Nexus between assets structure and profitability of Croatian banking system

Iris Lončar* and Tonći Svilokos

Department of Economics and Business Economics,
University of Dubrovnik,
Lapadska obala 7, 20000, Dubrovnik, Croatia
Email: iris.loncar@unidu.hr
Email: tonci.svilokos@unidu.hr
*Corresponding author

Abstract: Traditionally, in Croatia, as well as in other developing countries, most entities (households and enterprises) with cash surpluses entrust their investment portfolios to banks, instead of investing in securities. Therefore, the question of the profitability of banks' business becomes a key issue, as they do not only meet the interests of their shareholders and management, but also have positive effects on the whole economy. The aim of this paper is to analyse the influence of the structure and dynamic of total assets on financial performances on the example of the Republic of Croatia. In order to achieve the main purpose, the cross-section and fixed-effects panel models will be estimated. They will include standard profitability and various assets indices. The results of the analysis show that the level of total assets and especially the level of fixed assets, as well as the share of the other deposits, significantly influence the level of profit after taxation, as well as on return on assets (ROA) and return on equity (ROE).

Keywords: Croatian banking industry; assets' structure; profitability; ROA; return on assets; ROE; return on equity; cross-section model; fixed-effects panel model.

Biographical notes: Iris Lončar is an Assistant Professor in Accounting and Business finance at the University of Dubrovnik, Croatia. Her main research interests are accounting, management accounting and especially strategic management accounting.

Tonći Svilokos is an Associate Professor in Finance and Banking at the University of Dubrovnik, Croatia. His research interests are monetary economy, international finance and quantitative analysis methods.

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1   Introduction

The financial sector makes an extremely important contribution to the economy and many researchers attempted to measure all the potential gains that could be achieved from improving the efficiency of the financial sector. These authors (Bakar and Sulong, 2018; Diallo, 2018; Belke et al., 2016; Saqib, 2013; Masoud and Hardaker, 2012) support the supply leading theories that consider the development of the financial sector as the precondition for economic growth. Saqib (2013, p.13) offered a broad analysis of the effect of development and efficiency of financial sector on economic growth for a large cross section of countries (50 developing countries) and proved strong and robust support to the view that financial sector development is crucial for economic growth. On the other hand, there is another group of authors (Calderón and Liu, 2003; Patrick, 1966) who support the demand following theories. According to those theories, financial development is caused by economic growth. Apart from this, often mentioned issues in the economic literature include the following: does financial development induce or does it follow economic growth, and a strong consensus about the first assumption has appeared in the last decade (Bonin and Wachtel, 2003). Therefore, this paper is also based on that assumption. King and Levine (1993) have proven that strong domestic financial intermediation promotes the economic growth of the country. Besides the financial sector's role in providing payment services, they have indicated that it helps mobilise savings and it also helps direct funds. It increases the overall productivity, manages risks, ensures reduction of costs connected with performing activities and provides all the necessary financial services to individuals, enterprises and the government. However, every financial system requires trust and confidence from all the participants and subjects in order for it to sustain its operations. Otherwise, no one who possesses money surpluses would entrust financial assets to financial intermediates, and subsequently the system would not be able to distribute the collected funds towards the investment projects, which would further lead to the collapse of the entire economy.

Therefore, it is indisputable that there is a strong connection between financial systems and countries' economic development. Numerous researchers (Giovannini et al., 2013; Barajas et al., 2012; Rioja and Valev, 2007) have proven that a different intensity of impact has been noticed considering the economy-specific factors, and accordingly, most of them differentiate the impact in emerging/developing countries from the impact that occurs in advanced/developed countries. Giovannini et al. (2013, p.116) pointed out that

> "during the initial stage of economic development, the financial sector would stimulate economic growth, mainly by favouring capital formation and higher savings (supply-leading hypothesis). As economic development proceeds, however, the financial sector would have to feed the innovation of the real sector, through the development of new financial services (demand-leading hypothesis)".

