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Risk and competitiveness in the Italian banking sector

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Abstract

In this paper, we analyse the relationship between risk and competition in the Italian banking sector over the period from 2006 to 2010. We employ OLS and panel estimators to estimate the impact of the Lerner index, a measure of bank market power, on the Altman Z-score, a proxy of the insolvency probability. Our results are consistent with the traditional charter value paradigm and reject the new risk-shifting paradigm proposed by Boyd-De Nicolò (2005). We find that the relationship between bank risk and competition becomes more tightening during the financial crisis. Our results are robust to different definitions of crisis and different specifications.

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1. INTRODUCTION

The debate on the competition-risk nexus recurs in every financial crisis. "The legislative reforms adopted in most countries as a response to the banking and financial crises of the 1930s – Padoa-Schioppa (2001, p.14) states –, shared one basic idea which was that, in order to preserve the stability of the banking and financial industry, competition had to be restrained." In modern banking literature, this common belief has evolved into the charter value paradigm (Keeley 1990; Hellmann et al., 2000). According to this theory, if depositors (or the deposit insurance authority) do not observe the riskiness of bank's asset portfolio, bank's shareholders (and managers) have an incentive to take excessive risks, exploiting limited liability. Monopoly rents in imperfectly competitive credit markets mitigate this incentive, making banks relatively conservative in order to preserve their charter value (i.e. the discounted value of their expected future profits).[1]

The crucial hypothesis to obtain a negative trade-off between competition and bank financial fragility is that banks fully control the risk level of their asset portfolio. Boyd and De Nicolò (2005) reexamined this trade-off by reversing the assumption on the risk controller: banks set the lending rate, while the borrowers choose the risk level of funded projects and, thus, of the bank loan portfolio. Using a Cournot model with information asymmetries about the risk level of firms' investment projects, Boyd and De Nicolò (2005) show that firms have an incentive to shift risk on banks that is all the greater the higher is the loan interest rate (risk-shifting paradigm). Thus, when banks' market power and loan rates increase, firms tend to choose risky projects and, if probability of default is correlated across borrowing firms, the banks' financial fragility increases.

A number of papers have reconciled charter value and risk-shifting paradigm by assuming that loan default probabilities are imperfectly correlated (Martinez-Miera and Repullo 2010), that banks are able to choose the optimal degree of default correlation in their loan portfolio (Hakenes and Schnabel 2011) or that both banks and firms can affect the riskiness of loan portfolio (Wagner 2010). In these cases, a non-monotonic U-shaped relationship between competition and bank risk emerges: in very competitive markets, the effect of low intermediation margins on good loans dominates the risk-shifting effect and further competition increases the probability of bank failure, while in very concentrated markets, the risk-shifting effect due to bad loans dominates and a new entry reduces the risk of banks' loan portfolio and, hence, the probability of bank failures.

Conflicting theoretical predictions have fed a growing strand of empirical research on the relationship between banking competition and financial stability. Findings are mixed, varying with the sample, econometric model, and risk and competition measures considered in the analysis. Empirical evidence from cross-country analyses supports both paradigms. Beck et al. (2006) document that concentration of credit markets is negatively associated with the probability of banking crises. In contrast, Boyd et al. (2006) and De Nicolò and Loukoianova (2007) consider 133 developing countries and provide support for the risk-shifting paradigm, finding that concentration in credit markets feeds bank risks and that this relationship is stronger when asset composition and bank ownership (private vs state-owned and foreign vs domestic) are taken into account. Fiordelisi and Marè (2014) show that the soundness of European cooperative banks is positively influenced by the degree of bank competition and find that risk-shifting paradigms holds also during the 2007–2009 financial crisis. Berger et al. (2009) estimate a quadratic model on a large sample of banks from developed countries: they document an inverted U-shape relationship between bank risk and market power, in line with Martinez-Miera and Repullo (2010). Similar results are obtained by Tabak et al. (2012) for Latin America.

These studies identify an average relationship between bank competition and bank risk that could be strongly heterogeneous across countries. For example, Beck et al. (2013) estimate a model in which bank market power competition, as measured by the Lerner index, is related to bank

[1] Further arguments in favour of the competition-fragility nexus are that fiercer bank competition also disincentives relationship lending and borrower screening, again increasing banking risk (Allen and Gale 2004).

soundness, as measured by Altman Z-score. Their findings show that on average the charter value paradigm dominates the risk-shifting hypothesis, but they reveal a significant cross-country heterogeneity in the competition-stability relationship.

