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**BBSWP/13/005**

## COMPETITION AND BANK RISK
## THE ROLE OF SECURITIZATION AND BANK CAPITAL


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**October 2013**


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# COMPETITION AND BANK RISK
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**Abstract:** We find that the increased use of securitization activity in the banking sector augmented the effect of competition on realized bank risk during the 2007-2009 crisis. Our results suggest that securitization by itself does not lead to augmented risk while higher levels of capital do not buffer the impact of competition on realized risk. It follows that cooperation between supervisory and competition authorities would be beneficial when acting on the financial stability implications of financial innovation and the effects of bank capital regulation.

**Keywords:** securitization; competition; bank risk
**JEL classification:** G21; D22

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## I. Introduction

The 2007-2009 financial crisis brought the connection between competition and bank stability again to the fore. Historically this was not always the case. Indeed, in the five decades following the Great Depression, the banking industry was tightly regulated and, as a result, competition was largely contained in most developed countries (Benston, 1998). Essentially the underlying idea at the time was that competition was detrimental to financial stability. In contrast, in the three decades prior to the 2007-2009 financial crisis, an unprecedented process of deregulation took place in the banking sector (Vives, 2001). Broadly speaking, during this latter period, efficiency considerations took a preceding role over financial stability concerns as the deregulatory process aimed primarily at improving the efficiency of the financial system.

The economic theory is however unclear on the expected effect of increased competition on bank risk.[2] One strand of the literature argues that competition endangers financial stability. In a nutshell, it suggests that increased competition for deposits would erode profits lowering the market power of banks thereby depressing their charter value. This decline coupled with the existence of limited liability (and a 'quasi' flat-rate deposit insurance in most countries) would encourage banks' owners to expand and take on new risks by shifting the risks to depositors and ultimately the government (Keeley, 1990; Matutes and Vives, 1996; Hellmann, et al., 2000). In this direction also, more concentrated (and possibly also less competitive) markets have larger banks that might be better able to diversify and therefore contribute to more stable financial system than less concentrated markets (Ramakrishnan and Thakor, 1984; Boyd and Prescott, 1986;Williamson, 1986; Allen, 1990).[3]

In contrast, there is a parallel strand of the literature that argues that competition among banks would enhance, rather than disrupt, financial stability. This latter strand of papers considers the effect of bank competition on the loan market as opposed to focusing on the effect of bank competition on the deposit market only. The additional consideration is that competition would lower the lending rate charged to borrowers thereby raising their profits so they would have fewer incentives to take on new risks lowering, as a result, the overall risk profile of the bank (Boyd and De Nicoló, 2005).[4]

[2] For very good overviews see for instance Vives (2010), Carletti and Hartmann (2003), Cetorelli (2001).

[3] A related argument also supporting this positive effect of competition on risk refers to the number of banks to be supervised by the authorities. A more concentrated banking system implies a smaller number of banks. This would be expected to reduce the supervisory burden and improve the overall quality of the supervision enhancing, as a result, the stability of the banking system (Allen and Gale, 2000).

[4] Martinez-Miera and Repullo (2005) show that this argument does not account the fact that lower rates also reduce the banks' revenues from non-defaulting loans.

Comparing different models, Allen and Gale (2004) illustrate how crucial the specific details of the models are in concluding whether competition leads to more or less financial stability suggesting that the issue is multifaceted. There is also a vast empirical literature analyzing the relationship between competition and bank risk which tends to provide similarly ambiguous results.[5] Hence further evidence on the different factors at work underlying this relationship, both at the empirical and theoretical level seems warranted. Building on the existing literature, we focus on two main variables (securitization and bank capital) that might have affected this relationship in recent years.

