

Vujanović, Nina; Fabris, Nikola

Article

Does market competition affect all banks equally? Empirical evidence on Montenegro

Journal of Central Banking Theory and Practice

Provided in Cooperation with:

Central Bank of Montenegro, Podgorica

Suggested Citation: Vujanović, Nina; Fabris, Nikola (2021) : Does market competition affect all banks equally? Empirical evidence on Montenegro, Journal of Central Banking Theory and Practice, ISSN 2336-9205, Sciendo, Warsaw, Vol. 10, Iss. 2, pp. 87-107, <https://doi.org/10.2478/jcbtp-2021-0015>

This Version is available at:

<https://hdl.handle.net/10419/299013>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by-nc-nd/4.0/>



UDK: 336.71(497.16)

DOI: 10.2478/jcbtp-2021-0015

*Journal of Central Banking Theory and Practice, 2021, 2, pp. 87-107**Received: 17 October 2019; accepted: 25 April 2020***Nina Vujanović*, Nikola Fabris****

Does market competition affect all banks equally? Empirical evidence on Montenegro

** Central Bank of Montenegro,
Podgorica, Montenegro**E-mail:
nina.vujanovic@cbcg.me**** Faculty of Economics,
University of Belgrade,
Serbia and
Central Bank of Montenegro,
Podgorica, Montenegro**E-mail:
fnikola@ekof.bg.ac.rs*

Abstract: Bank stability is an important aspect of financial stability, especially in bank-centric systems like that of Montenegro. Hence, it is important to analyse risks affecting stability of both the banking and financial system as a whole. Rising competition among banks could pose a challenge and possibly change the level of credit risk, especially if the banks are small in size. This can affect both credit risk and financial stability. Small-sized banks could be the ones to react less nimbly to a changing market structure than bigger banks with stable market shares. This study tries to answer whether competition affects credit risk in Montenegro and whether banks differing in size react differently. Panel data techniques were applied to eleven banks which account for over 90 percent of the banking sector. The results indicate that market concentration could be particularly harmful when it comes to credit risk of small-sized banks, while large-sized banks are less affected. Overall, the increasing competition may positively affect credit risk in Montenegro.

Keywords: credit risk, bank competition, financial stability.

JEL code: G21 and G28

1. Introduction

Until late 1990s, Montenegro's banking system existed only in formal terms, considering that it did not perform any of its key tasks of depositing available liquid assets and their allocation. The banking system reform was launched at the beginning of this century with the adoption of a completely new set of regulations, the introduction of international accounting standards, the removal of obstacles

for foreign investments, bringing banking supervision under the central bank authority, privatisation, etc. The licensing of new banks and the entry of renowned foreign banks into the system was an impressive achievement.

The development of the banking system was extremely fast in the years preceding the outbreak of the global financial crisis when both deposits and loans were recording three-digit growth rates. It was a period of fierce competition in which adequate risk management was neglected. However, the effects of the global financial crisis became apparent at the beginning of the last quarter in 2008 and the banking system was one of the most adversely affected sectors in Montenegro. To wit, a large number of enterprises ran into difficulties and were unable to repay their loans, which led to a rapid growth of non-performing loans. These loans peaked in the third quarter of 2011 when they reached 25%. Such trends represented a major challenge to financial stability. Every organization that strives to survive, to develop and to be sustainable, must be ready to face all the challenges that today's turbulent and uncertain times carry with them (Luburić, 2019).

Banking system stability largely contributes to stability of the financial system, particularly in the bank-centric systems such as Montenegro's in which the reliance on the banking sector to ensure adequate financing is increasing. This results in a growing correlation between credit and economic cycles and raises supervisory concerns. Therefore, the link between a growing competition in the banking system and credit risk is becoming increasingly important (Fabris, 2018). The fact that the NPL level has remained high (and is still above the pre-crisis level) in the years after the financial crisis outbreak reflects the need to analyse the sources and intensity of risks that could affect stability of both the banking and overall financial system. That is why this study aims to examine how competitiveness affects stability of the Montenegrin banking system.

The global interest in the issue of correlation between competitiveness and stability of the banking system has been renewed after the global financial crisis. From the end of World War II until the 1980s, the banking systems were strictly regulated and thus competition was largely contained in most developed countries. The key argument in this period was that too much competition was detrimental to stability of the banking and financial system in general. However, a completely opposite trend of deregulation of the banking and financial system in general began in the 1980s. During this period, the emphasis was put on efficiency and the issues surrounding financial stability were neglected.

There is no consensus in the literature on this issue. There are basically two competing views. According to the traditional view, greater competition reduces market power and profit margins. This motivates banks to accept higher risk in

order to ensure market share, i.e. to accept clients with poorer credibility, which increases the share of non-performing loans. This means that in a less competitive environment, banks have better profit opportunities and higher franchise value and, consequently, they will be less prone to risk taking. So, the traditional view is that excessive competition jeopardizes financial stability, meaning that increased risk is then transferred to depositors and ultimately to the government.

On the other hand, the revisionist view starts from the assumption that increased competition would enhance financial stability. This view advocates that higher competition reduces interest rates and lower interest rates reduce the borrowers' burden of loan repayment (increase profitability), thus reducing loan default rates and, consequently, the overall risk profile of banks. Also, besides lower credit costs, increased competition can lead to economies of scale, better allocation of capital, and the like, which can encourage economic growth and thus further strengthen stability of the banking system through a sounder banking portfolio.

