



Market power and stability of CEE banks

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Abstract

Background: In spite of growing number of empirical studies, especially after the start of financial crisis, literature fails to provide conclusive answers on the relationship between bank competition and stability. **Objective:** We contribute to the existing literature by conducting a bank level analysis of market power implications on CEE bank stability and test whether bank market power increases bank stability.

Approach: On the sample of 415 CEE banks from 1997-2012, we use Distribution free approach to generate bank specific market power and efficiency indicators and then run a fixed effects panel regression. **Results:** We find evidence supporting the Competition - fragility view; banks with more market power are more stable. Also, we find evidence that this stability is a result of lower portfolio risk supporting the franchise value channel. **Conclusions:** For banks in CEE countries where economic crisis increased risk materialization, increasing competition from the early 2000s, may have been a factor decreasing bank stability which may bear significant implications for upcoming years when competition is likely to increase further.

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Introduction

The stability of banking sector is an important topic in economic and social context since banking crisis can have substantial negative effects on economic output and social welfare. Leaven and Valencia (2012) provide an extensive and up-to date overview of country-level banking crisis including policy responses and fiscal costs. Yet, banking sector stability is determined and linked to many factors usually grouped in macroeconomic, financial and structural (Jahn, Kick, 2012). One of the factors influencing the bank stability is the level of competition which is defined as a level of rivalry between firms. In the period of prolonged financial crisis, the motive for investigating this relationship is quite clear which results in rising of the number of

work on this matter. Looking from the CEE banks perspective, this issue becomes even more important, since they witnessed a noticeable increase in competition over the last decade which could even further increase as they become more integrated in EU common banking market.

Although fairly rich and rapidly growing after the start of the crisis, literature fails to reconcile traditional view that competition leads to fragility with somewhat younger view that competition promotes bank stability, with both views having theoretical and empirical background to some extent. In the meantime, a third group of researchers recently emerged claiming that the relationship between bank competition and stability is complex one and even case dependent (Allen and Gale, 2004). Apart from standard issue of different specifications of various models, there are a couple of down-to-earth reasons for inconclusiveness of these results; Bank specific yearly market power indicator is relatively hard to produce. Lerner index, that would be obvious choice, is calculated from prices and in a way includes profitability just like most of the stability indicators. Therefore, we use a relatively new measure of bank individual market power, a competition efficiency frontier (CEF). Further on, measuring bank stability often proves a difficult task itself as the term itself is rather abstract and often observed only ex post. This usually results in authors using different indicators of banks stability: non-performing loans ratio, value adjustment costs, or some binary indicator based on default threshold. However, it should be noted that practitioners in recent years started accepting Z-score as an indicator of bank market power. But, converging to a standard measure Z-score itself can be misleading since it is a product of two separate stabilities (portfolio and leverage) and besides, Z-score tends to reward the stability of earnings, even though on a low level.

To address mentioned issues and explore the specificities of industrial organisation in the banking sector, we conduct a bank level analysis and contribute to the bank competition - stability research area in a couple of manners. Firstly, our relatively long sample (1997-2012) allows us to look at the pre-crisis and crisis period separately and contribute to the CEE countries crisis related literature. Also, we calculate a wide set of other indicators for CEE banks that help us to see the competition implications better. These include: franchise value, regulatory burden, X-efficiency, etc. Special attention in the paper is given to the choice of indicators as we believe that recent literature may have reached a consensus on them a bit too soon in order to attend the techniques.

Relationship between bank competition and stability

Theoretical and empirical work gives contrasting predictions on the relationship between bank competition and stability. Beck (2008) gives a rather extensive overview of the literature and points to additional in-depth literature survey by Carletti and Hartman (2003) and Allen and Gale (2004). Although results vary in every fashion, one could consider earlier work on this matter more inclined to the view that competition decreases bank stability, and more recent somewhat more inclined to opposing view. Because of this inconsistency, a third approach started to emerge based on the idea that relationship between competition and stability is complex one and even case dependent (Allen and Gale, 2004). Other ideas state that this relationship is not necessarily linear or even intuitive (Caminal and Matutes, 2002, Allen and Gale, 2004).

The traditional view on the relationship between competition and stability suggests that increased rivalry between banks makes them more prone to risk taking which in turn makes them more fragile. After the Financial crisis of 2007/2008, this,

competition - fragility view gained momentum with increased competition being viewed by a number of economists as a factor stimulating sub-prime activities in United States, or Swiss franc loans in some CEE countries. Anecdotal evidence from Croatia suggests that it was competition that stimulated Swiss franc loans expansion as the bankers themselves admitted in: Fifth CNB Bank Survey (2006). Apart in Croatia, Swiss franc loans share in total loans amounts to over 5% in their peak in Hungary, Poland, Romania, Serbia and Slovenia. The view that more competitive environment makes banks more fragile finds a confirmation in many papers that not only confirm the relationship, but also offer the channels for its materialization. Most of the researches confirming competition - fragility view use the franchise value hypothesis as the explanation for banks with higher market power being more stable.