The limits of the cross-country approach have spurred research at the country level. Most studies find evidence in favour of the charter value theory. For example, a positive nexus between interbank competition and bank financial fragility has been documented for the US (Keeley 1990; Demsetz et al. 1996; Brewer and Saidenberg 1996), Spain (Salas and Saurina 2003; Jiménez et al. 2013) and Germany (Buch et al. 2013; Kick and Prieto 2015). Only few papers lend some support to the risk-shifting paradigm. In particular, Jayaratne and Strahan (1998) show that the US state branching liberalisation in the 1980s lowered loan losses, while Boyd et al. (2006), analyzing a cross-section of US banks in 2003, find that the probability of bank failure is positively related to bank concentration.

In this paper, we examine the competition-risk nexus in the Italian banking system from 2006 to 2010 using data by the Italian Banking Association. The focus on Italy and global crisis period is interesting for different reasons. First, to the best of our knowledge, this is first study on the bank competition-risk nexus in Italy. During the last decades, the Italian banking system has experienced an intense process of consolidation and privatization and major regulatory transformations. The total number of banks has gradually decreased from 1156 in 1990 to 592 banks (plus 79 foreign branches) in 2014.[2] A strong process of spatial diffusion of banks has accompanied the consolidation process across regions. The number of branches has steadily increased until 2008, and then slightly decline in response to the financial crisis: the average population served by a bank branch was equal to 2278 in 1997, 1734 in 2008 and 1979 at the end of 2014. On the whole, the degree of interbank competition has intensified even if it remains lower than in other countries and strongly differentiated across regions (Angelini and Cetorelli 2003; Coccorese 2004, 2014; Drummond et al. 2007). In addition, Italy is a country of small firms financed by small banks (Alessandrini et al. 2009). This means that only a very few banks are too-big-to-fail banks[3] and that firms have few alternatives to bank funding financial, mitigating concerns for these two potential sources of confounding of the competition-risk nexus.

Second, the inclusion of both (equally weighted) tranquil and crisis periods in the sample allows to address the concern of measuring bank risk ex post and not ex ante as required by theoretical models. Controlling for a global shock that hits across banks weakens biases due to a non-random realization of risks taken ex-ante that is not captured by the observed variables. In other words, the shock of the financial crisis is so intense and generalized across banks that once controlled for it, the omitted variable concern becomes minor and estimates are more accurate and consistent. Moreover, in crisis periods it is likely that incentives to shift risks from firms to banks, such as in Boyd and De Nicolò's model, and from banks to depositors, such as in the charter value paradigm, tend to intensify. Thus, it is interesting to verify whether this risk-shifting behaviour during the crisis have strengthened, mitigated or reversed the relationship between banking competition and risk. Despite the merit of including crisis periods, we exclude the 2011 debt crisis. This debt crisis produced a mutual protection pact regime between high-debt governments (such as Italy) and their banking system affecting negatively the bank risk taking and its competitiveness (Marchionne and Fratianni 2016). As it is difficult to control pervasive effects empirically, the inclusion of this period would generate significantly biases in our results.

By way of preview, we find a negative relationship between bank market power and risk supporting the charter value paradigm, while we find no evidence for the risk-shifting theory or for

[2] From 2006 to 2010, the total number of banks decreased from 793 to 760. Some merger deals involving the major Italian banks such as the merger between Banca Intensa and San Paolo in 2006, Unicredit and Capitalia and BPU and Banca Lombarda (now UBI Banca) in 2007, and Monte dei Paschi di Siena and Banca Antonveneta in 2008.

[3] In fact, the Italian government intervened only marginally in favour of the banking system during the global financial crisis (Fratianni and Marchionne 2010).

a U-shaped competition-risk nexus. Then, we show that the crisis reinforced the trade-off between bank competition and bank fragility: Italian banks that were more subjected by competition of rival banks are also those banks that borne the higher risks during the crisis.

The paper is organized as follows. The empirical model and variables are described in Section 2. Dataset and descriptive statistics are presented in Section 3, while results are discussed in Section 4. Section 5 concludes.