Turning to the first factor, large increases in the use of securitization activity in the decades before the crisis represented a major structural development in the banking sector in most developed countries (Marques-Ibanez and Scheicher, 2010).[6] Securitization allowed banks to turn traditionally illiquid claims (overwhelmingly in the form of bank loans) into marketable securities and sell them off to the financial markets. In principle, from the perspective of individual banks, securitization allowed banks to diversify their risk portfolio more effectively, both geographically and by sector. Yet banks might also respond to the static reduction in risks due to securitization by taking on new ones.[7]

Our first hypothesis acknowledges that securitization activity might have impacted on the effect of competition on bank risk in recent years. Scant empirical evidence from the pre-crisis period suggests that banks that were more active in the securitization market were found to have higher profitability, and were often better capitalized (Cebenoyan and Strahan, 2004). At the same time, in the long-run banks in more competitive markets with high levels of securitization activity might be expected to have riskier loan portfolios (Ahn and Breton, 2011).[8] More broadly, as competition increases banks might also respond to the static reduction in risks due to securitization by taking on new ones, in particular, by loosening their lending standards, increasing their leverage, or becoming systemically riskier (Mian and Sufi, 2009; Keys et al., 2010; Nijskens and Wagner, 2011).[9] There is, however, some recent and growing empirical evidence suggesting that there are no differences in performance (i.e. credit risk) between equivalent securitized and non-securitized loans (Albertazzi et al., 2011, and Benmelech et al., 2012).

Our second hypothesis recognizes that in the run-up to the 2007-2009 crisis, prudential regulators responded to the process of financial de-regulation by giving bank capital a central position as a

[5] See Beck (2008) and Vives (2010) for two excellent surveys of this large literature.
[6] While securitisation in a narrow view has been used as a technique in the United States for more than fifty years, the decade prior to the financial crisis coincided with spectacular increases in the amount of securitisation activity, in the number countries using these techniques and in the development of new credit risk transfer instruments.
[7] See Gorton and Metrick (2012) for a lucid and comprehensive recent review of this literature.
[8] In this model securitization works as a signaling device indicating that banks will reduce monitoring.
[9] A number of recent theoretical models illustrative the social costs of securitization. See for instance Stein (2011) or Gorton and Ordoñez (2012).

supervisory tool influencing banks' behavior. As a result, in most recent models of competition bank capital plays a major role. Higher levels of bank capital would raise banks' charter value thereby buffering risk-taking incentives in competitive markets. Hence banks with high capital ratios in more competitive markets would reduce bank risk by more than banks with high capital ratios in less competitive markets (Keeley, 1990; Hellman et al., 2000). Equity also provides banks with greater incentives for exerting better monitoring of borrowers as it forces banks to internalize the costs of their default.[10] At the same time, there are also reasons to expect a positive relationship between capital and risk particularly as competition increases. In fact the theoretical literature gives us grounds for doubting that increased capital requirements will necessarily result in reduced risk-taking incentives (Gale and Özgür, 2005; VanHoose, 2007). For instance, an increase in the required capital ratio can force banks to take on more risk in order to achieve target rates of return (see Gale, 2010). Empirically also, higher levels of capital may simply be the result of regulators forcing riskier banks to hold higher buffers. There is, in fact, significant evidence finding a positive relationship between higher levels of bank capital and risk (see for instance Berger and Bouwman, 2013; Delis and Staikouras, 2011).[11]

## II. MODEL, IDENTIFICATION STRATEGY AND DATA RESULTS

A major challenge of the empirical literature analyzing the relationship between competition and risk is when to time the realization of bank risk (Beck, 2008) as there is an important lag between the period in which risk-taking takes place and its materialization. Another, important modeling challenge is that an important component of bank risk often materializes only in the event of a crisis.

We exploit the materialization of bank risk during the 2007-2009 crisis and consider whether the ex-ante cross-sectional variability in bank characteristics and competitive conditions prior to the crisis are related to the ex-post materialization of bank risk.[12] Our approach assumes that to a large extent the measurement of risk can only be gauged when an extreme event materializes. That is, when a crisis occurs.