Franchise value channel is relatively simple to explain. Bank with market power has more business potential and it can choose whether and in which area to use its` market power. Because of this potential the bank is rewarded on the market and has a market value well above the book value. Therefore franchise value can be seen as a form of non-physical, goodwill-alike value that represents a form of bank potential but also an opportunity cost of bank failure. Having an extra value in their possession, bank owners have incentive to avoid unnecessary risk. As Besanko and Thakor (1993) suggest, banks which appropriate informational rents from developing relationships with borrowers have more incentives to limit risk exposure. On the other hand, the loss of market power decreases the franchise value of a bank and shuts down this disciplining mechanism (Demsetz and others, 1996). The whole concept actually relies on the fact that bank owners and managers are the ones choosing the bank risk level. In the same time, they are aware of the market power their bank has (no matter how much of it has been exercised) as Marcus (1984) and Dermine (1986) show in theoretical work. Similarly, Keeley (1990) set theoretical and empirical evidence on franchise value hypothesis with emphasize on the deregulation process as the driver of the increased competition and fragility. Using different techniques, Suarez (1994), Edwards and Mishkin (1995) Hellman and others (2000) confirmed the trade-off between bank competition and stability. Other researchers rely on the effect bank competition has on the banking sector supervision, regulatory policy, loan portfolio diversification, etc. However, the franchise value concept is generally well accepted and intuitive. Besides market power, factors leading to higher franchise vale are considered to be: size, efficiency, reputation and relationship with clients (Furlong and Kwan, 2006).

Besides franchise-value channel, economic theory points to three additional channels through which competition leads to greater fragility. The first channel is the effect that the competition has on the banking supervision; usually presented through the idea that more concentrated banking sectors are easier to supervise and more efficient supervision lead to stability (Allen and Gale, 2004 and Beck, 2008). The second channel is represented through the relationship between bank competition and payment systems. According to this channel, competition depletes excess liquidity in banks, as in the period of external shocks the potential for interbank liquidity pooling is reduced (Saez i Shi, 2004.). Finally, competition can have a negative effect on bank stability through the insufficient loan portfolio diversification. As Mishkin (1999) shows, higher market share allows for better risk diversification in loan portfolio which allows for continuation in loan activity in the period of recession.

However, this traditional view, where competition increases fragility of the banking system, is often challenged by, somewhat younger, competition - stability view which claims that market power can reduce stability of banks (Boyd and De Nicolo,

2005). According to this view, market power decreases bank stability as a result of risk-shifting process which is an idea based on the two standard banking issues: moral hazard and adverse selection. The theoretical ground for this view was laid by Stiglitz and Weiss (1981) by showing that higher interest rates that result from the lack of competition can easily increase moral hazard and adverse selection which results with increased risk in the loan portfolio. Higher interest rates change the quality structure of clients (by increasing the share of clients with less elastic demand for credit) which increases non-performing loans. Similarly, Koskela and Stenbacka (2000) show that pricing competition among banks leads to lower interest rates and higher level of investments. However, this does not affect bank default rate and therefore there is no trade-off between competition and stability. Boyd and De Nicolo (2005) used risk shifting paradigm to show positive connection between concentration and fragility via the influence of competition on client behaviour. They find that increased competition reduces credit risk and increases financial stability.

Besides the risk shifting paradigm, the theory also mentions "too-big-to fail" policy as the reason of competition increasing stability. The rationale behind this explanation is that regulators are usually willing to help systematically important institutions in order to prevent the shock spilling through the entire sector. However, by knowing that they are systematically important, banks tend to be more prone to risk taking which makes the system less stable. This thesis has one additional dimension: the idea of being systematically important can influence even the depositors of a bank, who then become less interested in monitoring the bank they save with (Mishkin, 1999, Beck, 2008). Final argument of competition – stability proponents is that concentrated banking sectors are not easier to monitor because banks with higher market share are involved in more complex business activities which regulators have problem monitoring (Beck and others, 2006).

Recent work, especially after the start of the financial crisis, approached the competition - stability research basically from another angle, by employing more advanced techniques and by allowing for the non-linearity of the main relationship. Martinez-Miera and Repullo (2010) extended the Boyd and De Nicolo (2005) famous risk-shifting approach and allowed for imperfect correlation in loan defaults to show that relationship between competition and risk is U-shaped. Also, Beck, Demirguc-Kunt and Levine (2006) and Schaeck, Cihak and Wolfe (2009), show that more concentrated systems are less likely to witness a banking crisis of some kind. Also, Berger, Klapper and Turk-Arisis (2008) show that competitive environment stimulates holding of higher capital which compensates more risk they are taking. Finally, Beck, De Jonghe and Schepens (2013) show that increase in competition will have bigger impact on banks' risk in countries with stricter activity restrictions, more homogenous market structure and deposit insurance and more effective systems of credit sharing. Excluding the literature using concentration measures as a proxy of competition, literature on the bank competition – stability relationship in CEE is rather scarce. However, recently, two papers, Ariss (2010) and Agoraki and others (2011), used Lerner index in bank level research to confirm that increase in bank market power leads to greater bank stability.

