How does Eu banking competition impact financial stability?

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Abstract
Recent turmoil in the global financial system has impacted severely on the banking sector. The present financial crisis has led academics and policy-makers to re-consider the links among bank performance, risk and changes in the competitive environment. This study investigates the relationship between competition and financial stability in the EU banking systems between 2003 and 2009 in order that to confirm if the idea of increasing competition in EU as a result of a single European market it fits with the issue of financial stability of the European financial system. Our two stage empirical estimations demonstrate that in case of EU countries the competition stability view is validated, except the new member countries group. The implications of market power (Lerner Index) had a stronger effect then the structural features (concentration measured with HHI). As secondary results we find that the sizes of the banks and the macroeconomic indicators like GDP growth and inflation rate have different impact on financial stability, depending on groups of countries from EU.

Keywords: competition, financial stability, banking, Lerner index
JEL codes: G21, G28, G34

1. Introduction

Recent turmoil in the global financial system has impacted severely on the banking sector. The present financial crisis has led academics and policy-makers to re-consider the links among bank performance, risk and changes in the competitive environment. The single European financial market implies the possibility for a financial institution of a European Union country to function on the basis of the functioning authorization issued by its own country, in any of the member states in order to increase competition and harmonization of bank practices in EU.

This study investigates the relationship between competition and financial stability in the EU banking systems between 2003 and 2009. In the banking literature is that there is a trade-off between competition and stability in the banking sector. The "competition-fragility" view considers more bank competition erodes market power, decreases profit margins, and results in reduced franchise value, encouraging banks to take on more risk to increase returns. The other view - "competition-stability" view, argues that more market power in the loan market may result in higher bank risk because, on the one hand, the higher interest rates charged to loan customers make it harder to repay loans and

exacerbate moral hazard incentives of borrowers to shift into riskier projects and, on the other hand, it is possible that a highly concentrated banking market may lead to more risk taking if the banking institutions believe that they are too big to fail in the context of protection by the government safety net.

The main contribution of this paper is to confirm if the idea of increasing competition in EU as a result of a single European market in order to decrease and harmonize prices it fits with the issue of financial stability of the European financial system.

The rest of the paper is organized as follows: Section 2 reviews the previous literature on the relationship between financial stability and banking competition. In section 3 we explain the methodology we have used to measure the impact of banking structure on financial stability and we discuss the data and the variable selection. Thereafter, the results of the empirical analysis are presented and discussed in section 4. The main conclusions are drawn in section 5.

2. Literature review

A large academic literature provides support to the relationship between competition and stability in banking. The beginning of research in the field of the relation between market structure and banking system performance starts in 1980s, with focus on US banking market (Stiglitz and Weiss (1981), Marcus (1984); Dermine (1986); Chan, Greenbaum and Thakor (1986)).

The traditional competition-fragility view has been supported by many empirical studies. Upon this theory, higher competition has a negative impact on stability. Keeley (1990); Carletti and Hartmann (2002); Jimenez et al. (2007); Beck (2008); Berger et al. (2008) agree that less concentrated banking systems are more prone to experience crises.