Our model measures the probability of a bank belonging to the group of riskier institutions during the 2007-2009 crisis. We define as "risky" as those banks that received direct public assistance during the crisis and creating a binary variable (*RISKY*) that takes the value of 1 if the bank had any form of

[10] There is evidence from the crisis suggesting that higher capital might be associated to more risk (Demirguc-Kunt et al. (2010).
[11] In fact many of the banks failing during the crisis had capital levels above the average of their peers (Haldane and Madouros, 2012).
[12] Other studies have used a similar strategy to consider how certain pre-crisis characteristics were linked to stock market performance during the recent crisis (see for instance Beltratti and Stulz, 2012).

financial support during the crisis after 2007Q2-2008Q4 period and 0 otherwise. Hence our definition of risky banks refers only to the risks that materialized during the crisis. The statistical sources used and a brief description of the main variables included in our study are provided in the first two columns of Table I. In total we have 495 bank observations for the largest listed bank parent companies in Austria, Belgium, the Netherlands, Germany, France, the UK, Italy, Portugal, Spain and the United States.[13]

For each country, we construct a measure of competition and based on the ex-ante literature, we also add a number of other factors likely to impact on bank risk (see Altunbas et al., 2011). Hence the vector *X* also includes 5 bank-specific characteristics: securitization activity (*SEC*), capital-to-assets (*CAP*), size in terms of total assets (*SIZE*), loan growth (*EXLEND*) and, short-term deposits (*DEP*). More importantly for our purposes, we include the interaction between competition (*COMP*) and two main bank specific characteristics: securitization (*SEC*) and bank capital (*CAP*). In this way, we assess whether banks with different characteristics in terms of financial innovation and capital position adopted different risk strategies in connection with the existence of high competition in the loan market (*COMP*X*).

The baseline empirical model is given by the following probit equation:

$$P\left[ risky_{ik} = 1 \middle| X \right] = \Phi(\alpha COMP + Y'\beta + X'\gamma + COMP * X\lambda) \qquad (1)$$

where *P* is the probability, *Φ* is the standard cumulative normal probability distribution, *Y* is a vector of country dummies *k* where bank *i* has its main seat, and *X* a vector of bank-specific characteristics of the same bank *i* over the five years prior to the crisis (2002Q2–2007Q2). This approach limits endogeneity problems. The probit model is estimated by maximum likelihood.

Our measure of bank risk, *RISKY*, captures whether an institution received government support. The construction of this variable is based on the collection of information related to the public rescue of individual banks via capital injections or other government-sponsored programmes. Information on this variable has been obtained from public and confidential sources including the European Commission, European Central Bank (ECB), Bank for International Settlements (BIS), Bloomberg and the websites of a number of governmental institutions and national central banks. Around 30% of the banks in our sample needed financial support after the start of the crisis in August 2007.

[13] In order to have a comparable sample, we focus on the parent company of the largest privately owned, listed commercial banks headquartered in those countries. This reduces our sample from 1,100 initial institutions (often belonging to a larger group as branches or subsidiaries) to 495 banks. For a full description of the characteristics of the database and variable definitions see Altunbas et al. (2011).

In order to measure bank competition, we use the so-called Boone-indicator (Boone, 2008). This measure of competition is based on the notion that in a competitive market, more efficient companies are likely to gain larger market shares than in a non-competitive market. Compared to other measures of competition like the Hirschman-Herfindahl index (*HHI*), the adjusted Lerner index, or the price cost margin (*PCM*), the Boone indicator is monotone in intensity to competition and does not depend on the Cournot model assumptions. For instance, the standard intuition of the *HHI* is based on a Cournot model with symmetric firms, where a fall in entry barriers reduces the *HHI*. However, in a setting in which firms differ in efficiency, an increase in competition reallocates output to the more efficient firms that already had higher output levels. Hence, the increase in competition raises the *HHI*, but decreases the Boone-indicator because of the strengthening relationship between performance and efficiency. Other commonly used measures of competition such as the price-cost margin (*PCM*), or the so called Lerner index, have similar disadvantages.[14]

Finally, heavier competition reduces the *PCM* of all firms. But since more efficient firms may have a higher *PCM* (skimming off part of the profits stemming from their efficiency lead), the increase in their market share may raise the industry's average *PCM*, contrary to common expectations. As such, the estimates of the *PCM* will typically underestimate the price-cost margin (*PCM*) and the actual level of competition. For all these reasons, we chose the Boone-indicator as our preferred measure of competition.