Methodology

Data and variables

The specificity of every research focused bank competition is the necessity of generating own key variables which makes research on this matter rather data consuming and technically demanding. Perhaps the most extensive review of the

lack of this consistency was presented in Carbó et al., 2009, who showed the magnitude of these differences on sample of 1912 banks in 14 European countries from 1995 to 2001. The authors found that R-squared between the Lerner index and the H-statistic was only 0.06 while the R-squared between the HHI and these two measures were, respectively, 0.09 and 0.05. The lack of robustness of these results is a good motivation for authors worldwide to keep researching this area. All bank level data were obtained from the Bureau van Dijk/Fitch Bankscope database while real GDP growth was obtained from Eurostat web service. Our initial sample includes 415 banks from 15 CEE countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Serbia, Slovakia, Slovenia and Romania. To avoid unreliable data, only banks that were present on the market for at least six years were chosen in our sample. Because of market power and x-efficiency calculation, our initial sample of 3555 observation is reduced to 550. The coverage of banking sector assets in our dataset amounts to around 80% of the banking sector assets in average country. However, countries are not evenly represented in this bank-level research with some of the EU acceding and candidate countries entering our sample in the last couple of years.

Besides all the challenges, working on CEE countries still has two advantages. Firstly, banks in CEE countries mostly compete within the country. This means that, although residents (especially corporate) from the CEE countries do borrow from abroad, from time to time, CEE banking sectors can still be seen as relatively closed markets. Also, as recent literature suggests (Beck and others, 2013), heterogeneity often influences cross country analysis. Analysing a relatively homogenous group, somewhat reduces this issue. Variables used in our research can be divided in these four groups:

- Bank stability (dependent variable in our main equation). Apart from Z-score, a composite indicator of bank default risk and its` components, we also use credit risk indicators: Non-performing loans ratio, Value adjustment costs to assets, uncovered non-performing loans to capital.
- Measure of individual bank market power: Competition efficiency frontier.
- Other bank-specific (control) variables that measure bank franchise value, efficiency, size, funding, liquidity, regulatory burden, net-interest margin, implicit loan rate, implicit customer deposit rate, equity to assets, market share, credit growth.
- Macro-variables that explain general macroeconomic environment where banks operate: real GDP growth, country dummies, crisis dummies.

Compared with country-level research, bank-level research on competition-stability relationship offers the advantage of observing the process from the banks` perspective. However, as Beck (2008) claims, bank level research often produces most inconsistent results on competition - stability relationship. One of the reasons for these inconsistencies is the fact that the literature on bank competition - stability nexus may have gone too far regarding the techniques and models, while left the issue of selecting variables and indicators sidelined. For instance, most of the research will focus on the Lerner index – Z-score relationship. However, having in mind that both Lerner index and Z-score encompass profitability in some form in numerator, these results could be mechanical more than economical. Measuring individual bank market power, on the other hand, is technically challenging, especially when working with countries with lower data quality. While traditional Lerner index would result with yearly data, competition efficiency frontier is a relative measure of bank resistance towards competition and it is not calculated from prices. Kraft and Huljak (2011) applied CEF on a cross section of banks within one country

and suggested that competition may vary on different market segments in single country.

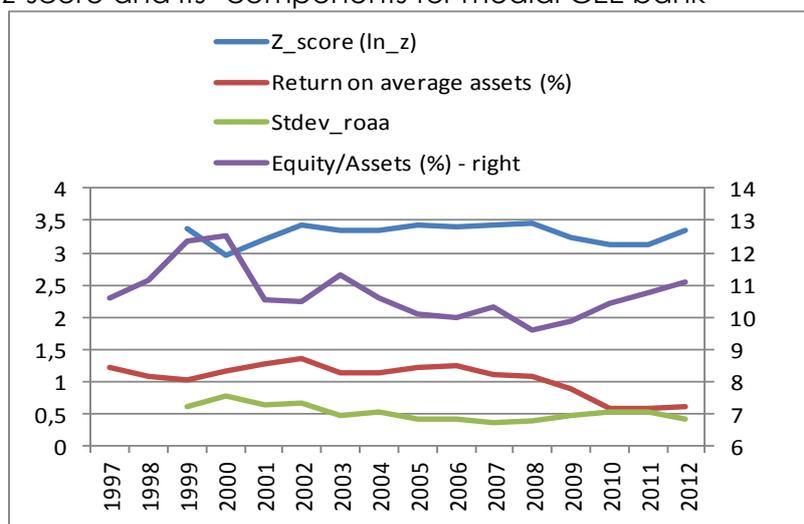
Apart from the bank individual market power, additional indicators are required in our research as the standard banking data does not tell the whole story. Being a non-observable term, bank stability as a variable is rather specific. We use Z-score, a standard composite indicator of bank stability that combines risk, earnings and capitalisation. We also use a decomposition of this indicator, as well as other standard portfolio risk indicators: non-performing loans ratio, value adjustment costs and uncovered NPLs. For bank cost efficiency we use X-efficiency (XE) concept that combines allocation and technical efficiencies of the bank that are both under the influence of bank management.

Finally, bank franchise value indicator is calculated as the ratio of bank market value to book value. However, our ratio represents a simplified version of Tobin q. Calculating a franchise value is important, since (in competition - fragility view) the disciplining mechanism within the bank is the protection of this value. With CEE banks rarely having an active equity market, we impute the market value by calculating the present value of operating revenue. For space saving purpose, we show the techniques for calculating bank market power, efficiency, stability and franchise value in the Appendix.

