005***	-0.006***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
TBANKZ	0.014***	0.014***	0.013***	0.012***	0.014***	0.014***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
CRISIS	-0.140***	-0.231***	-0.124***	-0.613***	-0.138***	-0.134***
	(0.029)	(0.049)	(0.029)	(0.084)	(0.029)	(0.040)
CRISIS*DIV		0.330**		1.241***		-0.023
		(0.152)		(0.201)		(0.151)
Constant	-0.468	-0.508	-1.036***	-0.780	-0.472	-0.469
	(0.657)	(0.658)	(0.680)	(0.671)	(0.666)	(0.666)
R-sq: within	0.131	0.132	0.134	0.145	0.130	0.130
between	0.020	0.023	0.016	0.020	0.018	0.018
overall	0.044	0.047	0.036	0.042	0.048	0.047
Obs.	7506	7506	7506	7506	7506	7506
Banks	1110	1110	1110	1110	1110	1110

Notes: ***Statistically significant at the 1% level, **Statistically significant at the 5% level, *Statistically significant at the 10% level, Robust standard errors in parenthesis; Estimations obtained from a fixed effects model with robust standard errors clustered at the bank level; Variables are defined in Appendix II

Table 12 – Robustness results: simultaneous control for different forms of diversification

	(1)	(2)	(3)	(4)	(5)
DIV*inc*	0.555***	0.537***	0.540***	0.507***	0.513***
	(0.132)	(0.133)	(0.132)	(0.136)	(0.138)
DIV*asset*	0.993***	1.015***	1.003***	0.827***	0.878***
	(0.174)	(0.177)	(0.175)	(0.175)	(0.179)
DIV*bs*	0.375***	0.374***	0.368***	0.427***	0.429***
	(0.124)	(0.127)	(0.125)	(0.131)	(0.134)
LNAS	0.079***	0.086***	0.076***	0.090***	0.094***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.025)
GDPGR	0.042***	0.043***	0.043***	0.039***	0.040***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
INFL	0.011***	0.009**	0.012***	0.012***	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
CAPRQ		0.044**			0.021
		(0.020)			(0.021)
OFFPR		0.010			0.007
		(0.018)			(0.018)
PRMON		0.097***			0.099***
		(0.033)			(0.033)
ACTRS		-0.165			-0.125
		(0.103)			(0.105)
ECONFR			0.008*		0.007*
			(0.004)		(0.004)
CREDIT				-0.005***	-0.005***
				(0.001)	(0.001)
CONC				-0.007***	-0.006***
				(0.002)	(0.002)
TBANKZ				0.012***	0.011***
				(0.001)	(0.001)
Constant	0.945**	0.295	0.446	1.238***	0.157
	(0.377)	(0.496)	(0.427)	(0.375)	(0.577)
R-sq: within	0.091	0.100	0.092	0.129	0.137
between	0.090	0.071	0.076	0.068	0.050
overall	0.095	0.077	0.089	0.108	0.089
Obs.	8051	7852	8022	7677	7506
Banks	1204	1163	1198	1146	1110

Notes: ***Statistically significant at the 1% level, **Statistically significant at the 5% level, *Statistically significant at the 10% level, Robust standard errors in parenthesis; Estimations obtained from a fixed effects model with robust standard errors clustered at the bank level; Variables are defined in Appendix II

Table 13 – Robustness results: accounting for nesting effects
(Multi-level mixed effects modeling)

	MLME_1			MLME_2		
Fixed effects	(1)	(2)	(3)	(4)	(5)	(6)
DIV*inc*	0.588***			0.590***		
	(0.081)			(0.107)		
DIV*asset*		0.931***			1.031***	
		(0.095)			(0.147)	
DIV*bs*			0.328***			0.472***
			(0.075)			(0.119)
LNAS	0.063***	0.074***	0.068***	0.065***	0.083***	0.077***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
GDPGR	0.042***	0.042***	0.042***	0.042***	0.039***	0.038***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
INFL	0.010***	0.010***	0.008***	0.011***	0.009***	0.010***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
CAPRQ	0.024**	0.024**	0.021**	0.024**	0.020*	0.018*
	(0.011)	(0.010)	(0.011)	(0.010)	(0.011)	(0.011)
OFFPR	0.009	0.011	0.009	0.003	0.007	-0.003
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
PRMON	0.088***	0.093***	0.093***	0.089***	0.092***	0.093***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.016)
ACTRS	-0.113**	-0.086*	-0.092**	-0.111**	-0.065	-0.081*
	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)	(0.047)
ECONFR	0.006**	0.007**	0.006**	0.007**	0.007**	0.006**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
CREDIT	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
CONC	-0.006***	-0.005***	-0.005***	-0.006***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
TBANKZ	0.012***	0.012***	0.012***	0.012***	0.012***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	1.335***	0.788**	1.358***	1.282	0.668**	1.339***
	(0.305)	(0.312)	(0.307)	(0.305)	(0.316)	(0.307)