We used the Boone indicator with country-level data as described in Van Leuvensteijn et al. (2011, 2013). The Boone indicator varies from 0.2 to 5.6 and shows that, according to our metric, Portugal appears to be one of the less competitive countries. The securitization variable, *SEC* reflects averages of securitization flows ranging from 0 to 9.8% of total assets (source DCM Analytics Dealogic) while the average capital to total assets (*CAP*) before the crisis around 9%. We compute a bank-specific measure for credit expansion, *EXLEND*, by subtracting from each bank's lending growth the average expansion in bank lending for the whole banking industry in that country. The average short-term deposit as percentage of assets, *DEP*, amounts to around 70%. As a macro variable we have included year on year real *GDP* growth.

[14] Graddy (1995) and Genesove and Mullin (1998) estimate the elasticity-adjusted Lerner index, Lerner-index times the price-elasticity of sugar demand and show that the conjectural variation parameter can be interpreted as a measure of competition. Corts (1999) criticizes this approach suggesting that, in general, efficient collusion cannot be distinguished from Cournot competition using the elasticity adjusted Lerner index.

## III. RESULTS

Table II, column I shows that the use of securitization (*SEC*), diminishes the likelihood of receiving public assistance. In other words, off-loading risks to third parties via securitization by itself, did not seem to have made banks more likely to default during the crisis period. In this direction also, better capitalized banks (*CAP*) and those institutions more reliant on stable funding via customers deposits have lower likelihood of default. The latter is not surprising as many whole sale markets dried up during the crisis compared with traditional deposit funding which remained far more stable for most institutions. These outcomes (columns II-VII) do not change when different specifications are introduced although the direct impact of competition loses, of course, it significance when country dummies are introduced or when the interaction between *COMP* and *CAP* are included.

Turning to our main hypotheses on the interaction terms of competition, our results show that securitization compounds the direct effect of competition on bank risk. In other words, as competition increases, banks with higher levels of securitization activity (*SEC*) also tended to have a riskier profile as the crisis erupted (columns IV and V). One possible plausible explanation for these results is that enhanced competition before the crisis might have lead to a higher resource to securitization activities which eventually resulted in an increased risk profile by banks presumably due to reduced monitoring incentives by those banks. In other words, it seems that securitization by itself (i.e. 'per se') is not deleterious from a financial stability perspective but rather the *interaction* between competition and securitization that potentially can pose a financial stability problem.

We also find that as competition increases, bank capital is not effective in counterbalancing the direct effect of competition on financial stability. In other words, as competition intensifies, higher levels of capital are not enough to support financial stability. At the same time, we also find that capital by itself was effective in buttressing individual banks' soundness during the crisis.

An important consideration is that as the variable competition was interacted (with securitization and bank capital) in a non-linear model, the direct interpretation of the interaction variable could be misleading (Ai and Norton, 2003). For instance, we found a positive estimated marginal effect for the interaction term between competition and capitalization which implies that higher securitization would make the positive effect of competition larger. This, however, does not mean that the interaction between these two variables is always positive and siginificant across the whole sample.

Chart I presents two charts showing both the correct interaction effects as well as the incorrect marginal interaction effects of our model for the variables interacting competition and securitization (Panel A) and competition and capital (Panel B). The charts indicate that the interpretation of the interaction terms is more complex than as suggested by the single marginal effect estimator calculated for the whole sample as presented in Table II. The thrust of the interpretation, however, remains as both panels suggest that only for a small percentage of the population the interaction effects are negative. That is, Charts I.A and I.B show that for the overwhelming majority of the banks in our sample the values of the interaction term are positive. This suggests that in most cases higher competition coupled with more resource to securitization activity (or higher capital levels) is conducive to more bank risk. The significance of the interaction terms is assessed in Chart II. It estimates the interaction effects for whole sample and shows that these interactions are highly significant (i.e. 1%) and positive for a large group of observations. More concretely, it is positively significant for nearly for 83% of the sample for the variable interacting competition and securitization and 64% the variables interacting competition with bank capitalization. Finally, as suggested by Green (2010), we have further represented graphically the interaction variables according to the strength of competition and our results shows that the strength of the interaction results applies in particular for those markets with higher levels of competition (i.e. competition above the median).[15] Finally our results are consistent to the use of other (continuous) variables accounting for bank risk.[16]