Stylized facts

Our relatively long sample provides an opportunity to explain CEE banking sector stability in historical context. In late 90s CEE banking sector stability was challenged by earnings volatility which resulted mostly from the credit risk materialisation that even took form of banking crisis in a couple of countries. As Honohan and Klingebiel (2000) mention, six CEE countries went through a full blown banking crisis in some form (Bulgaria, Czech, Croatia, Hungary, Poland, Slovenia) with social cost ranging from 3% to 30% of GDP. In the aftermath of the crisis, banks had relatively high capital adequacy, however, high volatility of earnings and their lower level decreased the Z-score index. In the period around 2000 the process of market consolidation gathered pace, which was stimulated by the foreign investors entrance (Kasman et al, 2010). In the period from 2001 to 2008 bank enjoyed a period of high credit growth accompanied with high loan portfolio quality which resulted with stable and high earnings which brought their Z-score to historical maximum (Figure 1).

Figure 1
Z-score and its` components for medial CEE bank



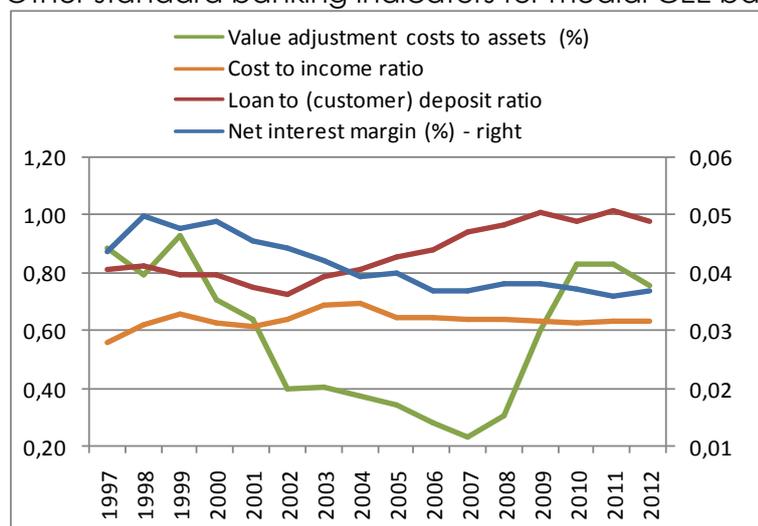
Source: Author's illustration

In the period of tranquillity (2001-2008), net interest margin decreased which is often described (heuristically) in literature as a result of bank competition. However, in the period of increasing loan to assets ratio and the decrease of capitalisation, lower net interest margins was still enough for banks to record new profitability heights. In this period, strong credit growth was in large portion financed from foreign financial institutions, leading to the increase of loan to deposit ratios. Regarding efficiency, standard Cost to income ratio suggests that after 2003 banks managed to increase their efficiency and keep it stable since. However, this indicator is significantly under the influence of economies of scale and technological progress which makes him unreliable for judging the managerial cost efficiency (Figure 2).

After 2008, and the onset of the financial crisis, value adjustment costs increased and interest revenue decreased which eroded bank earnings and reduced Z-score to a ten-year minimum. With banks becoming more risk averse, their capitalisation levels started increasing which was accompanied by loans stagnation. In the same time, net interest margin started to stagnate as interest rates increased with additional pressure of loan quality on interest income (Figure 2).

Figure 2

Other standard banking indicators for medial CEE bank



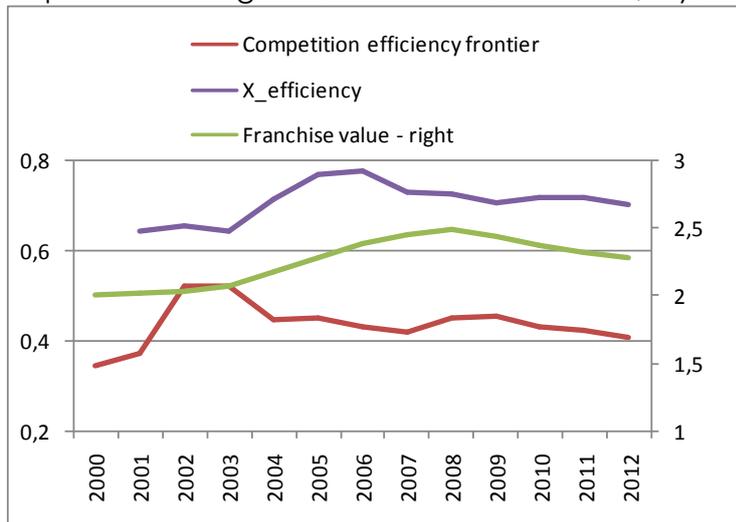
Source: Author's illustration

Using the additional, empirical indicators, we are able to generate information that helps us explain further CEE banking sector trends and put the competition - stability relationship into historical perspective. First of all, in the period of rapid decrease of net interest margins, bank competition in CEE countries seems to have increased as both of our competition indicators suggest. Increased competition after 2003 seems to be the result of a couple of factors. First of all, because of consolidation process, the number of banks decreased and with larger banks slowly entering all the segments of banking (especially SMEs), number of banks trying to reach one client, increased. Relatively similar was the effect of easily available foreign financing, usually from parent banks, which allowed banks to engage more of their assets into placements to private sector (Figure 3).