Since the research was carried out on the example of the Croatian economy, the specifics of developing countries were primarily taken into account. Their main feature is undeveloped stock and bond markets which cannot be expected to represent a significant source of funds for corporations' and economies' development. Therefore, in these countries, as well as in Croatia, banks have entirely taken over the process of intermediation and they play a growth-supporting role. The described environment is known as a bank-based financial system. Croatia, as a typical bank-centric country, has a

well-developed banking system with 21 banks operating on the market as of the end of 2018 (CNB – Banks bulletin, 2019).

The primary purpose of this paper is to initiate a discussion regarding the influencing factors that affect the profitability of the Croatian banking sector – one of the Croatian economy's strongest sectors. As relatively little is known about how different assets' structures affect profitability, we decided to limit our research solely on that factor. Besides the main aim: to analyse the influence of the structure and dynamic of total assets on financial performances on the example of the Republic of Croatia, related objectives of our paper are: to present the structure of Croatian financial and banking sector, to emphasise the problem of the concentration of Croatian banking industry, to explain the indicators of profitability and to discuss specifics of the structure of banks' assets in Croatia. However, the main goal that has driven this research was to contribute and to deepen research related to identifying the relevant factors for the profitability of the banking sector.

Our paper is organised so as to achieve set goal and objectives. Therefore, a brief introduction is given at the very beginning. The introductory paragraph is followed with the theoretical definitions and presentation of the relevant literature and results of existing empirical researches. The next section provides an insight into the main structural features of the Croatian financial and banking sector. After that, data sources and research design are presented. Finally, by using the data, we examine the relation between assets structure and profitability of the Croatian banking system. That results in models and a discussion which makes a unique contribution to the topic of this paper.

2 Literature review

As it is mentioned in the introduction, the banks are very important for the financial system and for the entire economy as well. That is why numerous researchers have put in a lot of effort into determining the most crucial factors that influence the banks' performance and profitability. That is not an easy task because there is a wide range of controllable and uncontrollable factors that could be important for achieving acceptable financial results in the banking sector and, because of that, they have to be taken into consideration. In this part of the paper, the most important papers that investigate this topic worldwide are analysed, and it is followed by a presentation of the main results that could be found in the papers that investigated this topic in the case of the Croatian banking system.

The bank performances across eighteen European countries between 1986 and 1989 were examined by Molyneux and Thornton (1992). They have estimated a simple linear equation using a pooled sample and they have found the evidence that supports the expense preference expenditure theories, but have not found the evidence for the Edvards-Heggestad-Mingo risk avoidance hypothesis.

Financial development and structure could be important for bank performance as well. The starting point of Demirgüç-Kunt and Huizinga (2000) research is that countries differ whether they rely their finance on banks or on market. It is well known fact that most countries in Europe and in Japan are bank-based where banks have the main role in process of allocating the funds. On the other hand, the different solution can be found in the USA where banks are important but not so much as financial markets in a process of transferring funds from net savers to net borrowers. In that context, authors of the paper

argue that after controlling of the level of financial development, the adopted solution (market vs. banks) is not important for banks profits and performance. They found out that the greater bank development lowers bank profits because of tougher competition.

The profitability of banks in Europe has been studied by Goddard et al. (2004). They reported cross-sectional and dynamic panel estimations of a model that captures the impact of selected determinants of profitability, for the period 1992–1998. The main findings were that the size of the earned profit has significant persistence over time. The evidence of significant size-profitability relationship has been found in some cases but their opinion is that the results are not conclusive. Importance of off-balance sheet business has been proved to be positive for UK, but neutral or negative for other countries, while the relationship between capital-assets ratio and profitability has been found to be positive for all.

In their paper, Zhang and Dong (2011) tries to detect the determinants of banks' profit measured by ROE and ROA for the USA banking system. In order to separate the effect of bank size they classified banks into three categories. After the comparison of their results with other relevant literature they reported that these variables appeared important for bank profitability measured by ROA: capital ratio, loans and deposits with positive influence, regardless of the bank size.