2. EMPIRICAL APPROACH

We propose two separate tests. The first aims to uncover the impact of bank competition on bank stability; the second to identify changes in this relationship over the crisis period.

In the first test, a risk measure of bank i at time t, $Risk_{it}$, is regressed on an intercept, c, a set of control variables at the bank level, X_{it}, and two interest variables: a proxy of the competition level, $Competition_{it}$, capturing the market power of bank i, and a dummy $Crisis_t$ controlling for the financial crisis. All independent variables are lagged one period to avoid causality problems except the dummy *Crisis*. The test is formalised as follows:

$$Risk_{i,t} = c + \beta \cdot Competition_{i,t-1} + \gamma \cdot Crisis_t + \lambda \cdot X_{i,t-1} + u_{i,t}, \quad (1)$$

where u_{it} denotes a well-behaved error term. $\beta<0$ supports the risk-shifting paradigm of the competition-stability model in which banks with market power apply higher increases in interest rates to firms making their defaults more likely and, hence, the banking sector as a whole weaker. Instead, $\beta>0$ is consistent with the charter value paradigm: according to the competition-fragility view, a higher market power reduces the banking competition that, in turn, decreases bank risk, making the banking sector more stable. When β is statistically not different from zero, there is no dominant paradigm.

The second test checks whether the competition-stability relationship was affected by the financial crisis. We estimate the following equation:

$$Risk_{i,t} = c + \beta \cdot Competition_{i,t-1} + \gamma \cdot Crisis_t + \delta \cdot Competition_{i,t-1} \cdot Crisis_t + \lambda \cdot X_{i,t-1} + u_{i,t}. \quad (2)$$

The only difference with respect to equation (1) is the introduction of an interactive term between *Competition* and *Crisis*. It identifies the marginal impact of the financial crisis on the competition-stability relationship. A statistically insignificant δ or $\delta=0$ shows that the crisis does not change the competition-stability relationship and the same relationship holds before and during the crisis. A significant $\delta>0$ is consistent with the charter value paradigm and indicates that the erosion of profit margins during the financial crisis made banks with lower market power riskier than in the standard pre-crisis period. A significant $\delta<0$, instead, suggests that the financial crisis promotes the risk-shifting paradigm. As the financial crisis raised the systemic risk and led firms to herding behaviour in terms of risk-taking, a higher correlation in loan defaults increases the risk of banks charging higher interest rates and supports the risk-shifting paradigm during the financial crisis.

We use Altman Z-score as dependent variable. It is a weighted sum of five financial ratios (working capital to total assets, earnings to total assets, earnings before interests and taxes to total assets, the market-to-book value, and sales to total assets). This index measures the distance from insolvency: the higher Z-score, the lower the probability of firm insolvency and, hence, the greater the firm stability (Roy 1952). We prefer the original version to the modified Z-score by Laeven and Levine (2009) because our sample period is short and the latter drops the initial and final year.

We employ the Lerner index to measure the market power, an inverse proxy of banking competition. This index is equal to the ratio of the difference between the average revenue (proxied by the ratio of total operating income to total assets) and the marginal costs estimated using a

translog cost function on the average revenue; see Table 1. We apply an OLS estimator to the translog cost function year by year over the period from 2006 to 2010 to control for potential shocks due to the financial crisis.[4] The Lerner index presents four advantages with respect to alternative measures of market power such as Herfindahl index, market share and other standard concentration measures: 1) it is a measurable indicator at the bank level; 2) it captures not only the impact of pricing power on the asset but also the funding side of the bank; 3) it fits well with the theoretical model; 4) it does not require the geographical market to be defined (Beck et al. 2013).