A third view has emerged recently that attempts to reconcile these two concepts. It is a model developed by Martinez-Miera and Repullo (2010) that starts from U-shaped relations between bank competition and stability. This view was later confirmed by a number of empirical works. Its initial assumption is that higher levels of competition enhance bank stability up to a certain threshold and beyond this threshold the efficiency gains of more banking competition may be outweighed by financial instability effect (Brei et al., 2020).

The novelty introduced by this paper refers to filling the gap of how competition affects stability of the banking system in a small and open economy using the example of Montenegro. Also, to our best knowledge, there are no studies that analyse this issue according to the size of banks.

This paper consists of five sections. The next section gives an overview of the literature dealing with this issue. The third section details the model specification and testing, while the fourth section shows the effects stemming from variables that affect credit risk, viewed as macroeconomic and bank-specific variables. Finally, the most important findings are systematized in the concluding remarks.

2. Literature review

Competition in the banking industry is a factor external to the bank and its effects on bank credit risk is not so clear. The number of factors that affect the level of competitiveness is significant (Grubišić, Kamenković and Kaličanin,

2019). Different theories pose different arguments and they mostly analyse the competition-credit risk linkages *ex ante* – from the early stage of potential debtor assessment. Ruckes (2004) argues that, in addition to the assessment of the potential debtors, a bank assesses its competitors (other banks) when deciding on extending loans. If the assessment made of competing banks is negative, the bank is less likely to extend a loan to a risky debtor. However, Ruckes points that favourable assessments of competing banks increase the chances of bank tapping into risky loan arrangements. This generally hints that the bank market power is a determinant of riskiness of a loan portfolio.

Traditionally, greater market competition could be harmful, regardless of industry. Banks could be more prone to risky behaviour against the backdrop of increased competition, which feeds in credit risk (Keeley, 1990; Salas and Saurina, 2003; Repullo, 2004). The fewer banks comprise the banking system, the more likely they have better profit opportunities, higher franchise values and greater capital reserves against the negative macroeconomic shocks (Jiménez, Lopez, and Saurina, 2013; Brei et al., 2020). When facing high competition, they increase their risk taking (Keeley, 1990), riskier credit policies and, as a consequence, higher non-performing loans and even possibly bankruptcies. This is known as “franchise value” paradigm. Fungáčová and Weill (2013) studied the effects of bank competition on the failure of banks in Russia. They found that increased competition leads to great bank failure, supporting the traditional view on the effects of competition on bank’s risks. Jiménez, Lopez, and Saurina also find the support for the franchise value paradigm to apply to the Spanish banking system. In their paper, Allen and Gale (2000) found that increased competition can lead to interbank market instability as in such condition banks are unlikely to be willing to lend to other banks facing liquidity-constraints. In their later study, Allen and Gale (2004) also found that increased competition motivates banks to take greater risk by reducing their franchise value. Using a dynamic model of imperfect competition, Matutes and Vives (2000) found that higher market power reduces the default probability. Hellmann, Murdock, and Stiglitz (2000) found that increased competition in the deposit market leads to instabilities in the banking system. Marques-Ibanez, Altunbas, and Leuvensteijn (2014) found that increased competition leads to intensified securitization activities and increases the risk profile and likelihood that the bank will be rescued after the crisis. The hypothesis that greater competition leads to increased instability of the banking system was also confirmed in the paper by Chang (2011). Beck, Demirguc-Kunt, and Levine (2006) showed that more concentrated national banking systems have a lower risk of facing a systemic banking crisis. On the example of eight Latin American countries Levy-Yeyati and Micco (2007) found that an increase in bank competition leads to increased risks to stability of the banking system.

Yet, loan portfolio could be much improved due to greater competition, as bank improve their monitoring efforts. The advocates of this hypothesis, Boyd and De Nicolo (2005), explain that greater competition may result in lower interest rates, which reduces probability of loan default and, hence, the risk of bank failure. Under the assumption that banks' loan defaults are perfectly correlated, probability of default should coincide with the probability of bank failure. This negative correlation between credit risk and competition is known as the *risk-shifting effect*. Goetz (2018) studied the sample of US banks and showed that lifting barriers to bank entry increases the quality of loans and even boosts banks' profits. Non-performing loans reduce by 22 bases points upon an increase of the banking market by one standard deviation, showing a very large economic effect from the increase in competition. The authors conclude that financial stability is improved with greater competition in the USA. Agoraki, Delis, and Pasiouras (2011) also find that market power reduces non-performing loans and solvency risk in thirteen Central-Eastern European countries over the 1998-2005 period. Based on cross-country analysis of 38 countries, Schaeck, Cihak, and Wolfe (2009) found that more competitive banking systems are less likely to experience a systemic banking crisis.

Unlike the above theories that advocate only a single effect from competition on credit risk (either positive or negative), Martinez-Miera and Repullo (2010) identified two opposing effects influencing credit risk in the context of increased competition. According to the authors, there seems to be a trade-off between a financial stability on one hand and competition on the other. Just like Boyd and De Nicolo (2005) they concur that higher competition may induce risk shifting effect. However, they relax the assumption of a perfect competition. In addition, Martinez-Mera and Repullo argue that due to boosted competition and reduced interest payments, profit from loans decreases and reduces the banks' buffer for bad loans. The latter is a *margin-effect*, labelling negative relation between competition and bank failure. The two opposing risk-shifting and margin-effects lead to an inverted-U relationship between credit risk and competition. Gomez and Ponce (2014) confirmed this relationship and found that there is a level of competition above which banks' loan quality starts to deteriorate. Likewise, the most recent study on this topic (Brei et al., 2020) find the evidence of a non-linear relationship between competition and non-performing loans in thirty-seven countries of Sub-Saharan Africa over the 2005-2015 period. The authors conclude that the gains from competition are counterweighted against risks arising from few banks' market power in the form of lower margins, risky behaviour and inability to create capital buffer against negative business cycles. They conclude that there is a need for policymakers to guard financial stability better as competition increases. Tabak, Fazio, and Cajueiro (2012) made similar findings for Latin

American countries where high and low level of competition is associated with more stability, while the average level of competitiveness has the highest fragility. This link for MENA countries was confirmed by González, Razia, Búa, and Sestayo (2017).