## IV. CONCLUSION

We found that as competition increases banks resorting more heavily to securitization activity have more incentives to increase their risk profile and are more likely to be rescued after the crisis. Likewise, we find that as competition becomes stronger, increased capital levels do not buffer the direct impact of competition on bank risk. While the latter finding most likely reflects the regulators' tendency to demand higher capital in a more competitive environment, it also shows that higher levels of bank do not prove to be sufficient to ensure financial stability as competition increases. As in Gale (2010) and Beck (2008) our results suggests that, first, excessive reliance on bank capital does not seem enough to ensure financial stability. Second they suggest that supervisory authorities should cooperate closely with competition

[15] Results available upon request.
[16] We check the consistency of our results using an alternative continuous variable accounting for bank risk as perceived by the markets: the expected default frequency of each bank. Results available upon request.

authorities in particular when evaluating the financial stability implications of bank capital regulation or securitization.

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# Table I
# DESCRIPTIVE STATISTICS

This table presents the names of the variables employed in our empirical analysis, indicating the data sources, as well as a brief description of how the variables have been constructed. More detailed information, plus all publicly available data, are available upon request. This table presents the summary statistics of the variables used in our paper (see Section II for further details). Unless stated otherwise, descriptive statistics are derived from the average values calculated on the basis of quarterly data for the pre-crisis or the crisis period. The variable accounting for bank risk is calculated during the crisis period (2007Q4 to 2009Q4). The variables accounting for securitization, capital structure, size, loan growth and deposits are calculated from the averages of quarterly data for individual banks for the pre-crisis period (2003Q4 to 2007Q3). *GDP* growth and competition variables are calculated from the country using quarterly and yearly data respectively averaged over the pre-crisis period already mentioned.

| Variable | Source | Description | N | Average | Median | St. Dev. | Min. | Max. |
|---|---|---|---|---|---|---|---|---|
| RISKY | European Commission, central banks, Bank for International Settlements, governmental institutions and Bloomberg | Binary variable – with a value of 1 if public financial support was received during the crisis period (2007Q4 to 2009Q4) and 0, if otherwise | 495 | 0.303 | 0.000 | 0.460 | 0.000 | 1.000 |
| COMP | Authors' calculation | The average relationship between market share and marginal costs estimated by country-level by year for the period 1994-2004, the Boone indicator | 495 | 4.970 | 5.600 | 1.425 | 0.234 | 5.600 |
| SEC | DCM Analytics Dealogic | Ratio of total securitization to total assets * 100 during the pre-crisis period (2003Q4 to 2007Q3) | 495 | 0.133 | 0.000 | 0.706 | 0.000 | 9.804 |
| CAP | Bloomberg | Tier I capital to total assets * 100 during the pre-crisis period (2003Q4 to 2007Q3) | 495 | 9.011 | 8.721 | 3.477 | 1.424 | 32.740 |
| SIZE | Bloomberg | Logarithm of total assets (USD millions) during the pre-crisis period (2003Q4 to 2007Q3) | 495 | 7.657 | 6.962 | 2.140 | 3.970 | 13.980 |
| EXLEND | Authors' calculation | Individual bank lending growth minus the average loan growth of all banks over a specific quarter during the pre-crisis period (2003Q4 to 2007Q3) | 495 | 6.698 | 6.072 | 2.402 | -0.274 | 13.270 |
| DEP | Bloomberg | Short-term demand deposits to total assets * 100 during the pre-crisis period (2003Q4 to 2007Q3) | 495 | 69.049 | 73.346 | 16.362 | 7.052 | 89.825 |
| GDP GROWTH | Bank for International Settlements | Quarterly changes in real GDP during the pre-crisis period (2003Q4 to 2007Q3) | 495 | 1.277 | 1.341 | 0.203 | 0.585 | 1.846 |
| COMP*SEC | | | 495 | 0.508 | 0.000 | 3.352 | 0.000 | 54.901 |
| COMP*CAP | | | 495 | 45.985 | 47.372 | 22.737 | 0.678 | 183.343 |