Table 1: Variable definitions

Translog Cost Function		
Determinants		
P	Price of Total Assets	Total operating income to total assets[(a)]
C	Costs of Total Assets	Total operating costs
Q	Firm Size	Total assets
W_1	Fixed Capital	Other operating and administrative expenses to tangible and intangible assets (Input 1)
W_2	Labour	Personnel expenses per employee (Input 2)
W_3	Fund	Interest expenses to total deposit and money market funding (Input 3)
Marginal Costs		
MC	Yearly Marginal Costs	Marginal Cost using Total Assets in the yearly Translog Cost Function
Bank Risk-Competitiveness		
Risk		
Zs	Altman Z-score is an easy-to-calculate index that combines multiple corporate income and balance sheet values to measure the financial health of a company. It is equal to: $Z_s = 0.012*T_1 + 0.014*T_2 + 0.033*T_3 + 0.006*T_4 + 0.009*T_5$ The five determinants of Z-scores are: T_1 = Working Capital / Total Assets. It measures liquid assets in relation to the size of the company. T_2 = Retained Earnings / Total Assets. It measures profitability that reflects the company's age and earning power. T_3 = Earnings Before Interest and Taxes / Total Assets. It measures operating efficiency apart from tax and leveraging factors. It recognizes operating earnings as being important to long-term viability. T_4 = Market Value of Equity / Book Value of Total Liabilities. It adds market dimension that can show up security price fluctuation as a possible red flag. T_5 = Sales/ Total Assets. It is a standard measure for total asset turnover (varies greatly from industry to industry).	
Competitiveness		
LERNER	Yearly Lerner Index	Lerner Index estimated using a yearly translog cost function. It is equal to $(P-MC)/P$
Controls		
FUND	Funding structure	Share of wholesale funding
LOAN	Assets Mix	Loans to Total Assets
NOINT	Revenue Composition	Non-interest income to total income
Ln(TA)	Bank Size	Logarithm of Total Assets
CREDIT	Credit Risk	Loan loss provisions to total interest income
GROWTH	Total Assets Growth	Annual Growth in Total Assets
TIER1	TIER 1 Capital Ratio	TIER 1 Capital Ratio

NOTES: (a) Negative total operating income are excluded (7 observations).

Our dummy *Crisis* is equal to 1 for 2008, 2009 and 2010, 0 otherwise.[5] We consider alternatively dummy *Crisis* being equal to 1 for 2009 and 2010, 0 otherwise as the effect of the crisis could be observed with delay on bank accounting data (Fratianni and Marchionne, 2009, 2010). We control also for other bank-specific determinants of the stability-competition relationship. The vector $X_{i,t-1}$ consists of six variables characterising the bank's business model (Beck et al. 2013; Meslier et al. 2016): 1) the share of wholesale funding in total funding, *FUND*, which captures diversification and flexibility of the funding structure, 2) the loans to assets ratio, *LOAN*, as a measure of the assets mix, 3) the share of non-interest income in total income, *NOINT*,

[4] We get similar results by estimating the translog function over the whole period adding time dummies (results available upon request).

[5] The first signs of the crisis emerged in 2007 in the US, but Italy was affected in 2008 (Laeven and Valencia, 2010)

as a measure of the revenue composition; 4) the natural logarithm of total assets, *ln(TA),* as a proxy for bank size; 5) the loan loss provisions to interest income, *CREDIT,* as a measure of credit risk, and 6) the annual growth rate in total assets, *GROWTH*, as an indicator of market opportunities and the bank's risk attitude. We also include the Tier 1 capital ratio, *TIER1*, to control for regulatory capital requirements and potential constraints to the banks' business model.

3. DATA AND DESCRIPTIVE STATISTICS

Our data set consists of 2,687 observations from 748 banks over the period from 2007 to 2010 for the current variables and from 2006 to 2009 for the lagged ones. Data are from the Italian Banking Association.[6] Table 2 reports some descriptive statistics. The *LOAN* distribution has a tail on the left suggesting that few banks have a low ratio of loans to total assets. Other variables are right-skewed (not reported) with mean much larger than median for *Zs*, *FUND*, *GROWTH* and *TIER1*. Hence, not only do few banks take large risks, but also few banks (not necessarily the same) have a higher share of wholesale funding, grow quicker and show a higher Tier1 capital than other banks. *LOAN*, *ln(TA)*, and *FUND* show a low variability due to their higher persistence over time. Also *LERNER* standard deviation is relatively low with respect to its mean, suggesting that the market power changes but only gradually. On the contrary, *TIER1*, *GROWTH* and *Zs* varies considerably in the sample. This great variability could be exacerbated by the short sample period and the attrition problem caused by missing values in control variables.