The evidence of the effects of competition on credit risk is generally scarce but the current literature indicates that there could be diverse effects. Apart from the fact that there could be some turning point after which competition changes the sign of its effect on credit risk, it remains unclear where the heterogeneity of competition-credit risk comes from. Considering the high levels of competition in the banking sector of Montenegro and the fact that empirical literature has failed to provide the answer on how this variable relates to credit risk, we investigate this matter further. Montenegro represents an interesting case for such a research because of changing competition levels in the banking industry.

This paper hypothesis that banks that differ in size may in fact respond differently to competition. Literature on the impact of bank size on competition is rather scarce and contradictory. Therefore, the important contribution of this paper is to shed light on this area in which there are contradictory findings. Based on a large sample of more than 18,000 banks in 101 countries, Bikker, Spierdijk, and Finnie, (2006) found that market power of banks increases with bank size in more than 70% of the countries in the sample. They provided two potential explanations. The first is that size itself matters. The second explanation is connected with the fact that large banks tend to operate in different product and geographical sub-markets. This finding is also supported by the study Kasman and Kasman (2014) on the example of Turkish banks in the period 2002Q1-2012Q2. They concluded that larger banks have greater market power. They came to this conclusion based on the findings of their study that larger banks have lower earnings volatility.

A completely opposite conclusion was reached by Coccoresse and Santucci (2019) on the sample of Italian banks in the period 1989 - 2013. They found that smaller banks enjoy a higher degree of market power. It is explained with the relationship lending that characterizes the interaction between banks and borrowers in Italy (closer relations with customers). On a sample of Chinese banks, Shih (2007) suggests that bank size does not have any significant impact on bank performance and competition. The same conclusion was reached by an OECD study (2011) on a sample of member countries of this organization.

In the context of credit risk, big banks can show less risk aversion as a result of the “too big to fail” hypothesis (Louzis, Vouldis, and Metaxas, 2012). If the competition increases and the bank is big in size, the effect of different market structure on credit risk could be small. In other words, for banks that have stable and big

market shares, increased market competition means less in terms of different credit policies or loan portfolio. The opposite could hold for banks that are small in size and have lower market shares. When facing increased market competition, these banks may increase or decrease their risky portfolio. The following two hypothesis are developed:

H1: Rising competition does not affect loan portfolio of big-sized banks

H2: Rising competition affects risk loan portfolio of small-sized banks

3. Data and model

We test the above hypothesis on using the bank level data from Montenegro. The scope of the analysis includes eleven banks accounting for 94% of total assets of the banking sector (Q42016), which consists of fifteen banks at the time.¹ The analysis used quarterly series for the period between Q42004 and Q42016, whereas for two banks the time series are shorter (Q12006 - Q42016 and Q12008 - Q42016) and sourced from the Central Bank of Montenegro.

We use the ex-post measure of the credit risk – non- performing loans (NPL) as dependent variable, whereas the independent variables include a set of macroeconomic and bank-specific variables sourced from the Statistical Office of Montenegro (Monstat) and the Central Bank. The latter group contains the measure of concertation (competition) in the banking sector, which will be explained later in the text.

Macroeconomic variables that were included are the level of GDP (at real prices), the unemployment level and gross wages (to grasp on the impact of standard of living on credit risk), real estate prices and the stock exchange index (to account for wealth effect), and the sovereign debt level (which measures the impact of sovereign debt on credit risk). Bank factors potentially influencing NPL levels are the size of a bank (approximated by the share of the bank's assets in total banking sector assets), bank capitalisation (solvency ratio), lending activity (level of loans), loan quality (proxied by the percentage of provisioning) and bank competition measured by the Herfindahl-Hirschman index (HHI). Quarterly statistics on GDP and sovereign debt series were available for the periods 2009-2016 and 2007-2016, respectively. Outside of these periods, quarterly series were obtained by means of data interpolation. In addition, specific series were adjusted so as to

¹ Other four banks are relatively new and due to the short time series could not be included in the estimations.

take into account changes in the definitions of the given series and their seasonal character.

The variables used in the model and their definition are presented in Table 1:

Table 1: Variables and their definition

Variable	Definition
Dependent variable	
Credit risk	Percentage share of non-performing loans into total loans)
Macro variables	
GDP	Gross domestic product, real prices in mil of EUR)
Unemployment	The % of unemployment
Wages	Gross wages
Real estate prices	Real estate prices in Podgorica
Sovereign debt	Sovereign debt in mill EUR
Stock exchange index	Montenegrin stock exchange index, Monex
Inflation	Annual consumer price index, CPI
Bank variables	
Competition	Hirshman-Herfindahl index (HHI) – sum of the squared market shares
Bank size	Share of bank's assets into total assets)
Quality of loans	Provision (%)
Lending activity	Loans in millions of euros
Bank capitalisation	Solvency ratio

Source: Central Bank of Montenegro, Statistical Office of Montenegro (Monstat). Real estate prices represent an average subjective price of a real estate in the capital of Montenegro, obtained on the basis of a survey conducted on a quarterly basis by the Central Bank of Montenegro. This data was used due to the lack of data on the house price index in Montenegro.