Boyd and Runkle (1993) assess the relationship between bank size and risk measured by Z-Index for 122 banks over the period 1971-1990 and find that there is an inverse relationship between size and Z-Index and standard deviation of asset returns. Edwards and Mishkin (1995) investigating US banks in the 1980s argue that the excessive risk-taking response to the erosion of profits due to competition from financial markets. Hellmann *et al*. (2000) analyzing the relation between competition for deposits and excessive risk taking in a dynamic model of moral hazard in which banks choose their asset risk and compete for deposits demonstrate that financial liberalization in US in 1970s and 1980s stimulates excessive risk taking and has a negative impact on prudent bank behavior. Bolt and Tieman (2004) investigate the consequences of loan competition among banks and they find that increased competition results in more risk taking by banks, due to the fact that a bank with looser acceptance criteria attracts more demand. In these conditions banks makes higher per period profits, but the quality of the bank's loan portfolio deteriorates which in turn causes higher default probabilities and risk of failure. For UK, Capie (1995), studying the stability and efficiency of the UK banking system between 1890 and 1940, confirms the hypothesis that less competitive banking systems is more stable. Salas and Saurina (2003) find a very significant and robust relationship between Tobin's q and the solvency and non-performing loan ratios of Spanish banks. Jimenez et al. (2007) assess the relationship between bank competition and risk taking in the Spanish banking system for the period 1988-2003 demonstrates as bank market power increases, bank NPL ratios decline. Fungacova and Weill (2009), empirically investigating the role of bank competition on the occurrence of bank failures for Russian banks for the period 2001-2007, confirms the competition-fragility view. De Nicolo (2000), examining the relationship between bank size, franchise value and insolvency risk measured by Z-Index for 21 industrialized countries for the 1988-1998 period, finds that franchise values decrease and insolvency risk increases in size. Micco and Panizza (2005) analyze the relationship between bank concentration and credit volatility for 93 industrial and developing countries for the period 1990-2002 and finds that there is a strong negative relationship between bank

concentration and credit sensitivity to external shocks. Jiménez, Lopez, and Saurina (2007) uses a Lerner index based on bank-specific interest rates as a measure of the degree of market power in the Spanish commercial loan market and find a negative relationship between loan market power and portfolio risk.

The alternative "competition-stability" view argues that the risk of bank failure rises in more concentrated markets. The presence of large banks constitutes a potential threat to the stability of the financial system, because, in case of a failure of a big bank, the financial system could be exposes to a systemic risk. Stiglitz and Weiss (1981) show that higher loan interest rates which result from lower competition may increase the riskiness of loan portfolios due to moral hazard and adverse selection. Some recent studies support these arguments (Boyd and De Nicolo (2005), Boyd, De Nicolo, and Jalal (2006), and Schaeck, Cihak, and Wolfe (2006), Molyneux and Nguyen-Linh (2008)).

Tunay (2009) examines the empirical relation between competition and fragility in the Turkish banking system for the years 1988-2007, using CR3 based on total assets as a measure of concentration, finds that there is a negative relationship between competition and fragility in the Turkish banking system. Staikouras and Wood (2000) find that Spanish banks are more competitive and more profitable and more stable than Greek banks for 1990s. De Nicolo and Loukoianova (2007) examine the joint effects of bank ownership and market structure on banks' risk profiles and financial stability for 133 nonindustrialized countries for 1993-2004, using Z-Index and HHI are used as proxy for bank risk and concentration respectively. They find a positive and significant relation between bank concentration and bank risk of failure and this relation is stronger when state-owned banks have sizeable market shares.

Berger, Demirguc-Kunt, Levine, and Haubrich (2004) distinguish between concentration and broader measures of competition, and conclude that the competitiveness in banking cannot be gauged using classical concentration indicators. Schaeck, Cihak, and Wolfe (2006) using the Panzar and Rosse H-statistic as alternative measure of the degree of competitiveness concludes that more competitive banking systems are more stable. They point out that concentration and competition describe different characteristics of banking systems meaning that concentration is an inappropriate proxy for competition.

Berger et al. (2008) test the impact of market structure on the risk potential of banks for 23 industrialized countries, using a nonlinear relationship between financial stability and market structure in banking. They use NPL and Z-Index and equity to total assets ratio to proxy banking system stability and Lerner index and HHI based on deposits and loans as a proxy for market power and concentration. Their results suggest that – consistent with the traditional "competition-fragility" view – banks with a greater degree of market power also have less overall risk exposure. The evidence also provides some support for one element of the "competition-stability" view – that market power increases loan portfolio risk.

3. Methodology and data

In this section we discuss the empirical model used to test the implication of banking competition on financial stability of banks. The model is estimated on a panel of 923 commercial banks from 27 countries members of European Union for the 2003 – 2009 period. Because we work with a large number of cross-sections and a short times series, we will use Generalized Method of Moments (GMM) Dynamic Panel Data models what has the general form:

$$\mathrm{FS}_{\mathrm{it}} = f(COMP_{it}, B_{it}, BS_{jt}, M_{jt}) \qquad (1)$$

where the subscripts i, j, t denote bank i, country j, and year t; FS_{it} - Financial stability; $COMP_{it}$ - Banking competition; B_{it} - Bank-Specific variables; BS_{jt} - Banking system specific variables; M_{jt} – macroeconomic variables.