# Table II
# PROBIT ESTIMATES OF THE PROBABILITY OF BEING RESCUED

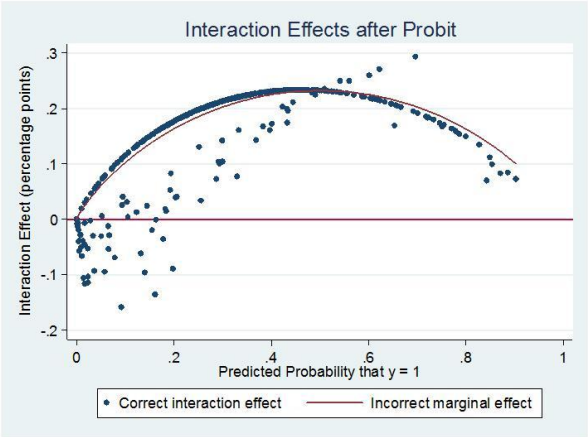
This table provides the probit estimates of seven specifications on the likelihood of receiving financial support. The first column shows the effect of bank balance sheet variables and competition. Column (II) shows these effects with country dummies. Column (III) introduces *GDP* growth as macro variable. Columns (V) and (VII) introduce the interaction effects, while Columns (IV) and (VI) show the interaction effects without the macro variable GDP growth (see Section II for further details and Table I for variable definitions). The dependent variable is calculated during the crisis period (2007Q3 to 2009Q4). Regressors are calculated as averages of quarterly data for individual banks during the pre-crisis period (2003Q4 to 2007Q4) unless otherwise indicated. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

| | (I) | | (II) | | (III) | | (IV) | | (V) | | (VI) | | (VII) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COMP | 0.1260 | *** | 0.0615 | | 0.1153 | *** | 0.1017 | *** | 0.0841 | *** | -0.0279 | | -0.0794 | |
| | (0.0251) | | (0.0388) | | (0.0300) | | (0.0254) | | (0.0298) | | (0.0574) | | (0.0593) | |
| SEC | -0.1371 | ** | -0.1044 | *** | -0.1470 | ** | -0.8783 | ** | -0.9549 | ** | -0.0923 | ** | -0.1008 | ** |
| | (0.0557) | | (0.0351) | | (0.0668) | | (0.3623) | | (0.3770) | | (0.0388) | | (0.0507) | |
| CAP | -0.0224 | *** | -0.0283 | *** | -0.0230 | *** | -0.0238 | *** | -0.0248 | *** | -0.1885 | *** | -0.2217 | *** |
| | (0.0071) | | (0.0078) | | (0.0073) | | (0.0070) | | (0.0072) | | (0.0613) | | (0.0629) | |
| SIZE | 0.0605 | * | 0.0580 | ** | 0.0620 | * | 0.0513 | | 0.0529 | * | 0.0457 | | 0.0447 | |
| | (0.0333) | | (0.0284) | | (0.0330) | | (0.0325) | | (0.0319) | | (0.0327) | | (0.0308) | |
| EXLEND | 0.0310 | | 0.0346 | | 0.0299 | | 0.0341 | | 0.0327 | | 0.0319 | | 0.0299 | |
| | (0.0270) | | (0.0284) | | (0.0268) | | (0.0264) | | (0.0261) | | (0.0257) | | (0.0242) | |
| DEP | -0.0088 | ** | -0.0080 | ** | -0.0088 | ** | -0.0090 | *** | -0.0091 | *** | -0.0089 | *** | -0.0087 | *** |
| | (0.0035) | | (0.0034) | | (0.0035) | | (0.0033) | | (0.0033) | | (0.0032) | | (0.0030) | |
| Macro Economic variables | | | | | | | | | | | | | | |
| GDP GROWTH | | | | | 0.1064 | | | | 0.1581 | | | | 0.2290 | * |
| | | | | | (0.1421) | | | | (0.1473) | | | | (0.1303) | |
| COUNTRY DUMMIES | | | Yes | | | | | | | | | | | |
| Competition interactions | | | | | | | | | | | | | | |
| COMP*SEC | | | | | | | 0.1706 | ** | 0.1825 | ** | | | | |
| | | | | | | | (0.0787) | | (0.0811) | | | | | |
| COMP*CAP | | | | | | | | | | | 0.0308 | *** | 0.0368 | *** |
| | | | | | | | | | | | (0.0112) | | (0.0116) | |
| CONSTANT | -3.7414 | *** | -5.6402 | *** | -3.9954 | *** | -3.1943 | *** | -3.5494 | *** | -1.0233 | | -1.0530 | |
| | (0.6397) | | (0.8844) | | (0.6947) | | (0.6618) | | (0.7225) | | (1.3052) | | (1.3304) | |
| No. of observations | 495 | | 495 | | 495 | | 495 | | 495 | | 495 | | 495 | |
| R2 | 0.1372 | | 0.1686 | | 0.1379 | | 0.141 | | 0.1433 | | 0.1485 | | 0.1427 | |
| Percent true positives/negatives | 51.25/75.66 | | 57.14/76.80 | | 51.28/75.59 | | 51.85/75.76 | | 50.63/75.55 | | 53.01/75.97 | | 54.88/76.14 | |
| Percent correctly classified | 73.23 | | 74.6 | | 73.23 | | 73.35 | | 73.1 | | 73.6 | | 73.97 | |
| Hosmer–Lemeshow test | 9.76 | | 11.72 | | 11.83 | | 6.75 | | 7.07 | | 8.12 | | 6.47 | |
| Hosmer–Lemeshow test p-value | 0.2822 | | 0.1639 | | 0.1588 | | 0.5633 | | 0.5292 | | 0.4223 | | 0.5945 | |