Random effects						
Var (Residual)	0.273	0.272	0.274	0.248	0.239	0.233
	[0.264, 0.283]	[0.263, 0.282]	[0.264, 0.283]	[0.239, 0.258]	[0.230, 0.248]	[0.225, 0.242]
Var (Country-level)	0.222	0.233	0.233	0.227	0.245	0.240
	[0.151, 0.327]	[0.159, 0.340]	[0.159, 0.342]	[0.154, 0.336]	[0.167, 0.358]	[0.163, 0.352]
Var (Bank-level)	0.267	0.263	0.275	0.552	1.298	0.606
	[0.240, 0.297]	[0.236, 0.293]	[0.247, 0.305]	[0.461, 0.661]	[1.052, 1.602]	[0.524, 0.702]
Var (DIV)				3.855	8.494	5.751
				[3.072, 4.839]	[6.919, 10.429]	[4.746, 6.970]
Covariance (DIV, intercept)				-1.098	-3.023	-1.411
				[-1.373, -0.823]	[-3.698, -2.349]	[-1.691, -1.132]
LR test Random slope & intercept vs Random intercept only				190.35***	312.32***	343.77***
AIC	13896.79	13854.53	13930.35	13710.45	13546.21	13590.57
Obs.	7506	7506	7506	7506	7506	7506
Banks	1110	1110	1110	1110	1110	1110

Notes: ***Statistically significant at the 1% level, **Statistically significant at the 5% level, *Statistically significant at the 10% level, Standard errors in parenthesis; 95% confidence intervals in brackets; MLME_1: Maximum likelihood estimates from a multi-level model with random and fixed slope coefficients. MLME_2: Maximum likelihood estimates from a multi-level model with fixed effects, random intercepts for countries and banks, and a random slope for DIV. Variables are defined in Appendix II

Table 14 – Robustness results: accounting for endogeneity
with Limited Information Maximum Likelihood estimations

	(1)	(2)	(3)	(4)	(5)	(6)
OFSI_lag1		0.478***		0.461***		0.460***
		(0.018)		(0.018)		(0.018)
DIV*inc*	2.107***	1.206***				
(lag1_instrumented)	(0.467)	(0.411)				
DIV*asset*			2.532***	1.525***		
(lag1_instrumented)			(0.342)	(0.306)		
DIV*bs*					1.109***	0.675***
(lag1_instrumented)					(0.234)	(0.201)
LNAS	0.080***	-0.010	0.137***	0.028	0.066***	-0.015
	(0.024)	(0.021)	0.027	(0.024)	(0.023)	(0.021)
GDPGR	0.035***	0.023***	0.035***	0.024***	0.035***	0.023***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
INFL	0.019***	0.003	0.016***	0.002	0.011***	-0.001
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
CAPRQ	0.024	0.018	0.028*	0.021	0.013	0.012
	(0.017)	(0.014)	(0.017)	(0.014)	(0.017)	(0.014)
OFFPR	0.003	0.000	0.011	0.005	0.007	0.003
	(0.013)	(0.011)	(0.013)	(0.011)	(0.014)	(0.011)
PRMON	0.090***	0.063***	0.101***	0.071***	0.100***	0.070***
	(0.021)	(0.017)	(0.022)	(0.017)	(0.022)	(0.017)
ACTRS	-0.278***	-0.254***	-0.212***	-0.217***	-0.166**	-0.188***
	(0.083)	(0.066)	(0.083)	(0.064)	(0.081)	(0.065)
ECONFR	0.007**	-0.005*	0.010***	-0.003	0.007*	-0.005*
	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
CREDIT	-0.007***	-0.005***	-0.007***	-0.005***	-0.008***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
CONC	-0.010***	-0.005***	-0.006***	-0.003***	-0.008***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
TBANKZ	0.011***	0.008***	0.011***	0.008***	0.012***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
R-squared	0.084	0.322	0.121	0.327	0.129	0.320
Obs.	6195	6195	6195	6195	6195	6195
Banks	979	979	979	979	979	979