The variable proxying for banking competition is our main variable of interest and is commonly employed in the literature (Loukoianova, De Nicoló, and Boyd, 2009; Goetz, 2018; Fungáčová and Weill, 2013; Jiménez, Lopez, and Saurina, 2013). HHI is measured as the sum of squared bank market shares, where shares are ratios of bank loans in total banking sector's loans.

$$HHI = \sum_i^N s^2 \quad (1)$$

where i stands for a bank, N total number of banks in the banking industry and s is the ratio of bank loans into total banking industry loans. The higher the value of this index, the greater (lower) the market concertation (competition).

Hirshman-Herfindahl index taking values up to 100 marks competitive banking industry; up to 1,500 – unconcentrated industry; between 1,500 and 2,500 indicates moderate concentration, while HHI above 2,500 indicates highly concentrated industry.

Alternative measure of bank competition is the Lerner index which approximates a bank's price power (Jiménez, Lopez, and Saurina, 2013, Brei et al., 2020). The Lerner index is the ratio between mark-up and price of loan (usually interest income/revenue divided by total loans) where mark-up is the difference between price and marginal cost. Jiménez, Lopez, and Saurina also find that a third, rare measure, bank competition is the number of banks operating in the market (). Our choice lies with the HHI as it is the most widely used measure of concentration (Bikker and Haaf, 2002) that reflects market changes resulting from the entry or exit of a bank, while also being very simple to calculate. In addition, the data allowing the calculation of the alternative measures are not available.

The summary statistics of these variables averaging over the studied period are presented in Table 2.

Table 2: Summary statistics of all macro- and bank-specific variables (in level form)

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variable					
NPL (%)	572	11.45	6.27	1.90	25.30
Macro variables					
GDP (in million Euros)	572	727537.60	210467.5	389377	1241046
Unemployment (%)	572	14.93	4.00	10.30	27.40
Gross salary	572	612.63	152.78	292.40	768.00
Real estate prices (in Euros)	572	1185.54	260.97	760.00	1738.30
Stock exchange index	572	13180.75	8553.935	1536.5	40434
Government debt (in million euros)	539	1398788	610355	630964	2544130
Annual CPI index	572	102.67	2.64	98.70	111.40
Bank variables					
Herfindahl-Hirschman index (HHI)	572	1582.82	364.41	1036.30	2419.33
Bank size (share of bank's assets in total assets)	522	9.25	7.90	0.21	42.61
Provision (%)	522	6.56	3.53	0	27.5
Loans (in million euros)	572	2013765.00	878664.30	250528.00	3059336.00
Solvency ratio	572	28.3	45.9	1.45	876.4

Source: Authors' own calculations

The variation of NPL levels among banks between 2004 and 2016 is quite high, ranging from 1.9% to 25.3%, with the mean average value of 11.5%. The low value of the HHI shows that the banking sector is characterised by moderate concentration. Bank size varies over the period and across the sample, ranging from 0.21% to 45.6% of the total share of the banking sector assets. As for the macro variables, they showed high variation over the observed period.

Model is presented in the equation (2)

$$npl_{it} = \alpha + \beta' * macro_determinants_{it} + \gamma' bank_determinants_{it} + \varphi * HHI_t * size_{it} + crisis + \mu_i + \varepsilon_{it} \quad (2)$$

The logarithmic transformation is applied to all the variables presented in Table 2. npl_{it} is the dependent variable representing the share of NPLs in total loans of the bank i , at time t ; $macro$ denotes the vector of macroeconomic variables included and $bank$ denotes the vector of bank-specific variables (see Table 1); α is the intercept coefficient; μ are the bank-specific fixed effects while ε_{it} are independently and identically distributed error terms. Variable $crisis$ denotes a time dummy variable taking value one for the after prior the financial crisis (2008) and zero otherwise. To investigate how competition affects NPLs in banks of different size, we interacted the measure of industry concentration with the bank size (as denoted by $HHI_t * size_{it}$ in equation (2)). Specific variables, which require a longer time to affect the level of NPLs, were temporally lagged.

The static panel econometric techniques are applied to equation (2), which is a suitable technique for two reasons. First, cross-sectional econometric techniques (such as ordinary least square) have no appropriate tools to deal with the individual (bank) specific effects μ that can cause endogeneities if they are fixed and correlated with the explanatory variables. This issue could be attenuated with the fixed effect model, which applies within-transformation to equation (2), thereby eliminating the bank-specific fixed effects μ . If bank-specific effects μ are random, and not fixed, they enter the error term. This structure of the error term ($\mu_i + \varepsilon_{it}$) can be addressed appropriately with the random effect model. Whether random or fixed effect model should be applied is determined based on the Hausman test, which tests whether the unobserved bank-specific time-invariant component μ_i is correlated with explanatory variables or not. The model selection is explained in the following section.

4. The results

The Hausman test shows that fixed-effect approach is more appropriate to random effects, i.e. the bank-specific effects seem to be correlated with the independent

variables, causing an endogeneity problem. Hence, the fixed effect estimator with the appropriate adjustment of autocorrelation and heteroscedasticity was applied.² The results of the model are presented in Table 3, along with the Hausman test.