After 2008 bank franchise value decreased as bank average cost of capital increased and operating revenue started to decline. Its decrease in the period of decreasing market power and decreasing stability offers first anecdotal support for Franchise-value concept. Finally, there seems to be no efficiency increase in the period after the crisis started. Managerial (X) efficiency seems to increase until 2006,

which is probably a result of less efficient bank leaving the market. It appears that after the crisis banks did not reduce their cost to income ratio owing to increased managers' efficiency. This was probably the result of banks decreasing unit administrative costs or simply selecting cheaper inputs, as we see the decline of X-efficiency (Figure 3).

Figure 3
Empirical banking indicators for medial bank, 5 year moving averages



Source: Author's illustration

Model

The year 2008 is the year of significant economic slowdown and the start of the effective financial crisis in most of the CEE countries as the performance of medial bank (Figure 1 and Figure 2) clearly shows. For this reason, the econometric analysis is conducted on two sub-samples, pre-crisis period from 1997 to 2007 and the crisis period from 2008 to 2012. Our choice of sub-periods is also confirmed by Chow test that shows evidence of the break in the relationship between explanatory variables and the dependent variable for the period 2008 to 2012. We use fixed effects to control for the all time-invariant differences between countries. To confirm the feasibility of fixed effect, we use Hausman test and reject the null hypothesis that random effect are preferred. We also test the multi-collinearity (a phenomenon often witnessed with trans-log functions) while choosing variables for model. Finally, we also use the bank-level fixed effects to check the robustness of the results and run a two-stage least squares regression to control for possible endogeneity of market power by instrumenting it with its own lag.

With testing the relationship between bank competition and stability, we proceed the following way. As a first step, we conduct a relatively simple elasticity test to confirm the relationship between franchise value and market power. This serves as a robustness test not only for franchise value concept, but also for our market power indicator. In the second step we use our main equation to test the competition fragility hypothesis by modelling bank stability using a market power indicator alongside other control variables which corresponds with the majority of the bank-level research. Apart from the composite stability indicator, Z-score, we use its components: portfolio stability and leverage stability, as well as other stability indicators.

According to the Franchise value paradigm, market power should explain a part of the franchise value, alongside other, more tangible indicators. Regarding the choice of variables, our approach here is similar to De Jonghe, and Vennet (2008) approach, although we use relative simple model for franchise value. Our franchise value elasticity test is the following:

$$FV_{it} = f(MP_{it}, XE_{it}, NIM_{it}, MS_{it}, INT_BANK_{it}, EA_{it}, REG_{it}) + \varepsilon, (1)$$

with FV - franchise value, MP - market power, XE – x-efficiency, NIM - net interest margin, MS - market share, INT_B - interbank ratio (placements to / liabilities from other banks), EA - capital to assets, REG - regulatory cost (share of assets held at central bank). The subscripts i and t are for bank and year respectively.

Following Beck and others (2013) we use a set of bank-specific variables and macro variable to model bank stability in our main equation with market power as a main controlling variable. We use the following model:

$$ST_{it} = f(MP_{it}, MK_SH_{it}, EFF_{it}, LIQ_{it}, LTD_{it}, GR_{it}) + \varepsilon, (2)$$

with ST - bank stability, MK_SH - market share, EFF - efficiency, LIQ - liquidity, LTD - loan to deposit ratio for bank i in a year t, with GR being the country-level economic growth. The subscripts i and t are for bank and year respectively.

Results

Our franchise value elasticity test shows positive and statistically significant relationship between bank market power and franchise value. This test is often skipped in the empirical literature, with most of the authors taking for granted that market power influences franchise value. As expected, market power strongly influences franchise value, regardless of the used market power indicator. Apart from market power, bank size also increases franchise value. Looking from the “intangible” point of view, this seems reasonable since bigger banks usually enjoy goodwill in form of cheaper work-force (workers being willing to work for larger bank for smaller wages) and economies of scale. Factors decreasing bank franchise value are as expected regulatory burden and equity to assets ratio. Regulatory burden is often seen as a typical factor decreasing the franchise value and the main argument against strict regulation of the market. Regulatory burden leads to lower franchise value and decreases opportunity cost of bank default. Equity to assets ratio has similar effect as banks with higher capitalisation (induced by regulation or business circumstances) can't engage their full potential and have to protect themselves from unexpected circumstances with extra capital. Regarding other variables, higher intermediation efficiency (net interest margin) also increases franchise value, since it encompasses bank know-how. Surprisingly, cost efficiency does not seem to increase franchise value (Table 1).