Dependent Variables

We use the Z-score to proxy for financial stability. The Z-score is calculated as:

$$Z = \frac{ROA + E/A}{\sigma(ROA)} \tag{2}$$

ROA is the bank's return on assets, E/A represents the equity to total assets ratio and s (ROA) is the standard deviation of return on assets. A higher Z-score implies a lower probability of insolvency, providing a direct measure of soundness that is superior to analyzing leverage.

Explanatory Variables

We examine the impact of market structure in banking on and financial stability using the Lerner index as a proxy for market power. In order to estimate the degree of bank market power we use bank-level data, the approach followed being similar to that of Maudos and de Guevara (2007) and Delis and Tsionas (2009) who defined the Lerner index as:

$$L_{it} = \frac{(p_{it} - mc_{it})}{p_{it}} \tag{3}$$

where *p* is the price of total assets computed as the ratio of total revenue to total assets; *mc* is the marginal cost of total assets. To calculate the Lerner index, we first estimate the following translog cost function with one output (total assets), three input factors (labor, deposits, and capital), and three netputs (fixed assets, loan loss provisions, equity capital) (Schaeck and Čihák, 2008)

$$\begin{aligned} \ln C = {} & \alpha_0 + \alpha_1 \ln Y + \frac{1}{2}\alpha_2 \ln Y^2 + \sum_{k=1}^{2}\beta_k W_k + \sum_{h=1}^{2}\mu_h \ln E_h \\ & + \frac{1}{2}\sum_{k=1}^{2}\sum_{m=1}^{2}\gamma_{km} \ln W_k \ln W_m + \sum_{k=1}^{2}\rho_k \ln Y \ln W_k + \sum_{h=1}^{2}\varepsilon_h \ln Y \ln E_h \\ & + \sum_{k=1}^{2}\sum_{h=1}^{2}\lambda_{kh} \ln W_k \ln E_h + \frac{1}{2}\sum_{h=1}^{2}\sum_{n=1}^{2}\psi \ln E_h \ln E_n + \ln u_c + \ln \varepsilon_c \end{aligned} \tag{4}$$

where C denotes total cost, and Y is total assets. W is the vector of inputs (labor, funding, and other costs), and E is the vector of netputs (fixed assets, loan loss provisions, and equity capital). To obtain marginal cost, we differentiate Eq. (4) with respect to Y as follows:

$$mc_{it} = \frac{\partial C}{\partial Y} = \left[a_1 + \alpha_2 \ln Y + \rho_1 \ln W_1 + \rho_2 \ln W_2 + \varepsilon_1 \ln E_1 + \varepsilon_2 \ln E_2\right]\frac{c_{it}}{Y} \tag{5}$$

In the case of perfect competition, L = 0; under pure monopoly, L = 1; for monopolistic competition L ranges between 0 and 1; and L < 0, implies pricing below marginal cost and could result, for example, in a non-optimizing behavior of banks.

In order to test the robustness of our analysis, we introduce in the second model one alternative measures of market power, the Herfindahl-Hirschman Index (HHI), what reflect the concentration level of banking system.

We control for: bank size - log value of Total Assets (ln_ta), GDP growth rate – growth in real GDP in per cent (ln_gdp) and Inflation rate - change in annual average retail/consumer price level in per cent (IR).

Instrumental variables

In line with the previous literature (Berger et al., 2008; Schaeck and Cihak, 2010) we include a variety of instrumental variables. We use structure of capital (eq_ta), banking freedom (bank_free),

market share of foreign banks in terms of total assets(fba_ta), bank overhead costs/ total assets (overhead_ta), financial system deposits / GDP (fin_sys_dep_gdp) and Net Interest Margin (nim_bs). Bank capital adequacy is measured as the equity to assets ratio, quantified as the value of total equity divided by the value of total assets. Banking freedom is an index what informs whether foreign banks are allowed to operate freely, the difficulties when setting up domestic banks, and on government influence over the allocation of credit.