Table 3: Credit risk determinants in Montenegro, Fixed effect model

NPL (%)	Coefficient estimates	
Macro level determinants		
GDP (lagged 2 quarters)	-0.142** (0.069)	
Real estate prices (lagged one quarter)	-1.193*** (0.367)	
Stock exchange index (log of Monex index)	0.080 (0.150)	
Unemployment rate (lagged one quarter)	0.628** (0.333)	
Wages (log of gross wages)	-0.081 (0.392)	
Inflation (log of annual CPI index)	1.209 (1.349)	
Government debt (lagged 2 quarters)	0.002 (0.120)	
Time dummy		
Crisis	0.444 ** (0.209)	
Bank level determinants		
HHI index	2.023*** (0.613)	
HHI index * bank size	-0.072* (0.041)	
Bank size	0.123* (0.316)	
Level of capitalization (lagged one period)	0.201 (0.168)	
Credit activity (lagged 2 quarters)	0.503** (0.017)	
Low credit quality	0.120*** (0.027)	
_cons	-15.344 (7.574)	
N (observations)	498	R-sqwithin: 0.711
sigma_u	.578	R-sqbetween:0.107
sigma_e	.550	R-sq overall:0.591
Rho (fraction of variance due to u i)	.525	
Hausman test (p-value)	0.000	

Note: robust standard errors are presented in parenthesis. All variables are in logarithmic form

² Errors are clustered for each bank to correct for heteroscedasticity and autocorrelations.

The focus of interest of the regression (2) are the interaction terms between concentration index and bank size. This is because the focus of the paper is to investigate the effect of market competition on credit risk through the prism of bank size. As explained, we hypothesize that rising competition may affect banks of different sizes in different ways.

It is important to explain that the measure of competition is the concentration index. This means that the rising levels of the HHI signals falling competition and vice versa, a decreasing HHI interprets as rising competition in the banking industry. At the same time, our measure of credit risk is non-performing loans. The rising levels of non-performing loans indicate an increase in credit risk, while lower levels show a decreasing credit risk.

The positive sign of the HHI shows that a rising concentration increases credit risk. In other words, the higher the level of bank competition, the lower the NPLs in the country's banking sector, which is indicated by the positive effect of concentration in the banking market. Likewise, larger banks have higher NPL levels, as indicated by a negative sign in regression, just like in Greece (Louzis, Vouldis, and Metaxas, 2012), France and Germany (Chaibi and Ftiti, 2015). This supports the notion of “too-big-to-fail” hypothesis. However, considering these two variables are interacted (bank size and industry competition), it is important that we look at the marginal effects of the effect.

Table 4: Average marginal effects of competition

Different bank size percentile distributions	Marginal effects	Std. Error	P>z	[90% Conf. Interval]	
Size (p1)	1.992	0.603	0.001	1.001	2.984
Size (p20)	1.833	0.559	0.001	0.914	2.753
Size (p30)	1.739	0.539	0.001	0.853	2.525
Size (p40)	1.564	0.512	0.002	0.719	2.406
Size (p50)	1.464	0.565	0.004	0.631	2.300
Size (p60)	1.352	0.507	0.025	0.316	2.185
Size (p70)	1.174	0.522	0.025	0.315	2.035
Size (p80)	1.007	0.554	0.069	0.096	1.919
Size (p90)	0.800	0.728	0.272	-0.398	1.998

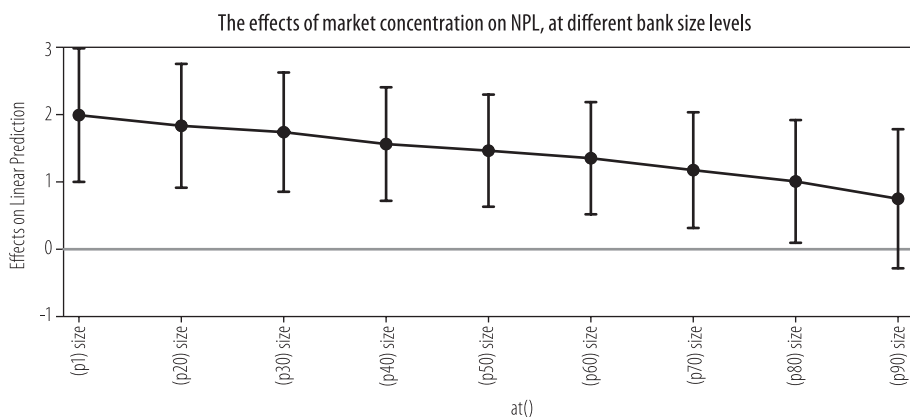
Note: (p1) - 1st percentile of bank size distribution. (p90) – 90th percentile of bank size distribution. Smaller (larger) banks are at lower (higher) distributional level.

Looking at the interaction terms we infer that the effect of competition seems to be different for banks that differ in size, as suggested by the negative and significant sign of the interaction term $HHI_t * size_{it}$. Large-sized banks may not be

absorbing the effects of increasing competition. To check at which bank size level the effect changes, we plot the marginal effects showing the effects of market concentration on credit risk, across banks differing in size. These effects of increased market concentration on banks at different percentiles of their size distributions are presented in Table 4.

As presented above, the effects of increased industry concentration increase credit risk of the majority of banks. However, the intensity of the effect (marginal effects) diminishes as we move from smaller to large-sized banks. Large-sized banks' credit risk is not affected by greater bank industry concentration. The results reveal that the rising bank concentration increases credit risk of predominantly small-sized banks. These effects are presented in Figure 1, where the effects of industry concentration on NPLs (vertical axis) are presented at differing bank size levels (horizontal axis). The gray line represents the zero-significance level, while the values above the gray line refer to positive and significant marginal effects.