As Beck and others (2013) suggest, the correlation between Lerner index and Z-score could be spurious since they both include profitability in numerator. However, our indicator of market power (CEF) suffers no such issues. Initially, our results do not provide a clear insight on the relationship between market power and bank stability when stability is measured with Z-score. However, stability represented with Z-score has two components: portfolio and leverage stability. Using the Z-score components, we see that banks with higher relative market power (CEF) have higher portfolio

stability in crisis period while we see no clear connection between market power and leverage stability. This is in line with the idea of CEF indicator as it is not dependent on size or prices and allows smaller banks to have market power on segmented CEE banking market. Larger CEE banks on average have higher leverage stability as they are usually foreign-owned and benefit from more comfortable capital position.

Table 1

Franchise value elasticity test

Dependent: Franchise value	OLS	Country f.e.
Market power	0.912 ***	0.841 ***
x_efficiency	0.019	0.009
Net interest margin	0.129 ***	0.134 ***
Market share	1.322 ***	1.061 ***
Interbank	0.000	0.000
Equity to assets	-0.069 ***	-0.065 ***
Regulation	-2.487 ***	-2.274 ***
Constant	2.250 ***	2.061 ***
N	307	307
r2	0.51	0.58

Note: *** significant at 1%

Source: Author's calculation

Our main equation and related robustness checks confirm competition fragility as we find evidence of market power being related to higher bank stability (Table 2). Regarding other variables, size is important for stability as well as credit growth. One has to be careful with this interpretation, since higher credit growth in crisis period could be result of some banks managing to find solid clients even when others can't or the result of banks protecting their own earnings by continuing to extant loans to lower quality clients to artificially preserve their earnings (*Zombie lending*). Relative cost efficiency is, as expected, positively connected with stability in most of the specifications as it increases earnings. Surprisingly, economic growth coefficients are mostly insignificant and have ambiguous signs indicating that the economic growth in current year is not important, providing that we already indicated whether we observe pre-crisis or crisis period. Our results remain stable if use the two-stage-least-squares procedure as well.

In the next step, we examine the robustness of our results by looking at the credit risk indicators of CEE banks regarding their market power. Even though credit risk is only one factor influencing bank total risk profile (portfolio stability), in CEE countries it is clearly the most important one. Our results show that, banks with higher market power have lower non-performing loans ratio and lower capital burden of uncovered non-performing loans which is also consistent with competition - fragility view. On the other hand, we find only weak evidence of banks with more market power having lower value adjustment costs to asset ratio.

Table 2

Competition – fragility test with Z-score and its components

	Pre-crisis period		Crisis period	
	OLS	Country f.e.	OLS	Country f.e.
	Pre-crisis period		Crisis period	
	Dep: Z-score			
Market power	0.53	-0.37	0.39	-0.09
X_efficiency	1.23 *	2.49 ***	-0.73 *	0.10
Liquidity	0.00	0.00	0.00	0.01
Credit growth	0.00	0.00	0.01 ***	0.01 ***
Loan to deposit	0.06	0.11	-0.04	0.01
Market share	0.66	2.41 ***	0.62	1.97 *
Growth	-0.01	0.18 *	-0.06 ***	-0.02
Cons	2.60 ***	0.14	3.98 ***	3.24 ***
N of obs	144	144	416	416
R-sq.	0.07	0.24	0.15	0.33
	Dep: Portfolio stability			
Market power	1.09 *	0.58	0.88 **	0.63 **
X_efficiency	1.45 *	2.87 ***	-1.24 **	-0.46
Liquidity	-0.01	-0.01	0.00	0.00 **
Credit growth	0.00	0.00	0.01 ***	0.01 ***
Loan to deposit	0.26	0.26	-0.04	-0.01
Market share	2.46 ***	4.19 ***	3.39 ***	4.69 ***
Growth	-0.02	-0.19	-0.01	0.01
Cons	-0.08	-2.90 **	1.36 ***	0.78
N of obs	133	133	333	333
R-sq.	0.22	0.33	0.14	0.26
	Dep: Leverage stability			
Market power	0.45	-0.42	0.36	-0.14
X_efficiency	1.10 *	2.35 ***	-0.80 *	-0.11
Liquidity	0.00	0.00	0.00	0.01
Credit growth	0.00	0.00	0.01 ***	0.01 ***
Loan to deposit	0.06	0.09	-0.03	0.02
Market share	0.44	2.11 **	0.09	1.45
Growth	-0.01	0.16 *	-0.05 ***	-0.01
Cons	2.67 ***	0.28	3.95 ***	3.30 ***
N of obs	144	144	416	416
R-sq.	0.05	0.23	0.13	0.31

Note: * significant at 10%, ** 5%, *** 1%

Source: Author's calculation

Discussion

Before financial crisis, banking sector s of CEE countries enjoyed a period of tranquility with high earnings, strong capital and low volatility. Consequently, the

stability of banks was high with Z-scores reaching their maximum historical values. In the period of financial crisis, after 2008, stability of banks in CEE decreased noticeably, with loan quality and weak credit growth leading to significant earnings decrease. In the same time, competition between banks increased as the market started to shrink.

Using a relatively simple elasticity test, we show that market power contributes to the franchise value of banks making the franchise value channel possible. Results of our main equation and associated robustness tests are consistent with competition fragility hypothesis since that we find evidence of banks with higher market power being more stable in the period of crisis. Our competition – fragility results are in line with some of the recent research on this matter - Berger et al. (2008) and Turk –Arisis (2010), and Jimenez et al. (2013). Using two subsamples, two measures of bank specific market power and two panel regression specifications our results are robust.