Table 2 – Descriptive statistics

Variable	Zs	LERNER	FUND	LOAN	NOINT	lnTA	CREDIT	GROWTH	TIER1
Panel A: Whole period									
Mean	0.079	0.400	0.102	0.654	0.246	13.078	0.293	0.666	27.568
Median	0.055	0.401	0.016	0.699	0.207	12.827	0.203	0.068	13.830
St.Dev.	0.356	0.132	0.212	0.189	0.216	1.720	0.375	22.176	366.720
Min.	0	0.026	0	0	-3.230	8.545	0	-0.999	-9.982
Max.	15.505	0.930	1	0.989	5.353	19.878	5.827	1103.961	15940
N. Obs.	2539	2508	2573	2576	2576	2576	2576	2611	2687
Panel B: Crisis subsample (from 2008 on)									
					Pre-Crisis				
Mean	0.088	0.456	0.100	0.646	0.247	12.989	0.240	0.124	32.875
Median	0.073	0.458	0.015	0.690	0.200	12.704	0.175	0.084	13.220
					Crisis				
Mean [(a)]	0.076	0.381***	0.103	0.656	0.246	13.108	0.31***	0.844	25.748
Median [(b)]	0.047***	0.379***	0.017	0.702	0.209	12.862*	0.218***	0.062***	14.07***
Panel C: Crisis subsample (from 2009 on)									
					Pre-Crisis				
Mean	0.079	0.437	0.104	0.650	0.237	13.007	0.242	1.035	24.649
Median	0.067	0.436	0.016	0.693	0.191	12.746	0.174	0.085	13.230
					Crisis				
Mean [(a)]	0.079	0.362***	0.1	0.658	0.255**	13.15**	0.344***	0.297	30.573
Median [(b)]	0.041***	0.359***	0.016	0.704	0.225***	12.915**	0.253***	0.046***	14.432***

NOTES: (a) One-sample mean-comparison test against all other years; (b) Wilcoxon rank-sum test against all other years. *** p<0.01, ** p<0.05, * p<0.1

[6] Due to the crisis, mergers and acquisitions affect our sample: for example, Banca Intesa and Sanpaolo IMI, two of the largest Italian banks, enter separately in the ABI dataset for 2006 and jointly from 2007 on. We treat banks separately until the date of merger or acquisition because consolidating or splitting the bank balance sheet before or after a merger or acquisition respectively, would introduce a certain degree of arbitrariness and possibly generate severe bias. The basic principle behind an M&A deal is that two banks together are more valuable than two separated banks. To seize synergies, the new bank has to restructure the business and hence it can hardly be considered equivalent to the sum of the old two separated banks.

We split the sample into pre- and post-crisis period using 2008 as the first year of the crisis in Panel B and 2009 in Panel C. In both the panels, the one-sample mean-comparison test and the Wilcoxon rank-sum test show that Zs and LERNER are statistically different in mean and median respectively during the crisis, except for the Zs mean. Differently from the cross-country analysis by Beck et al. (2013), common national level variables, endogenous accounting variables, and the short period prevent us from applying an IV estimator to single country data due to the lack of good instruments. We apply OLS, FE and RE models.

4. FINDINGS

Our main results are presented in Table 3 (using 2008 as first crisis year) and Table 4 (using 2009 as first crisis year). In Table 3, the natural logarithm transformation smooths out the highly skewed Z-score distribution. The interest variable is the yearly Lerner index. In all estimates, we control for *FUND*, *LOAN*, *NOINT*, *lnTA*, *CREDIT*, *GROWTH* and *TIER1* and apply robust clustered standard errors to correct for the effects of heteroskedasticity. The first column reports the OLS estimate. $\beta>0$ indicates that when the bank's market power increases, the reduction in banking competition makes banks less risky and, in aggregate, the banking system more stable. This result supports the traditional charter value paradigm. The impact of the financial crisis on bank stability is negative and very significant as expected: $\gamma<0$ shows that Altman Z-score has decreased since 2008, suggesting that the financial crisis makes the banking system more unstable.

Table 3 – Linear impact of competitiveness on risk in the Italian banking sector. Crisis starting in 2008.