Notes: ***Statistically significant at the 1% level, **Statistically significant at the 5% level, *Statistically significant at the 10% level, Robust standard errors in parenthesis; LIML: Estimations obtained from a limited information maximum likelihood approach with fixed effects; Variables are defined in Appendix II

Table 15 – Robustness results: accounting for endogeneity
with a Heckman-type treatment effect model

	(1)	(2)	(3)
Regression equation			
DIV*inc*	0.399***		
(treatment membership variable)	(0.096)		
DIV*asset*		0.241**	
(treatment membership variable)		(0.098)	
DIV*bs*			0.377***
(treatment membership variable)			(0.101)
LNAS	0.035***	0.033***	0.041***
	(0.010)	(0.010)	(0.010)
GDPGR	0.053***	0.053***	0.051***
	(0.004)	(0.004)	(0.004)
INFL	0.041***	0.041***	0.037***
	(0.005)	(0.006)	(0.005)
CAPRQ	0.017	0.010	0.021
	(0.015)	(0.015)	(0.015)
OFFPR	-0.012	-0.026**	-0.024**
	(0.012)	(0.011)	(0.012)
PRMON	-0.121***	-0.129***	-0.129***
	(0.026)	(0.026)	(0.026)
ACTRS	-0.052	-0.083*	-0.083*
	(0.044)	(0.042)	(0.044)
ECONFR	0.016***	0.015***	0.016***
	(0.003)	(0.003)	(0.003)
CREDIT	-0.003***	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)
CONC	0.007***	0.008***	0.007***
	(0.001)	(0.001)	(0.001)
TBANKZ	0.008***	0.007***	0.006***
	(0.002)	(0.002)	(0.002)
Constant	1.632***	2.108***	1.855***
	(0.333)	(0.318)	(0.324)
Simultaneous selection equation (dummy for diversification as dependant)			
LNAS	0.044***	0.029**	-0.015
	(0.016)	(0.015)	(0.014)
MERG	0.139	-0.190*	0.084
	(0.088)	(0.102)	(0.093)
GDPGR	0.020***	0.001	0.019***
	(0.006)	(0.006)	(0.007)
ACTRS	-0.041	-0.013	-0.059
	(0.052)	(0.058)	(0.063)
NIM	-0.007	0.031**	0.007

	(0.017)	(0.016)	(0.019)
SHDIV	3.202***	(2.950)***	3.429***
	(0.131)	(0.170)	(0.158)
Constant	-2.234***	-1.965***	-1.398***
	(0.299)	(0.274)	(0.293)
Obs.	7,506	7,506	7,506
Banks	1,110	1,110	1,110

Notes: ***Statistically significant at the 1% level, **Statistically significant at the 5% level, *Statistically significant at the 10% level, Robust standard errors in parenthesis; Estimations obtained from a treatment effect model estimated with maximum likelihood and robust standard errors clustered at the bank level ; Variables are defined in Appendix II