Under the condition of crisis, bank stability and performance become even more important. Rossi et al. (2018) concentrated on question whether the determinants of bank profitability have changed under the effect of regulatory and competitive dynamics. Their results confirm that rigorous behaviours in granting credit to borrowers improve bank profitability. To sustain the adequate quality of banking sector it is crucial to make right decisions about the asset structure. Saksonova (2013) offers two management techniques that can assure achieving mentioned goals. Those are:

- diversifying profitable operations by financial innovation

- lowering relative funding costs (e.g., by increasing the proportion of equity, lowering dividends if possible, etc.).

An unexpected conclusion came from the research which was conducted by Petria et al. (2015) who have tried to assess the main determinants of banks' profitability in EU27 over the period 2004–2011. They have settled as a proxy for banks profitability the return on average assets (ROAA) and the return on average equity (ROAE) and have concluded that the size of the banks does not have an influence on ROAE and has a small and weak effect in the case of ROAA. Simultaneously, they have concluded that credit and liquidity risk, management efficiency, the diversification of business, the competition and economic growth have an influence on banks' profitability, both on ROAA and ROAE.

The profitability of banks in Spain was analysed by Trujillo-Ponce (2013). Based on system-GMM estimation techniques he found that the high bank profitability during the 1999–2009 period is associated with a high proportion of customer deposits, a large percentage of loans in total assets, low credit risk, and good efficiency. The bank return measured by ROA is also increased with higher capital ratios. His research also reveals the differences in the performance of commercial and savings banks.

Effect of structural liquidity on the profitability of Polish commercial banks was investigated by Wójcik-mazur (2017). She concluded that both liquid assets and loans have a positive effect on ROE and that only a higher ratio of very highly liquid assets identified with cash in the central banks is a factor that limits ROE. According to those

results, having on mind the specific conditions in Polish banking system, the author concludes that increasing the level of liquid assets should not cause a substantial decline in the rate of return.

In Croatia, there are only a few researches that deal with this or similar topics. In this part we underline the results of Pejić Bach et al. (2009), Jermić and Vujčić (2002), Pervan et al. (2015) and Jurman (2009).

According to the results of Pejić Bach et al. (2009), it seems that Croatian banks' profitability mostly depends on particular characteristics of every particular bank, not so much on other environmental conditions. Their findings are grounded on pooled time average model. They also have found that capital to assets ratio has a negative influence on ROE, the ratio of net new loans and short-term financing has a negative influence on ROA and ratio of non-performing assets and total assets, as well as the market share has positive effects on ROA.

Jermić and Vujčić (2002) have analysed bank efficiency in Croatia between 1995 and 2000 by using the Data Envelopment Analysis (DEA). They concluded that foreign-owned banks are, on average, the most efficient, that new banks are more efficient than old, that smaller banks are globally efficient, and that large banks are efficient when they allow for variable-returns-to-scale.

The newest relevant paper is one of Pervan et al. (2015) where they have defined and estimated a model that would enable the identification of the profitability determinants of Croatian banks. The analysis was conducted for the period 2002–2010 and the ROA indicator was used as a dependent variable in the model of banks' profitability. The model incorporated three groups of profitability determinants: bank-specific, industry-specific and macroeconomic. Authors have proved that statistically significant variables with a positive influence on Croatian bank profitability are: profitability from the previous year, bank size, solvency risk, intermediation, industry concentration, market growth and GDP growth.

Jurman (2009) argues that a strong linear positive relationship between bank credit potential and GDP growth could be found in Croatia for the period from 1994 to 2007. According to his research results, the author suggested that banks should change their crediting policy. Credits to the population, as the largest share in crediting, should be significantly slowed down, while financial monitoring of current operations and development of economic subjects should be significantly increased.