Data

The sample comprises of 923 commercial banks from 27 countries members of European Union for the 2003 – 2009 period. Only active banks with information for at least 5 years were included. All bank-level data used are obtained from the BankScope database and are reported in Euros while data regarding banking systems characteristics and macroeconomic variables are collected from EBRD, World Bank, ECB reports and Heritage Foundation.

Table 1 presents the descriptive statistics for the variables used in our regressions.

Table 1 Summary statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
Z-score	21647.52	259.1234	9933000	-5.688664	327946.5
HHI	669.2507	527	4039	173	526.5329
LERNER_INDEX	1.005526	0.993453	45.71673	-35.37851	2.100863
LN_TA	7.483481	7.312311	14.58123	1.919827	2.0343
LN_GDP	0.577362	0.787425	2.414814	-1.52808	0.788617
IR	2.552179	2.134875	12.34877	0.101502	1.5991
BANK_FREE	69.19383	70	90	40	15.42965
FBA_TA	32.76203	19.44	98.8	5.32	28.5194
OVERHEAD_TA	0.034729	0.033731	0.259377	0.008059	0.019486
FIN_SYS_DEP_GDP	0.985502	0.838234	4.651049	0.176591	0.73652
NIM_BS	0.024757	0.025018	0.132959	0.007072	0.010339

Source: author's calculations

4. Empirical results

In the first stage, when we use only Learner Index as competition proxy, we find an inverse relation between Learner Index and Z-score at entire EU (see Table 2). This means that increasing competition leads to increasing financial stability; therefore, these findings confirm the competition – stability view. Analyzing the sample by groups of countries, the results confirm the competition - stability view for Euro area countries group and old member countries group, we find no statistically relevance for results of non-euro area countries group. For new member countries group we find a direct relation between market power and financial stability, results what confirm the "competition-fragility" view. The size of banks has no statistically relevance, except in the estimation for new EU members' sample, where we find an inverse relation between it and the financial stability. Interesting are results obtained for GDP growth and inflation rate implication on financial stability. The coefficients are validated for all samples of countries assessed, except non-euro area countries group. The results are different on groups of countries: for entire EU, euro area group and old member countries group the GDP and inflation rate growth have a negative impact on Z-score, respectively on financial stability. In the case of new member states both macroeconomic indicators have a positive influence.

Table 2 The impact of banking competition on financial stability

Dependend variable: Z-score					
	EU	**EURO AREA**	**NON-EURO AREA**	**OLD MEMBERS**	**NEW MEMBERS**
Z(-1)	-0.389656***	-0.370870***	-0.482652***	-0.385618***	-0.005269
	(0.007833)	(0.017899)	(0.004782)	(0.009132)	(0.031296)
LERNER_INDEX	-54841.78***	-53769.21***	2375.71	-55793.60***	109.9642*
	(13001.66)	(8478.895)	(3309.822)	(12055.96)	(77.44229)
LN_TA	74392.99	41155.32	21443.49	118844.6	-103.0956**
	(86688.83)	(71265.03)	(35777.43)	(87763.16)	(135.6035)
LN_GDP	-143640.7***	-140491.7***	-11859.43	-164864.7***	625.6738***
	(11109.22)	(14341.08)	(9911.400)	(10026.14)	(100.6423)
IR	-186450.9***	-146465.7***	-36928.64	-207842.1***	243.9576*
	(31512.21)	(17079.77)	(27036.92)	(30130.58)	(143.6034)
J-statistic	25.94597	18.81712	6.598615	25.18412	16.07593
P-value	0.038594	0.222141	0.967846	0.047524	0.377023
Method	GMM				
Effects Specification	Cross-section fixed (first differences)				