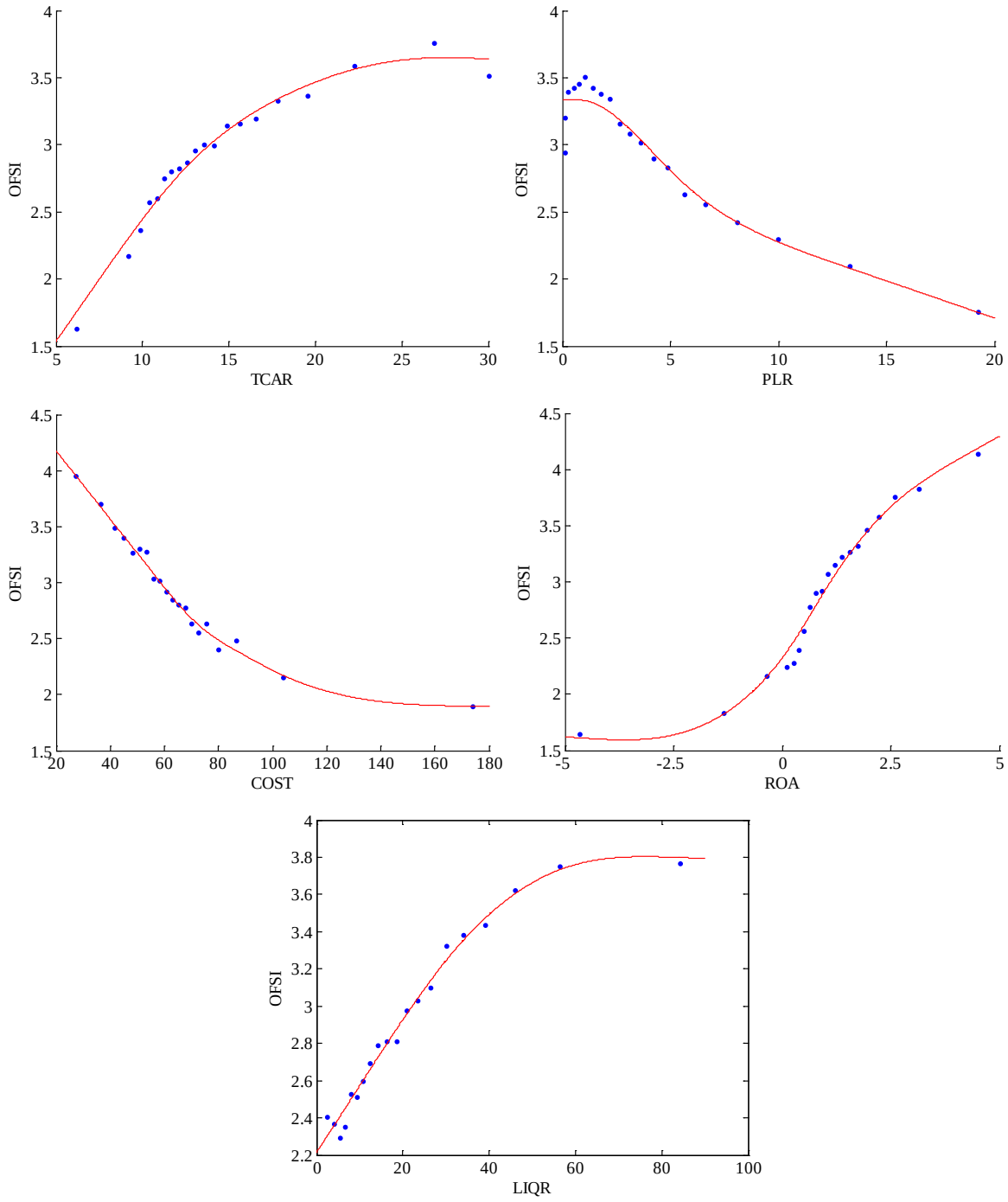

Figure 1 – Relationship of the OFSI with the financial ratios

Appendix I – SMAA2

The process of analyzing different scenarios with respect to the parameters of the additive evaluation model, is based on generating (at random) uniformly distributed tradeoff constants (w_{TCAR}, w_{PLR}, w_{COST}, w_{ROA}, w_{LIQR}) for the financial ratios, together with the corresponding monotone marginal value functions (f_{TCAR}, f_{PLR}, f_{COST}, f_{ROA}, f_{LIQR}). In particular, each scenario corresponds to a random additive value function constructed through a two-step process, as follows:

1. The tradeoff constants $w_{TCAR}, w_{PLR}, w_{COST}, w_{ROA}, w_{LIQR} \geq \varepsilon$ are generated at random such that $w_{TCAR} + w_{PLR} + w_{COST} + w_{ROA} + w_{LIQR} = 1$. The lower bound ε is set equal to 0.01 to exclude unrealistic scenarios, where a financial ratio becomes almost irrelevant for the evaluation. To generate random tradeoffs under these conditions, four random numbers $0 < u_1 < u_2 < u_3 < u_4 < 1$ are sampled from the uniform distribution in (0, 1). The tradeoff constant for ratio j (1-TCAR, 2-PLR, 3-COST, 4-ROA, 5-LIQR) is then obtained as $w_j = u_j - u_{j-1}$ (with $u_1 = 0$ and $u_5 = 1$). If any of the tradeoffs is lower than 0.01, the sampling is repeated.
2. For each financial ratio *j*, a random marginal value function is constructed. In order to avoid posing any restrictions (other than monotonicity) on the form of the marginal value functions, we employ a piecewise linear modeling approach. First, three uniformly distributed random numbers are generated such that $0 < v_{1j} < v_{2j} < v_{3j} < 1$. The marginal value function for ratio j is then defined as a piecewise linear function by setting $f_j(b_{0j}) = 0$, $f_j(b_{sj}) = v_{sj}$ ($s = 1, 2, 3$), and $f_j(b_{4j}) = 1$, where $b_{1k} < b_{2k} < b_{3k}$ are three equidistant values between then minimum (b_{0j}) and maximum (b_{4j}) of ratio j according to the data set (assuming that all ratios are expressed in maximization form). This piecewise linear approach (with four linear segments) enables the consideration of a wide class of convex, concave, and s-type marginal value functions, without imposing a specific functional form.