3   Structure of Croatian financial and banking sector

The phenomenon of decentralisation of intermediation activities, which is prevalent in highly developed countries, is determined by highly specialised companies that emerge as entities and that have a narrower scope than banks, but at the same time, they perform an extremely important function. That new model opens up significant opportunities for the development of economies of specialisation and it assigns a diminished role to the traditional banks (Cetorelli et al., 2012). Unlike the description of the so-called 'shadow banking' system, the Croatian economy is still familiar with the bank-centred model and traditional, general-purpose banks as central mediators between funding supply and demand. Importance of banks in the Croatian economy is recognised by numerous authors. Jakovčević (2001), for example, states that the banking system's development is directly correlated with the development of the entire economy, because the banks are the

main financial service providers of the real sector and they financially support production, consumption, and investments, which consequently leads to the improvement of the standard of living of the entire nation. Demirgüç-Kunt et al. (2011) examined the association between financial structure and economic development and they emphasised some key features. First, they proved that bank development is positively correlated with economic development and secondly, they conclude that financial development involves bigger banks. Nonetheless, they also stressed that financial systems generally become more market-based during the process of economic development – in other words, as economies grow, securities markets tend to develop more rapidly than banks.

Figure 1   Structure of the Croatian financial sector based on total assets
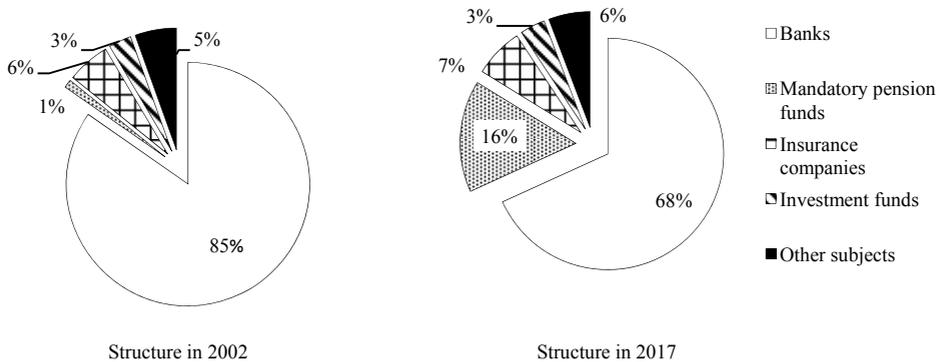
Structure in 2002   Structure in 2017
Source: CNB (2005) and Croatian Banking Association [CBA] (2018)

In order to achieve more closely insight into the structure of the Croatian banking sector, we have decided to analyse changes of main sector's indicators that have taken place over the period 2002–2017. The data were calculated on the basis of statistical data from the official – Croatian National Bank (CNB) publications and all indicators report annual values.

Figure 1 indicates that banks were playing the key role during the whole period, although their number tended to decrease continuously. It should be noted, accordingly to the CNB data, number of banks has been halved (the total number of banks operating in the country at the end of 2002 was 46, and it has been reduced to just 24 banks by the end of 2017), but they still control the overwhelming majority of the financial sectors' total assets. It is also interesting to note that, despite the reduction in the number of banks, their assets increased till 2011 and entered into a period of stagnation from 2011 to 2017 (Figure 2).

The figure shows not only the changes in the value of assets of the entire banking sector but also the changes in assets' value of the five leading banks in Croatia.

According to the relative share of the individual banks' assets in total assets value of all banks, CNB classifies banks on large, medium-sized and small banks. The group of large banks consists of all the banks with total assets value over 5% of the total assets of all banks, medium-sized banks include banks with assets over 1% and less than 5% of the overall banks' assets, and small banks are the banks with assets below 1% of the total assets.

Figure 2 Changes in the value of assets held by Croatian banks

□ TOP 5 BANKS' ASSETS   ⊠ TOTAL ASSETS
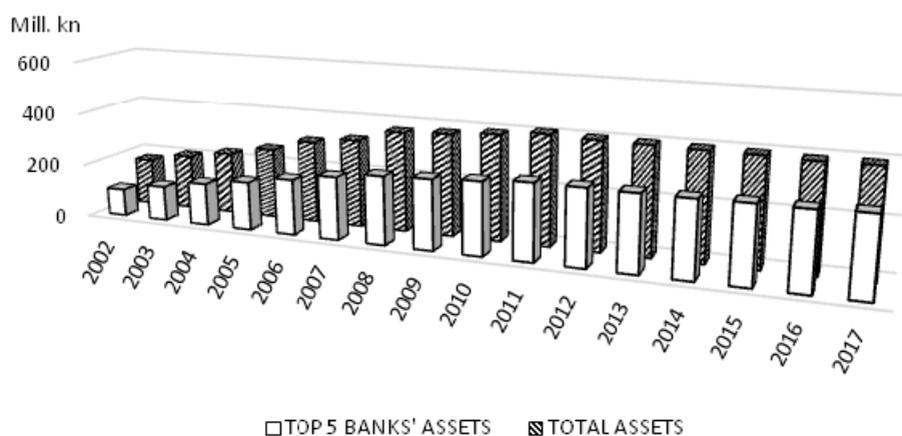
Source: CNB (2003–2018)