Note: Standard deviations are presented between brackets.
*, **, *** indicates significance levels at 10%, 5% and 1%

Source: author's calculations

As a robustness test, in the second stage we introduce HHI as a determinant variable, in order to test the structural banking features impact on financial stability, too. Also, we can consider HHI as a second proxy for competition. In all samples of countries, we find the same conclusion about the impact of competition on financial stability, validating the competition stability view (see Table 3). There is no statistically relevance for results of impact of competition on financial stability of non euro countries, and new EU members. In case of Euro area countries group and old member countries group, the results show a direct relation between market concentration and financial stability. Another finding is the fact that impact of market power (Lerner Index) is more prominent then the concentration (HHI) one.

Table 3 The impact of banking competition and concentration on financial stability

Dependend variable: Z-score					
	EU	**EURO AREA**	**NON-EURO AREA**	**OLD MEMBERS**	**NEW MEMBERS**
Z(-1)	-0.369173***	-0.370984***	-0.482311***	-0.383229***	-0.047793
	(0.025898)	(0.016560)	(0.007962)	(0.017136)	(0.129047)
HHI	187.2799	-1731.994**	77.57412	-2793.840***	17.31583**
	(1196.146)	(709.1726)	(87.24942)	(699.7130)	(7.931827)
LERNER_INDEX	-49292.19*	-53408.48*	1964.753	-65626.88***	-60.98116
	(44489.11)	(11824.49)	(47315.16)	(19844.64)	(291.3538)
LN_TA	175112.0	134632.6	-13682.66	482549.3**	73.93070
	(136185.1)	(162883.0)	(36575.33)	(187081.2)	(311.1243)
LN_GDP	-149513.2***	-150529.2***	-18463.96	-123169.4***	614.2545
	(19766.69)	(16271.31)	(18640.50)	(13396.19)	(603.3996)
IR	-240741.0***	-209067.4***	-25897.04	-246504.8***	1065.698**
	(44264.07)	(34612.28)	(25248.93)	(33507.70)	(463.9992)
J-statistic	15.78577	16.63999	5.244897	14.61107	16.83885
P-value	0.326631	0.27587	0.982103	0.405246	0.264867

Method	GMM
Effects Specification	Cross-section fixed (first differences)

Note: Standard deviations are presented between brackets.
*, **, *** indicates significance levels at 10%, 5% and 1%

Source: author's calculations

The size of banks has statistically relevance only in case of old member countries group and the impact, in this case, is positive. The results related to GDP growth and inflation rate implication on financial stability are the same like in the first stage of empirical testing.

5. Conclusions

Our two stage empirical estimations demonstrate that in case of EU countries the competition stability view is validated, except the new member countries group. That means in the period of 2003 – 2009 the competition had a positive impact in maintaining financial stability. The implications of market power (Lerner Index) had a stronger effect then the structural features (concentration measured with HHI). As secondary results we find that the sizes of the banks and the macroeconomic indicators like GDP growth and inflation rate have different impact on financial stability, depending on groups of countries from EU. Considering the EU as a whole and old members, the relation between financial stability and the size of banks is positive, but in case of euro area and new members it becomes negative. In case of the EU as a whole, euro area and old members the GDP and inflation rate growth have a negative impact on financial stability, but on financial stability of new member states both macroeconomic indicators have a positive influence. As policy recommendations we suggest the followings: the increasing competition could be a factor of financial stability in EU countries and, in this situation the regulators should be more concerned about stimulating competition and promoting adequate financial supervision architecture; in the case of euro area and new members the regulators should have in attention the mergers and acquisition that could increase the size of banks with negative impact on financial stability. Taking account the macroeconomic variable, the policy makers should be aware that an increase of inflation and GDP growth could have negative influences on financial stability in case of EU as a whole, euro area and old members, but not for new member states. Thus, they could stimulate economic growth in a caching up process even with the price of increasing inflation rate without threatening financial stability. Vice –versa, a decreasing of GDP growth and inflation could be factors of instability. The negative impact of decreasing inflation rate on financial stability is consistent with the "new environment" theory.

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