The randomly generated additive function can be easily used to evaluate any bank in the sample. The marginal values of the bank on the ratios can be obtained by linearly interpolating the ratios' piecewise marginal value functions.

Appendix II – Definition of variables

Variable	Description and sources of data
Stage 1: Estimation of the Overall Financial Strength Indicator (OFSI)	
TCAR	The total capital adequacy ratio under the Basel rules, measuring Tier 1 and Tier 2 capital as percentage of risk-weighted assets and of off-balance sheet risks. It serves as an indicator of capital adequacy (Source: OSIRIS).
PLR	The ratio of problem loans to gross loans (%), used as an indicator of asset quality. (Source: OSIRIS).
COST	The cost to income ratio (%) used as an indicator of management quality (Source: OSIRIS).
ROA	Return on assets ratio (%), used as an indicator of profitability (Source: OSIRIS)
LIQR	The liquid assets to deposits and short term funding ratio (%), used as an indicator of liquidity (Source: OSIRIS)
Stage 2: Determinants of OFSI (& Diversification status)	
A. Internal determinants	
DIV*inc*	Herfindhal-Hirshman type index used as indicator of diversification across the four main types of bank income, namely interest income, commission income, trading income, other operating income (Source: OSIRIS)
DIV*assets*	Herfindhal-Hirshman type index used as indicator of diversification across the two main types of bank earning assets, namely loans and other earning assets (Source: OSIRIS)
DIV*bs*	Herfindhal-Hirshman type index used as indicator of diversity of on-and off-balance sheet activities (Source: OSIRIS)
LNAS	Natural logarithm of total assets, used as proxy for bank size (Source: OSIRIS).
MERG	Dummy variable indicating whether a bank merged with or acquired at least one other bank. It takes the value of one on the year of the M&A and all the years that follow, and zero otherwise (i.e. years prior to the M&A and cases with no M&A activity). (Source: Bureau van Dijk)
Dummy for diversification	This dummy equals one if the Herfindahl index of diversification (income, asset, or balance sheet) exceeds the 75^{th} percentile of the empirical distribution, and zero otherwise.
B. External determinants	
I. Macroeconomic conditions	
GDPGR	Real GDP growth (%) (Source: Global Market Information Database).
INFL	CPI inflation (%) (Source: Global Market Information Database).
II. Regulatory conditions	