Classification of Croatian banks according to their size of assets at the end of 2002 and at the end of 2017 is shown in Table 1. The data for the whole analysed period illustrates the significant decrease in the number of banks since the beginning of the Croatian monetary independence, i.e., during the last two decades. Theoretically, with regard to decreasing trend, an increase in concentration can be expected and that is exactly what has been confirmed in Croatian practice. According to the published data for 2017, top six Croatian banks hold roughly 80% of market share by assets, and foreign ownership in the banks is prevailing, with 90% of assets under their control (European Banking Federation [EBF], 2018). Consequently, it can be concluded that small and domestic banks are relatively irrelevant from the aspect of their share in assets of all banks.

Table 1 Structure of Croatian banks according to their size of assets and share in all banks' assets

	2000		2017	
		The share of banks		*The share of banks*
Type of banks	*Number of banks*	*(%)*	*Number of banks*	*(%)*
Large banks	9	19.6	8	33.3
Medium-sized banks	12	26.1	1	4.2
Small banks	25	54.3	15	62.5
Total	46	100.0	24*	100.0

*In the total number of banks (25), 24 banks were performing their activities at 31st of December 2017 and 1 bank was bankrupt.

Source: CNB (2003, 2018)

Obviously, it can be concluded that the downward trend in the number of banks has been followed with an upward trend in the value of their total assets.

In order to examine the consolidation process within Croatian banking system the Herfindahl-Hirschman index (HHI) is calculated. Namely, that is commonly used

representative indicator of the concentration of a market with a wide practical application. HHI is calculated as the square sum of market shares of all participants on the market:

$$HHI = \sum_{i=1}^{n} s_i{}^2 ,$$
(1)

where: *n* –the number of banks; *s* (*i = 1 to n*) – market shares.

   If market shares are expressed in terms of percentages and if all of the percentages are taken for calculation, HHI can range between 0 and 10.000. In a perfectly competitive market, HHI approaches to zero, while in the case of a monopoly, HHI approaches to 10.000. An HHI ranging between 1.000 and 2.000 represents moderate concentration. A market with an HHI under 1.000 is considered competitive, i.e., non-concentrated. It is important to stress, if a company operates in a fairly competitive industry, it will be more difficult for it to achieve above-average profit margins.

   Value of HHI for the Croatian banking sector in the observed period (Figure 3) is between 1.237 and 1.482. It can be concluded that the Croatian banking sector is characterised by an oligopolistic structure: it is polarised into a small number of large banks and a large number of small banks.

Figure 3   HHI of the croatian banking industry
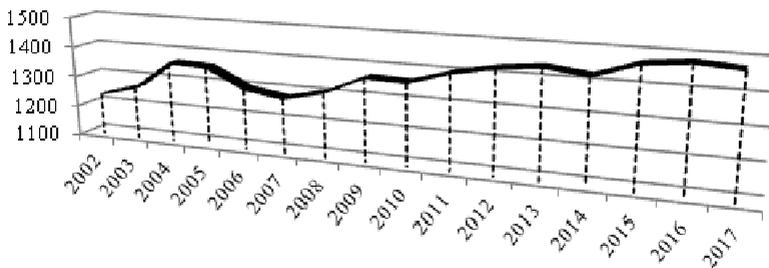
   Source: Authors' calculation according to CNB data

Croatian experience showed that many mergers and acquisitions of banks took place during the observed period (2002–2017) and the trend of an increased concentration in banking in Croatia has become prevalent. Described trends have been accompanied by the high level of internationalisation of the banking system, which has been reflected in foreign ownership of the biggest banks. However, we have decided to limit the research of this paper only on the influence of the size and structure of banks' assets on the banking sector profitability. Therefore, the following Table 2 shows the structure of banks' assets in nominal terms and a share of every single position in total assets.