Figure 1: Marginal effects of industry concentration on NPL, at different levels of bank size



Note: (p1) - first percentile of bank size distribution. Smaller (larger) banks are at lower (higher) percentile of variables distribution. 100th percentile of distribution is dropped because of few observations.

To sum up, the results imply that increasing competition may lower probabilities of default. Increased competition in the case of Montenegro has led to a decline in interest rates, which is clearly shown by empirical data showing a continuous downtrend in interest rates over a long period of time. Lower interest rates have increased profitability of the real economy and the probability of regular servicing of loans. On the other hand, they have also affected an increase in demand for

loans, which has led to the effect of economy of scale and better capital allocation, thus strengthening stability of the banking system. All this has had a reciprocal effect on economic growth and macroeconomic stability in general, which affected the quality of the portfolio of Montenegrin banks. Hence, the risk-shifting effect, rather than margin effect, may be in place in Montenegro.

This analysis has shown that increasing market competition in the banking sector could reduce credit risk, as predominantly small-sized banks decrease the share of loans released to risky clients. Larger banks, on the other hand, do not have a changing loan portfolio in the wake of higher or lower competition, possibly because they hold significant market shares. This makes sense, as the banking sector in Montenegro contains few very large banks and the rest are significantly smaller banks. In the reverse situation of higher concentration, credit risk of smaller banks is rising, as they try to gain additional market share by targeting lower-quality clients, which increases credit risk. Monitoring effects could rise pressure by greater number of banks operating.

A similar analysis was done by Fungáčová and Weill (2013) although in the context of risk of bank failure rather than credit risk. These authors conclude that there is a marginal effect of bank size on the relationship between market power and occurrence of bank failure. However, their interpretation is only based on pure significance of the interaction terms rather than derivations of marginal effects across banks differing in size.

4.1 Other determinants of credit risk

The results in Table 3 reveal that bank-specific factors are main drivers of credit risk in Montenegro. Only three out of seven macroeconomic variables – namely GDP, real estate prices and unemployment, proved to be statistically significant factors for NPLs in Montenegro. Economic growth, proxied by logarithm of GDP, has a significant impact on average on the NPL levels of eleven banks in the system. Economic growth significantly reduces the NPL level in Montenegro, suggesting that the ability to pay off debt is largely affected by the country's macroeconomic context. This is in line with the previously explained theoretical expectations, but also with the empirical evidence on Greece (Louzis, Vouldis, and Metaxas, 2012), Germany (Chaibi and Ftiti, 2015), the euro area (Anastasiou, Louri, and Tsionas, 2016), as well as Australia and the United States (Ali and Daly, 2010).

The increase in the real estate prices has a negative and significant effect on credit risk. This could be because a portion of collateral pledged in the Montenegrin banks consists of real estates. Real estate prices growth increases financial wealth, facilitating the servicing of debt and access to new loans due to the increased value of collaterals, which is confirmed by the results. However, the effect of the stock exchange index on credit risk is insignificant even though stock exchange index price growth could also increase the possibility to collect receivables by selling the debtors' shares kept as collateral. The degree of statistical significance and coefficient value suggest that the real estate prices had greater effect on the NPL levels compared to the stock exchange index, which can be explained by the fact that, when it comes to collaterals, banks in Montenegro preferred real estates to securities during the studied period.

The level of unemployment on average increases the level of NPLs considering that the number of clients with regular cash flows decreases when unemployment increases. This is in line with the findings on Greece, France, Germany, the euro area, and the USA (Ghosh, 2015; Louzis, Vouldis, and Metaxas, 2012; Chaibi and Ftiti, 2015; Anastasiou, Louri, and Tsionas, 2016). Although the theory predicts that income will have a negative effect on NPLs, this variable does not significantly influence credit risk in Montenegro. The findings are in line with Anastasiou, Louri, and Tsionas who found no effect of income level on credit risk in the euro area.

Inflation is not a significant driver of credit risk, just like in the euro area (Anastasiou, Louri, and Tsionas, 2016). This is an expected result as inflation is rather stable in euroised economy such as Montenegro.

The model indicates that sovereign debt has a positive but not significant effects on credit risk over the analysed period. Even though banks' exposure towards the government has intensified over the studied period, while the public debt growth is recognised as the main source of systemic risk in Montenegro (Central Bank of Montenegro, 2019), fiscal risk over the studied period did not spill over to the banking sector.

NPLs in the times following the global financial crisis are significantly higher, as judging by the positive and significant effect of the time dummy variable (*crisis*). The results only confirm that the period following the financial crisis has been marked by greater credit risk mostly driven by lower liquidity of the real economy.

Banking factors have more statistically significant effects on the NPL levels than macroeconomic factors. Besides the significant effect of market concentration

(competition) and bank size, significant effects stem from level of credit activity and quality of loans. The model results suggest a positive impact of loans on the level of NPLs in Montenegro's banking sector, possibly because banks' loan portfolio increase tends to be accompanied by looser credit standards. Relaxed credit standards increase the risk that the debt will not be recovered. In the period of credit expansion and lower interest rates, companies are encouraged to borrow more and invest in riskier projects. Poor loan portfolio, measured by the share of provisions in total loans, increases the level of NPLs, which supports current empirical findings (Ghosh, 2015; Messai and Jouni, 2013). On the other hand, the level of bank capitalisation does not have a significant effect on NPLs.