CAPRQ	Capital requirements Index. This variable is determined by adding 1 if the answer is yes to questions 1-6 and 0 otherwise, and the opposite occurs for questions 7 and 8 (i.e., yes=0, no=1). The questions are: (1) Is the minimum required capital asset ratio (risk-weighted) in line with Basel guidelines? (2) Does the ratio vary with market risk? (3-5) Before determining minimum capital adequacy, are any of the following are deducted from the book value of capital? (a) market value of loan losses not realized on the financial statements (b) unrealized losses on securities portfolios (c) unrealized foreign exchange losses. (6) Have regulatory/supervisory authorities verified the sources of funds to be used as capital? (7) Can assets other than cash or government securities provide the initial or subsequent injections of capital? (8) Can borrowed funds provide the initial disbursement of capital? (Source: Bank Regulation and Supervision Database, World Bank; Barth et al., 2001, 2006, 2008)
OFFPR	Supervisory power index. This variable is determined by adding 1 if the answer is yes and 0 otherwise, for each of the following 14 questions: (1) Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? (2) Are auditors legally required to communicate directly to the supervisory agency any presumed involvement of bank directors or senior managers in illicit activities, fraud, or insider abuse? (3) Can supervisors take legal action against external auditors for negligence? (4) Can the supervisory authorities force a bank to change its internal organizational structure? (5) Does the institution disclose off-balance-sheet items to supervisors? (6) Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? (7) Can the supervisory agency suspend directors' decisions to distribute dividends? (8) Can the supervisory agency suspend directors' decisions to distribute bonuses? (9) Can the supervisory agency suspend directors' decisions to distribute management fees? (10) Can the supervisory agency supersede bank shareholder rights and declare the bank insolvent? (11) Does banking law allow a supervisory agency or any other government agency (other than a court) to suspend some or all ownership rights at a problem bank? (12) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than a court) supersede shareholder rights? (13) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than a court) remove and replace management? (14) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than a court) remove and replace directors? (Source: Bank Regulation and Supervision Database, World Bank; Barth et al., 2001, 2006, 2008)
PMON	Market discipline & private monitoring index. This variable is determined by adding 1 if the answer is yes to questions 1-7 and 0 otherwise, and the opposite occurs for questions 8 and 9 (i.e., yes=0, no=1). (1) Is subordinated debt allowed (or required) capital? (2) Are financial institutions required to produce consolidated accounts covering all bank and any nonbank financial subsidiaries? (3) Are off-balance-sheet items disclosed to the public? (4) Must banks disclose their risk-management procedures? (5) Are directors legally liable for erroneous/misleading information? (6) Do regulations require credit ratings for commercial banks? (7) Is an external audit by certified/licensed auditor mandatory for banks? (8) Does accrued, unpaid interest/principal on nonperforming loans appear on the income statement? (9) Is there an explicit deposit-insurance protection system? (Source: Bank Regulation and Supervision Database, World Bank; Barth et al., 2001, 2006, 2008)
ACTRS	Activity restrictions Index. The score for this variable is determined on the basis of the level of regulatory restrictiveness for bank participation in: (1) securities activities, (2) insurance activities, (3) real estate activities, and (4) bank ownership of nonfinancial firms. These activities can be unrestricted, permitted, restricted, or prohibited and receive values of 1, 2, 3, or 4, respectively. We create an overall index by calculating the average value of the four categories. (Source: Bank Regulation and Supervision Database, World Bank; Barth et al., 2001, 2006, 2008)
III. Institutional development-economic freedom	
ECONFR	Proxy for the overall level of economic freedom and institutional development. It is a composite index that is calculated by considering: business freedom, trade freedom, fiscal freedom, government spending, monetary freedom, investment freedom, financial freedom, property rights, freedom from corruption, labor freedom (Source: Heritage Foundation).

IV. Banking sector structure, Development and Stability	
CREDIT	The ratio of private credit by deposit money banks to GDP (%) used as proxy for the development of the banking sector (Source: 2012 update of Financial Development and Structure Database, World Bank; Beck et al., 2000).
CONC	3-bank concentration ratio (%) (Source: 2012 update of Financial Development and Structure Database, World Bank; Beck et al., 2000).
TBANKZ	Banking sector Z-score, serving as indicator of the overall soundness of the banking sector. It is calculated as (ROA+(equity/assets))/sd(ROA), with the standard deviation of ROA, sd(ROA), being estimated over a 5-year moving window (Source: 2012 update of Financial Development and Structure Database, World Bank; Beck et al., 2000)
IV. Other country-level control variable	
DEVGTRANS	Dummy variable taking the value of 1 for developing and transition economies and the value of 0 for major advanced and advanced economies (Source: IMF, EBRD)
CBASSET	The ratio of central bank assets to GDP (%) used as an indicator of central bank's size. (Source: 2012 update of Financial Development and Structure Database, World Bank; Beck et al., 2000)
MCAPGDP	The ratio of stock market capitalization to GDP (%) used as an indicator of stock market development. (Source: 2012 update of Financial Development and Structure Database, World Bank; Beck et al., 2000)
BONDGDP	The ratio of private and public bond market capitalization to GDP (%) used as an indicator of bond market development (Source: 2012 update of Financial Development and Structure Database, World Bank; Beck et al., 2000)
INSTDEV	Overall indicator of institutional development, calculated as the average of six indicators accounting for: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, control of corruption (Source: World Governance Indicators Database)
ENFIND	Enforcement index calculated as the average of three indicators accounting for: rule of law, control of corruption (Source: World Governance Indicators Database)
CRISIS	Dummy variable taking the value of 1 for the period 2007-2010, and the value of 0 for the period 2001-2006.
NIM	Country-level bank net interest margin (Source: 2012 update of Financial Development and Structure Database, World Bank; Beck et al., 2000)
SHDIV	Share of diversified banks in the country