   The greatest change in bank assets, in nominal terms, was the growth in money assets, deposits with the central bank and loans to financial institutions and other clients as well. An overview of the assets structure reflects that more than 50% of assets is engaged in loaning. The share of other items at the end of 2017 had relatively constant proportion compared with the end of 2002.

Table 2   Structural changes in banks' assets

	2002		2017	
Banks' assets	*in mill. HRK*	*in %*	*in mill. HRK*	*in %*
Money assets	2.236,90	1.26	8.440,20	2.16
Deposits with CNB	19.151,00	10.81	62.295,30	15.92
Deposits with financial institutions	20.146,20	11.37	19.250,20	4.92
Treasury bills and CNB bills	10.116,70	5.71	8.607,10	2.20
Portfolio of securities	21.093,60	11.91	45.448,40	11.61
Loans	92.292,90	52.09	226.674,10	57.92
Net tangible and non-tangible assets	3.755,40	2.12	4.214,90	1.08
Other assets (reserves, interests, fees…)	8.385,30	4.73	16.406,20	4.19
Total assets	177.178,00	100.00	391.336,40	100.00

Source: CNB (2003, 2018)

An interesting fact is that banks operated with approximately 40% lower profits in 2017 in comparison to previous year. But, despite the unfavourable profitability trends of Croatian banks in last years, the banking system is still one of the most important sectors in Croatian economy and banks are definitely leaders in creating new value. They produced over one billion Euros of newly created value in 2017 (in this analysis new value is the value that is calculated as a simple sum of gross wages and gross profit). According to the research carried out by Lider and Bisnode (2018) there are 14 banks among the first 500 companies and as many as 3 banks among the top 10. In terms of value added across sectors, the largest share is held by banks – 10% and they also remain on top in terms of the profits (their share within the top 500 is 13.6%).

Because of banks' roll in financial sector, their contribution to stability, growth and performances of the whole economy, as well as because of all other possible benefits (for example: financial inclusion of the country, mitigating of risks, encouraging competition…), the problem of reconditioning the influencing factors that affect profitability becomes very important. In this paper, we have chosen to investigate how the structure of assets could reflect on banks' performance. Indirectly, we expect to find out the possible consequences of the concentration of the banking sector to the overall economy.

4   Methodology, theoretical framework and data

The starting assumption of the following empirical research is that the structure of the asset and its' liquidity affect the financial performance of the bank. The earning capacities of the bank and its' liquidity position are determined by the quality of assets that bank possesses. In order to check the stated assumptions, we decided to set up two types of models. For capturing the latest short-run effects we use four cross-section models that include data for all of the 24 banks that comprise Croatian banking system at

the end of 2017. The long-run dynamic is explored by panel models based on the balance sheet of the five largest banks that have been operating during the period from 2002 till 2017. These banks make around 73% of whole banking system assets. The data for the models are obtained from CNB bank bulletins for various years. The key components are systemised, mostly from their balance sheets, in order to examine assets' structure and to calculate indicators of profitability and liquidity.

According to available literature (Demirgüç-Kunt and Huizinga, 2000; Pavković, 2004; Albertazzi and Gambacorta, 2009; Gul et al., 2011), the commonly used indicators of profitability are: return on assets (ROA) and return on equity (ROE). ROA is ratio which is calculated by dividing the net income of the bank in a given time period with a total value of its assets, and ROE is the ratio of net income and total shareholders' equity. The differences between these indicators appear because the different financial leverage is used. In the situation where a bank uses a lot of equity capital in comparison to the total liability, it will be faced with a relatively large ROA and relatively small ROE at the same time, and the same can be validated for the reverse case. Usually, in a bank balance sheet, we can notice that the leverage is heavily used.