Our market power indicator is associated with higher portfolio stability, while we find no significant relationship with the leverage stability. In the next step we find no evidence of banks with more market power having higher net interest margins which suggests that their stability is not a result of higher prices that increase profitability included in stability measure. Even more, we actually find some evidence of banks with more market power having lower implicit interest rates (both passive and active) which could be under the influence of different client structure.

Consequently, our results suggest that banks in CEE use their market power outside the pricing strategy as they accomplish lower portfolio volatility through the higher quality of relationship with their clients. So instead of economic rents, banks with more market power use the advantage of informational rents as Allen and Gale (2004) suggest. This way, their clients benefit from stable funding and lower interest rates, while they benefit from lower reinvestment risk and higher asset quality. In that sense, growing differences in Z-score between CEE banks bare down to the quality issue. Results imply that banks with higher market power gain the advantage over weaker banks not through the aggressive interest rate policy, but through the acquiring better clients and investing in relationship with them. Results also imply that banks with less market power get stuck with clients of lower average quality which leads to decreasing interest revenue and higher value adjustment costs.

Conclusion

To conclude, bank franchise value seems to be a well functioning self disciplining mechanism within the CEE banks. As the theory suggests and our results confirm, stricter regulation and increasing competition are factors causing its decline which should be important information for policy makers. Increasing bank competition can have some positive implications (like increasing efficiency), however its effect can be offset with some stability losses which make the net effect of such an increase uncertain from the social welfare point of view. Looking from the perspective of CEE banks, joining the Banking Union, which creates a level playing field for members, could result in market power convergence to the somewhat lower level of older EU member states. Consistent with our findings of competition fragility relationship this could increase bank individual riskiness in the future.

There are several ways how this research can be expanded. First, in future research, it could be beneficial to test the risk shifting paradigm only on banks with less market power. Second, this research could benefit from employing dynamic panel analysis in form of GMM and Arlano-Bover estimator to combine fixed effect and lagged dependent variable. Initial test suggest that our results hold, when we control for the endogeneity and when we include lag of depended variable into

equation. However, as Beck and others (2013) suggest, pooling the data always hides cross-country variation and additional work on the technique could prove to be beneficial. From the technical point of view, our research as well as similar research on this topic could benefit from causality test. However, causality tests on panel data, although possible, are still rarely used and pose a few challenges. Finally, although the robustness of results was tested by using other bank stability measures, Z-score is an indicator developed for manufacturing companies and it rewards stability even on unwanted levels. Therefore, future research could also benefit from Z-score modification or using some other bank stability indicator.

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Appendix

Competition efficiency frontier calculation

The Competition efficiency (CEF) concept, recently developed by Bolt and Humphrey (2010), is from the technical perspective, an efficiency measure. However, in this approach, the efficiency refers to the competition as a process. Therefore, the bank or a group of banks on the CE frontier is actually a bank or a group whose revenue was the most restrained by the competition. This means that while we still maintain that bank revenue reflects productivity, cost and competition, we actually reverse the story and claim that revenues of banks are restrained by productivity, cost and competition.

Like Bolt and Humphrey (2010), we maintain that banks use spread revenue and non-interest revenue as their two main sources of revenue. However, since we lack the data to calculate the CEF for non-interest activities, we calculate only the CEF for spread business.

For estimation of spread revenue and non-interest revenue, we use the standard transcendental function in logs with two inputs (working and physical capital):

$$\ln(Y_i) = \theta_0 + \sum_{i=1}^5 \theta_i \ln X_i + 1/2 \sum_{i=1}^5 \sum_{i=1}^5 \theta_{ij} \ln X_i \ln x_j + \sum_{i=1}^5 \sum_{k=1}^2 \lambda_k \ln X_i \ln P_k + \sum_{k=1}^2 \pi_k P_k + 1/2 \sum_{k=1}^2 \sum_{m=1}^2 \pi_{km} \ln P_k \ln P_m \quad (1)$$

Where: Y – spread revenue to operating costs, Pk – productivity ratios: labor deposit ratio and tangible assets to deposit ratio, X – input costs: price of labor, price of physical capital, Pm – unit costs: processing cost, tangible assets unit cost and equity to assets. The subscripts i and t are for bank and year respectively.

In a composed error framework, equation (2) can be expressed as:

$$\ln(\text{rev}/\text{oc}) = R(\ln X_i, \ln X_j, \ln P_k) + \ln e + \ln u \quad (2)$$

Under the DFA approach (Berger, 1993) the total residual is made of random part and competition part ($\ln e$ and $\ln u$ respectively). Over long enough time period $\ln e$ will average to close to zero, while $\ln u$ will average to the competition effect. Afterwards, the series of residuals is averaged across banks and only then averaged bank residuals are averaged across bank groups (based on size, ownership, and strategy, survival). Only then was the CEF calculated using the following formula:

$$CE_i = \exp(\ln \bar{u}_i - \ln \bar{u}_{\min}) - 1 = (\bar{u}_i / \bar{u}_{\min}) - 1 \quad (3)$$

Where: CEF - competition efficiency for a bank or a group of banks, \bar{u}_i - averaged residuals across time for a certain bank or a group of banks and \bar{u}_{\min} the minimum \bar{u}_i vector. Thus the ratio is an estimate of the ratio of for the bank or a group of banks compared with the bank or bank group facing the greatest competition while having the same underlying cost and service productivity.