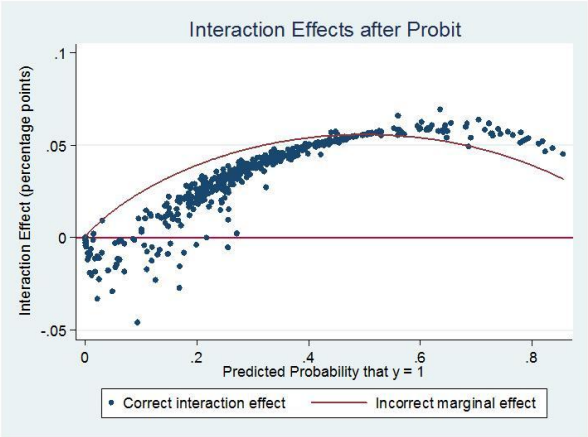
# Chart I
# MARGINAL EFFECTS

In Panel A (Panel B), the red line plots the expected marginal effect based on the estimates of the interaction effects between competition and securitization (capital) as reported in Table II (columns V and VII) over the sample population. The dots report the corrected values of the marginal effect of this interaction term varying over the sample population on the predicted risk of financial support.

**Panel A: Interaction effect of competition and securitization**



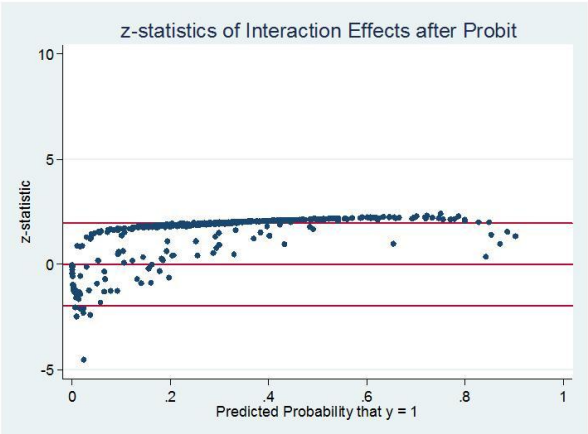

**Panel B: Interaction effect of competition and capitalisation**




# Chart II
# Z-STATISTIC AS A FUNCTION OF THE PREDICTED PROBABILITY

In Panel A (Panel B), the blue dots reflect the z-values of the correct interaction effect reported in Panel A (Panel B) in Chart I for the interaction effects between competition and securitization (capital) as reported in Table II (columns V and VII) over the sample population.

**Panel A: Interaction effect of competition and securitization**




**Panel B: Interaction effect of competition and capitalisation**