The analysis of the selected macroeconomic and bank-specific indicators in Montenegro suggests that the market is rather sensitive to credit risk. Changes in the quality of banks' loan portfolios can be explained by economic flows as well as by the trends in the banking sector itself. Yet, judging by the number of significant variables and the level of their significance, bank-specific variables seem to represent major drivers of NPLs in Montenegro. The unemployment level, real estate and business cycle represent significant macroeconomic factors influencing loan portfolios. In addition to macroeconomic indicators, Montenegro's level of NPLs has proven to be sensitive to all the tested banking factors such as the bank size, lending activity, loan quality, as well as the level of market competition.

4.2. Robustness check

The authors tested whether the inclusion of potentially endogenous variable influenced the results. Government debt could trigger new fiscal measures which would reduce public spending, i.e. wages in the public sector. Hence, the equation (1) was augmented by first excluding the wage variable and then excluding the variable referring to government debt. The results remain robust. We also employ random effects model and find that the results do not change. The results of the robustness check are presented in the Appendix.

5. Conclusion

Stability of the banking system is of great importance for small and open countries such as Montenegro which predominantly rely on the banking sector. This was obvious during the global financial crisis when it quickly spread from the banking system to all segments of the Montenegrin economy.

During the previous period, the concentration of the banking system changed. The paper analyses how competition in the banking system, measured through concentration, affects the stability of the banking system, especially from the aspect of bank size.

There is no consensus on this issue in the literature. The traditional view starts from the assumption that excessive competition leads to riskier behaviour of banks and thus jeopardizes stability of the banking system. On the other hand, the revisionist view considers that increased competition would enhance financial stability. This means that increased competition lowers credit costs, can lead to economy of scale, better allocation of capital and the like, which all leads to an improvement in the banking portfolio. In the meantime, a compromise has emerged indicating the link between competition and bank stability has a U-shaped curve.

The novelty of this paper is that it tests the impact of competition on stability of the banking system in a small and open economy, using the example of Montenegro, as well as the analysis of this impact considering bank size.

The study covered the analysis of credit competition on credit risk levels in Montenegro, showing that higher competitiveness has a positive effect on credit risk. Therefore, this confirms the revisionist view. Increased competition in the case of Montenegro has led to declining interest rates (as confirmed by empirical data), the economy of scale, and better capital allocation, which has strengthened stability of the banking system. This then boosted economic growth, which in turn has affected the quality of the portfolio of Montenegrin banks.

The analysis also found that in the context of lower competitiveness, small-sized banks are more prone to taking lower-quality clients with a view to improving their position in the market, which entails additional credit risk.

The paper also tests other determinants of credit risk in Montenegro. It is shown that of the presented macroeconomic variables, the level of credit risk in Montenegro is strongly influenced by business cycles, real estate prices, and unemployment. The analysis has shown that microeconomic factors, especially the level of loans, bank size, loan quality, and market competition, have even stronger impact.

References

1. Agoraki, M. E. K., Delis, M. D., and Pasiouras, F., (2011). Regulations, competition and bank risk-taking in transition countries. *Journal of Financial Stability*, 7(1), 38-48.
2. Ali, A. and Daly, K., (2010). Macroeconomic determinants of credit risk: Recent evidence from a cross country study. *International Review of Financial Analysis*, 19(3), pp. 165-171.
3. Allen, F. and Gale, D. (2004). Competition and financial stability. *Journal of Money, Credit and Banking*, 36(3), 453-480.
4. Allen, F. and Gale, D. (2000). *Comparing financial systems*. Massachusetts: MIT press.
5. Anastasiou D, Louri, H. and Tsionas, M. (2016). Determinants of Non-Performing Loans: Evidence from Euro-Area Countries. *Finance Research Letters*, 18(C): 116-119.
6. Beck, T., Demirguc-Kunt, A. and Levine, R. (2006). Bank concentration, competition and crises: first results". *Journal of Banking and Finance*, 30(5), 1581- 1603.
7. Bikker, J. A., and Haaf, K. (2002). Measures of competition and concentration in the banking industry: a review of the literature. *Economic & Financial Modelling*, 9(2), 53-98.
8. Bikker, J. A., Spierdijk, L., and Finnie, P. (2006). The impact of bank size on market power Netherlands Central Bank, Working Paper No 20.
9. Boyd, J.H. and De Nicoló, G. (2005). The theory of bank risk taking and competition revisited. *The journal of finance*, 60(3), 1329-1343.
10. Brei, M. et al. (2020). *Bad bank resolutions and bank lending*. BIS Working Paper, No. 837.
11. Central Bank of Montenegro (2019). Financial Stability Report 2019, Retrieved from <https://cbcg.me/en/publications/regular-publications/financial-stability-report>.
12. Chaibi, H. and Ftiti, Z. (2015). Credit risk determinants. *Research in international business and finance*, 33, 1-16.
13. Chang L. (2011). Interbank Competition and Bank Credit Risk: an Investigation on the Euro Area. Tilburg University, retrieved from <http://arno.uvt.nl/show.cgi?fid=123077>.
14. Coccorese, P. and Santucci, L. (2019). Banking Competition and Bank Size: Some Evidence from Italy". *Journal of Economics and Finance*, volume 44(2), 278-299.
15. Fabris, N. (2018). Challenges for modern monetary policy. *Journal of Central Banking Theory and Practice*, 7(2), 5-24.