Dependent Variable	ln(Zs)					
Specification	Simple			Interactive		
Estimator	OLS	FE	RE	OLS	FE	RE
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Competitiveness						
LERNER	1.3697***	1.1848***	1.2019***	0.8083***	0.5472**	0.6255***
CRISIS	-0.4287***	-0.4435***	-0.4474***	-0.7385***	-0.7742***	-0.7588***
CRISIS*LERNER				0.7207***	0.7694***	0.7229***
Controls						
FUND	-0.2141**	0.0253	-0.0837	-0.2146**	0.0421	-0.0795
LOAN	-0.2647***	0.1961	-0.3846***	-0.2486**	0.2424	-0.3540***
NOINT	0.4106**	-1.0454***	-0.1186	0.4285***	-0.9689***	-0.0845
Ln(TA)	-0.0074	-0.2577**	-0.0086	-0.0069	-0.2666**	-0.0091
CREDIT	-0.3755***	-0.2678***	-0.3861***	-0.3777***	-0.2734***	-0.3904***
GROWTH	0.0005***	-0.0001	0.0004***	0.0005***	-0.0001	0.0005***
TIER1	-0.0001	-0.0000***	-0.0001	-0.0001	-0.0000***	-0.0001
Constant	-2.9293***	0.4378	-2.6284***	-2.7070***	0.7801	-2.4013***
Bank Effects		Yes	Yes		Yes	Yes
Observations	2335	2335	2335	2335	2335	2335
R-squared	0.211	0.310	0.198	0.214	0.315	0.201
Number of banks		677	677		677	677
F-Test	62.52	299.3	715.8	57.16	292.3	741.7
Prob F-Test>F	0	0	0	0	0	0
BPLM			304.9			307.3
Prob BPLM>chi2			0			0

NOTES: OLS, RE and FE estimates using robust clustered standard errors of the impact of the Lerner Index (competitiveness) on Altman Z-score (risk) in the Italian banking sector over the period from 2006 to 2010. Dependent variable: ln(Zs). Interest variable: LERNER. Table 1 summarises variable definitions. The crisis dummy is equal to 1 from 2008 on and 0 otherwise. *** p<0.01, ** p<0.05, * p<0.10, # p<0.15

According to our expectations, banks with higher loans to assets ratio (*LOAN*) and loss provisions to interest income (*CREDIT*) are more exposed to risks (lower Z-score). A higher share of wholesale funding in total funding (*FUND*) or a lower share of non-interest income in total income (*NOINT*) reduces bank risk. It also decreases (higher Z-score) when bank's total assets grow more (*GROWTH*), but it is independent from bank size (*ln(TA)*). There are two explanations for this unexpected result. The first is that the survivorship of a large number of (relatively small) banks depends more on the the ability to increase and (possibly) diversify their assets than on actual size. The second is that we observe only surviving banks that expanded their total turnover during the crisis taking successfully more risk, but do not observe banks that failed or exited from the market. Contrary to our expectations, Tier1 capital ratio is statistically not significant. As the Tier1 capital ratio is a threshold requirement, it becomes relevant only if bank regulatory capital is close to the threshold level.

We add FE and RE bank effects to control potential bias in the OLS estimate. The Hausman test rejects RE when we force a result, but the statistics is not reliable because the asymptotic assumptions of the test do not hold. The Breusch and Pagan Lagrange-Multiplier test reject the hypothesis of zero variance of bank effects, a result that is consistent with RE. As results are mixed, we report FE and RE estimates in columns 2 and 3 respectively. Both support the charter value paradigm: banking competition undermines bank stability whereas the financial crisis increased bank risk. However, even if R^2 and F test statistics improve in FE estimate, *NOINT* switches sign, *FUND*, *LOAN* and *GROWTH* become insignificant, and *TIER1* and *ln(TA)* have a negative impact on bank stability (column 2). Due to this pattern, we rely on the RE estimate. It confirms the OLS results except only for *FUND* and *NOINT* (column 3). This outcome is in line with the previous literature (Beck et al. 2013). In our case, the instability of control variable coefficients through methods could also be due to our short sample period. Nonetheless, the point estimates of our key coefficients continue to be very significant, stable, and consistent with OLS estimates, suggesting that Lerner index and CRISIS are broadly uncorrelated with unobserved bank effects.