Measuring bank stability

Being a non-observable term, banking stability as a variable is rather specific. In bank-level research like ours, most of the authors use Z-score, an indicator that conveniently, combines risk, earnings and capitalisation which is in a way the core of banking business. However, as Kohler (2012) shows, the Z-score is actually a combination of two separate stabilities that can annul each other. This is the reason why, apart from the standard Z-score, we also look at its two components: portfolio stability and leverage stability.

$$Z = \frac{k + \mu}{\delta} = \frac{k}{\delta} + \frac{\mu}{\delta} = P + L \quad (4)$$

Where: Z - Z-score, k - three year - average Return on average assets, μ - equity to assets, δ - three year standard deviation of Return on average assets, P - portfolio stability and L - leverage stability.

Measuring bank x-efficiency

For bank cost efficiency, we use X-efficiency (XE) concept that combines allocative and technical efficiencies (both under the influence of bank management) in unknown proportion (thus the X name). For the same reasons as with CEF, for the individual bank X-efficiency, we also apply DFA to dismantle residuals on efficiency and random parts. We follow Berger and Hannan (1998) who measure X-efficiency, or the closeness of the bank costs to the minimum costs for the bank's output that could be achieved on the efficient frontier. In other words, we believe that competitive pressures or the lack of it will influence only relative bank efficiency, while it will not influence technological progress or economy of scale which depends on the optimal size of the bank.

To estimate efficiency Berger and Hannan (1998) assume that the cost function has a composite error term that includes both inefficiencies (deviations from the efficient frontier) and random error (luck, measurement error). The difficulty in estimating efficiency is in disentangling the two elements. This is exactly where DFA method proves its value. While most studies must impose distributions in order to separate them, DFA relieves us of the issue but requires a time series of data for each of our banks in return. The key assumption is that cost differences owing to inefficiency are relatively stable and should persist over time, while those owing to random error will average out over time.

For the XE calculation, we use standard trans-log cost function with three inputs (financial capital, labour and physical capital) and three outputs (investments, loans and fees):

$$\ln TC_{it} = \alpha_i + \sum_m^M a_m \ln Y_{m,it} + \sum_n^N b_n \ln W_{m,it} + \frac{1}{2} \sum_m^M \sum_n^N a_{mn} \ln Y_{n,it} \ln Y_{m,it} + \frac{1}{2} \sum_m^M \sum_n^N b_{mn} \ln W_{n,it} \ln W_{m,it} + \sum_m^M \sum_n^M ab_{mn} \ln W_{n,it} \ln Y_{m,it} + \varepsilon_{it} \quad (5)$$

Where: TC - total operational costs of a bank i in the period t, W - input prices, Y - bank outputs (loans, investments and fees and commissions), and ε - the residual. The subscripts i and t are for bank and year respectively. For the DFA method, a cost function is modified as:

$$\ln C_{ij} = \ln_t C(Y_{ij}, w_{ij}) + \ln x_i + \ln v_{it} \quad (6)$$

Where ln - natural logarithms, t - time, C - operating costs, C(Y, w) - a cost function with output quantity vector Y and input price vector w, ln x - an efficiency factor, and ln v - a random error. All the components in equation (6) vary over time except for the efficiency factor xi, which is assumed to be constant for bank i. To calculate efficiency, we average the residuals from equation (6) for each bank over the 5 years. This average residual, ln x̂_i for each bank, is an estimate of ln x_i, given that the random errors ln v_{it} will tend to cancel each other out for each firm separately in the averaging. We transform ln x̂_i into a normalized measure of efficiency:

$$EFF_i = \exp(\ln x_{\min} - \ln x_i) - 1 = x_{\min} / x_i \quad (7)$$

Where min - the minimum for all i. This is an estimate of the ratio of costs for the most efficient bank in the sample to bank i costs for bank i combination of outputs and input prices. This corresponds with the conventional notion of efficiency as the ratio of the minimum resources needed for production to the resources actually used, and ranges over (0, 1), with higher values indicating greater efficiency.

Measuring bank franchise value

Unlike book value that is relatively easy to calculate from the balance sheet, the market value is not easily available since CEE banks rarely trade on the stock exchange. Therefore in order to calculate bank market value we discount the operating profit with banks' the cost of capital in a model of eternal rent and this way calculate imputed market value. This relatively simple way of calculating franchise value allows us to generate enough observations for CEE countries.

$$FV_{ij} = \frac{MVA_{ij}}{BVA_{ij}}, MVAL_{ij} = \frac{OP_{ij}}{WACC_{ij}}, BVA_{ij} = EQ_{ij} \quad (8)$$

With FV - franchise value, MVA - market value, BVA - book value, OP - operating profit, WACC - weighted average cost of capital, EQ - balance sheet equity. The subscripts i and t are for bank and year respectively.