16. Fungáčová, Z. and Weill, L. (2013). Does competition influence bank failures?. *Economics of Transition*, 21(2), 301-322.
17. Ghosh, A., (2015). Banking-Industry Specific and Regional Economic Determinants of Non-performing Loans: Evidence from US States. *Journal of Financial Stability*, 20(C), 93-104.
18. Goetz, M. R. (2018). Competition and bank stability. *Journal of Financial Intermediation*, 35(PA), 57-69.
19. Gomez, F. and Ponce, J.(2014). Bank Competition and Loan Quality. *Journal of Financial Services Research*, 46(3), 215-233.
20. González, L.O., Razia, A., Búa, M.V., Sestayo, R.L. (2017). Competition, concentration and risk taking in banking sector of MENA countries. *Research in International Business and Finance*, 42(C), 591–604.
21. Grubišić, Z., Kamenković, S. and Kaličanin, T. (2021). Comparative Analysis of the Banking Sector Competitiveness in Serbia and Montenegro. *Journal of Central Banking Theory and Practice*, 10(1), 75-91.
22. Hellmann, T.F., Murdock, K.C., Stiglitz, J.E.(2000). Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough?. *The American Economic Review*, 90(1), 147–165.
23. Jiménez, G., Lopez, J. A., & Saurina, J. (2013). How does competition affect bank risk-taking?. *Journal of Financial stability*, 9(2), 185-195.
24. Kasman A. and Kasman, S. (2014) "Bank size, competition and risk in the Turkish banking industry", retrieved from <https://www.iises.net/download/Soubory/soubory-puvodni/Kasman.pdf>.
25. Keeley, M. C. (1990). Deposit insurance, risk, and market power in banking. *The American economic review*, 80(5), 1183-1200.
26. Levy-Yeyati, E. and Micco, A. (2007). Concentration and foreign penetration in Latin American banking sectors: Impact on competition and risk. *Journal of Banking and Finance*, 31(6), 1633-1647.
27. Loukoianova, E., De Nicoló, M. G., and Boyd, J. H. (2009). *Banking crises and crisis dating: Theory and evidence*. International Monetary Fund, Working paper 09/141.
28. Louzis, D.P., Vouldis, A.T. and Metaxas, V.L.(2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking and Finance*, 36(4), 1012-1027.
29. Luburić, R. (2019). . *Journal of Central Banking Theory and Practice* 8 (2), 33-49.
30. Marques-Ibanez, D., Altunbas, Y. and Leuvensteijn, M.V. (2014). Competition and bank risk: the effect of securitization and bank capital. European Central Bank, Working Paper Series No. 1678.

31. Martinez-Miera, D. and Repullo, R. (2010). Does competition reduce the risk of bank failure? *The Review of Financial Studies*, 23(10), 3638-3664.
32. Matutes, C. and Vives, X.(2000). Imperfect competition, risk taking, and regulation in banking". *European Economic Review*, 44(1), 1-34.
33. Messai, A. S. and Jouini, F. (2013). Micro and Macro Determinants of Non-performing Loans. *International Journal of Economics and Financial Issues*, 3(4), 852-860.
34. OECD (2011) "Bank Competition and Financial Stability", retrieved from <https://www.oecd.org/regreform/sectors/bankcompetitionandfinancialstability.htm>.
35. Repullo, R.(2004). Capital requirements, market power, and risk-taking in banking. *Journal of Financial Intermediation*, 13(2), 156-182.
36. Ruckes, M., 2004. Bank competition and credit standards. *The review of financial studies*, 17(4), 1073-1102.
37. Salas, V. and Saurina, J. (2003). Deregulation, market power and risk behaviour in Spanish banks. *European Economic Review*, 47(6), 1061-1075.
38. Schaeck, K., Cihak, M. and Wolfe, S. (2009). Are competitive banking systems more stable?. *Journal of Money, Credit and Banking*, 41(4), 711-734
39. Shih, V. (2007). Comparing the performance of Chinese banks: a principle component approach. *China Economic Review*, No 18, 15-34.
40. Tabak, B.M., Fazio, D.M., and Cajueiro, D.O. (2012). The relationship between banking market competition and risk taking: Do size and capitalization matter? *Journal of Banking & Finance* 36(12), 3366–3381.

Appendix

Table 1A: Robustness check

	Fixed effect without debt variable	Random effects model
L2.log (GDP)	-0.215 (0.0966)	-0.102 (0.0950)
L.log(real estate)	-0.994 (0.450)	-0.885* (0.397)
Log (Monex)	-0.0979 (0.157)	-0.113 (0.145)
Incpi	0.763 (1.219)	0.850 (1.193)
L.plate_new	0.198 (0.390)	0.214 (0.404)
Innez	0.671 (0.411)	0.314 (0.411)
crisis	0.356 (0.222)	0.413 (0.216)
size	0.449 (0.304)	0.256 (0.234)
L2.Inks	0.261 (0.172)	0.243 (0.158)
rezer	0.123*** (0.0261)	0.119*** (0.0247)
L2.Inkrediti	0.534* (0.193)	0.315 (0.173)
L.InHH	1.868* (0.690)	1.106 (0.608)
cL.InHH#c.~e	-0.0637 (0.0389)	-0.0380 (0.0302)
L2.dug_new		0.0234 (0.109)
_cons	-12.70 (5.954)	-6.163 (6.493)
N	498	498

Standard errors in parentheses * p<0.05, ** p<0.01, *** p<0.001