OLS, FE and RE estimates of equation 2 show that the negative impact of banking competition on stability becomes statistically more intense during the financial crisis (columns 4, 5, and 6 respectively). Under RE, for example, the higher bank risk during the crisis is compensated by a higher *LERNER* coefficient (column 6). A positive significant and stable interactive term coefficient through all the methods reinforces previous results, suggesting that the negative impact of competition on bank stability becomes harsher during turbulent periods. Estimates of the control variables are consistent with those of the simple model (columns 1-3). Table 4 corroborates previous results using 2009 as the beginning of the crisis. Balanced subsamples mitigate the potential bias created by a very short pre-crisis period but accounting data could be contaminated by the first sign of the crisis. Despite these concerns, both OLS and RE estimates are very similar to the corresponding estimates in Table 3. However, FE coefficients become unstable using a longer pre-crisis period because the lag in reporting crisis effects with accounting data is country-specific and fixed effects are probably unable to control this pattern. Again, we rely on the Breusch and Pagan Lagrange-Multiplier test and prefer RE to FE.

We rerun the estimates of Table 3 (i) modelling a quadratic bank competition-stability relationship similarly to Berger et al. (2009) to check potential non-linear effects, and (ii) adding and removing control variables to investigate the validity of our specification. We find that the bank competition-stability relationship is linear and it is robust to the definition of *CRISIS* and the model specification.

Table 4 – Linear impact of competitiveness on risk in the Italian banking sector. Crisis starting in 2009.

Dependent Variable	ln(Zs)					
Specification	Simple			Interactive		
Estimator	OLS	FE	RE	OLS	FE	RE
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Competitiveness						
LERNER	1.0300***	-0.0210	0.4684***	0.7136***	-0.3527#	0.1767
CRISIS	-0.3945***	-0.4600***	-0.4377***	-0.6409***	-0.6814***	-0.6482***
CRISIS*LERNER				0.5745**	0.5110**	0.4873**
Controls						
FUND	-0.2059*	-0.1697	-0.0918	-0.2101*	-0.1438	-0.0892
LOAN	-0.2451**	0.1551	-0.3618***	-0.2262**	0.2053	-0.3325***
NOINT	0.4580***	-0.8512***	-0.0275	0.4794***	-0.7771***	0.0064
Ln(TA)	0.0022	-0.1544#	0.0159	0.0019	-0.1594#	0.0151
CREDIT	-0.3508***	-0.1759**	-0.3279***	-0.3532***	-0.1840**	-0.3311***
GROWTH	0.0002**	-0.0003	0.0002*	0.0002**	-0.0003	0.0002**
TIER1	-0.0001	-0.0000***	-0.0001	-0.0001	-0.0000***	-0.0001
Constant	-3.0689***	-0.5385	-2.8104***	-2.9401***	-0.3753	-2.6961***
Bank Effects		Yes	Yes		Yes	Yes
Observations	2335	2335	2335	2335	2335	2335
R^2	0.214	0.327	0.199	0.217	0.331	0.201
Number of banks		677	677		677	677
F-Test	56.50	223.9	708.1	51.13	207.1	706.8
Prob F-Test>F	0	0	0	0	0	0
BPLM			324.7			321.4
Prob BPLM>chi2			0			0

NOTES: OLS, RE and FE estimates using robust clustered standard errors of the impact of the Lerner Index (competitiveness) on Altman Z-score (risk) in the Italian banking sector over the period from 2006 to 2010. Dependent variable: ln(Zs). Interest variable: LERNER. Table 1 summarises variable definitions. The crisis dummy is equal to 1 from 2009 on and 0 otherwise. *** p<0.01, ** p<0.05, * p<0.10, # p<0.15

5. CONCLUSIONS

The recent literature on banking has renewed the interest of economists in the competition-risk nexus. The traditional charter value paradigm (Keeley 1990) posits that there is a trade-off between banking competition and stability and predicts a positive relationship between banks' market power and financial stability. The risk-shifting paradigm (Boyd and De Nicolò 2005) suggests that no trade-off exists because fiercer banking competition leads to lower interest rates that, in turn, reduce the probability of firm default and make banks safer. The standard response to conflicting theoretical predictions is to let the data speak but empirical evidence from cross-country data is ambiguous and many papers have focused on individual countries. In line with this trend, we explore the competition-risk nexus using a panel data set of 677 Italian banks for 2006-2010.

We find that (i) Altman Z-score, our measure of bank soundness, is positively associated with the Lerner index, our measure of market concentration and (ii) the 2008-2010 financial crisis reinforced the existing relationship in Italy. These findings are robust to different estimators and the potential lag of crisis effects in accounting data whereas we find no support in favour of a quadratic bank risk-competition relationship.

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