According to the previously explained banks' classification based on their size, it can be concluded that there are eight large banks in Croatia, and only two of them account for 45.5% of the market, while all large banks make 90.5% of the banking market. Weighted average ROA for large banks is 0.9975% and for small banks, it is –0.175%. Weighted average ROA for the whole banking system is 0.8555%. Only one large bank reported a loss in 2017, while seven out of 15 small banks have a negative result. The weighted average ROE for the large banks is 15.52%.

In general, the Croatian banking system is highly capitalised. In average, large banks have 8.39% of the equity in regards to their total liabilities. For small banks, that share is even higher and amounts to 11.08%.

In following models, ROA and ROE were used as the dependent variables and, by using the set of independent variables that have been calculated from the data presented in banks' balance sheets, we try to explain their values. In line with the previous researches we use the following variables:

- M: market share of the bank measured by the share of banks' assets in total banking assets
- L_A: the ratio of the loan and bank assets
- E_P: the ratio of equity and total liabilities
- DEP_A: the ratio of other deposits and total assets
- C_A: the ratio of cash and total assets
- T_A: the ratio of tangible (non-performing) assets and total assets
- GUAR_A: the ratio of given guarantees and total assets.

Unlike Cernohorska et al. (2019), who have chosen to analyse the impact of macro variables on bank profitability: inflation rate, central bank interest rate, taxation rate and GDP per capital, the research in this paper is focused on the bank-specific variables.

Descriptive statistics for the chosen variables are presented in Table 3.

Table 3   Descriptive statistics for chosen variables

	Mean	*Maximum*	*Minimum*	*Std. dev.*
M	0.041667	0.261127	0.001199	0.067759
L_A	0.511703	0.711915	0.152383	0.121944
E_P	0.119289	0.535257	0.028914	0.104364
DEP_A	0.05299	0.137676	0.01078	0.039279
C_A	0.019261	0.06537	0.005517	0.011718
T_A	0.01812	0.051463	0.00343	0.010996
GUAR_A	0.029656	0.077876	0.000486	0.020111
ROA	−0.001065	0.019022	−0.022781	0.011311
ROE	0.00321	0.415131	−0.62002	0.17898

Source: Author's calculation

Our cross-section multiple regression models are:

$$Y_i = \alpha_1 + \beta_1 M_i + \beta_2 L\_A_i + \beta_3 E\_P_i + \beta_4 DEP\_A_i + u_i, \tag{2}$$

$$Y_i = \alpha_1 + \beta_1 M_i + \beta_2 L\_A_i + \beta_3 E\_P_i + \beta_4 DEP\_A_i + \beta_5 C\_A_i + u_i, \tag{3}$$

$$Y_i = \alpha_1 + \beta_1 M_i + \beta_2 L\_A_i + \beta_3 E\_P_i + \beta_4 DEP\_A_i + \beta_5 T\_A_i + u_i, \tag{4}$$

$$Y_i = \alpha_1 + \beta_1 L\_A_i + \beta_2 E\_P_i + \beta_3 EDP\_A_i + \beta_4 GUAR\_A_i + u_i, \tag{5}$$

where Y_i representing dependent variables ROA and ROE. For each model, we calculate two equations presented in the following section.

For panel models, we calculate the difference of the variables in order to see whether the change of assets components will be reflected on ROA and ROE. The two panel models that distinguish various kinds of assets are:

$$ROA_{i,t} = a_1 + \beta_1 DEBT\_INS\_A_{i,t} + \beta_2 CBDEP\_A_{i,t} + \beta_3 DEP\_A_{i,t} + \beta_4 FA\_A_{i,t}$$
$$+ \beta_5 FIX\_A_{i,t} + \beta_6 C\_A_{i,t} + \beta_7 L\_A_{i,t} + u_i \tag{6}$$

$$ROE_{i,t} = \alpha_1 + \beta_1 DEBT\_INS\_A_{i,t} + \beta_2 CBDEP\_A_{i,t} + \beta_3 DEP\_A_{i,t} + \beta_4 FA\_A_{i,t}$$
$$+ \beta_5 FIX\_A_{i,t} + \beta_6 C\_A_{i,t} + \beta_7 L\_A_{i,t} + u_i \tag{7}$$

In equations (6) and (7) variables are:

DEBT_INS_A: the change of debt instruments share in total assets

CBDEP: the change of deposits in CNB share in total assets

DEP_A: the change of other deposits share in total assets,

F_A: the change of financial assets share in total assets,

FIX_A: the change of fixed assets share in total assets

C_A: the change of cash share in total assets

L_A: the change of loans share in total assets

i: denotes a cross-section dimension and that is a specific bank

t: denotes the time-series dimension and in our case, that is a year.

Hsiao (2003) and Klevmarken (1989) list several benefits of using panel models. Here we mention some of them. Namely, within panel models the individual heterogeneity can be controlled. They usually have more variability, less collinearity among the variables, more degrees of freedom and more efficiency of the data. In addition, in panel models, the dynamics of adjustment can be better studied, and the effects that are simply not detectable in pure cross-section or pure time-series data can be better detected and measured.

    The error component in panel models consists of a time-invariant unobservable individual-specific effect that is not included in the regression (μ_i), and the remainder of the disturbance that varies within the cross-section and time-series dimension ($\varepsilon_{i,t}$):

$$u_{i,t} = \mu_i + \varepsilon_{i,t} \tag{8}$$

In our dataset, we use balance sheet of five relevant banks for a time span of 15 years. Because the cross-dimension is much smaller than the time dimension the random effect model is not appropriate. That is why we decided to employ fixed effect model (FE) which is usually recommended over the pure pooled time series analysis. The FE model relaxes the assumption that the regression function is constant over time and space and it allows each cross-sectional unit to have its own constant term while the slope estimates are constrained across units. The unit-specific intercept term absorbs all heterogeneity in Y and X (Baum, 2006).

5   Model results and discussion

Our descriptive analysis shows that in 2017 the most variations can be found in ROE, ROA, and M variables. If we do not take into account the value of assets, the average ROA becomes even negative. The highest ROE is 41.5%, and highest ROA is 1.9%. The minimum market share that controls the smallest bank is 0.1199%, and the biggest bank controls 26.11% of the market, which we already discussed previously. In average, banks have 51.17% of loans, 5.3% of other deposits, 1.9% of cash, and 1.8% of tangible assets in total assets. A bank that uses the biggest financial leverage has 2.8% of equity in total liability. There is one bank that has even 53.5% of equity in total liability which is very uncommon in the banking business.

    Our model results indicate that variables L_A and DEP_A are significant in all models. Quantity of bank loans in total assets positively influence on bank performance, while the ratio of other deposits and bank assets has a negative influence. Variables C_A, T_A, and GUAR_A were not significant, and according to that, we can conclude that the quantity of cash, tangible assets and given guarantees in total assets are not important for achieving good banking performance.

    In addition, a variable that represents bank market position was significant in model one, two and partially in model three (in the case when we use ROE as the dependent variable). A positive value of the coefficient of variable M is in line to the results of previous research (Simatele et al., 2018; Mirzaei et al., 2013; Pejić Bach et al., 2009).

Table 4 Cross-section models of multiple linear regression

	Model 1		Model 2	
	Dependent variables		*Dependent variables*	
	ROA	*ROE*	*ROA*	*ROE*
c	−0.00824	−0.1984	−0.01046	−0.24181*
	(−1.01422)	(−1.35995)	(−1.30717)	(−1.72989)
M	0.05286**	0.77952*	0.05158**	0.79488*
	(2.08310)	(1.71163)	(2.09930)	(1.91298)
L_A	0.03074**	0.55259**	0.02773*	0.47419*
	(2.08095)	(2.08393)	(1.92058)	(1.95432)
E_P	−0.04781***	−0.24005	−0.0413**	
	(−3.08254)	(−0.75458)	(−2.64228)	
DEP_A	−0.09535**	−1.67175**	−0.1141**	−2.0267**
	(−2.31322)	(−2.25971)	(−2.73188)	(−2.7754)
C_A			0.209151	3.97991
			(1.51223)	(1.70884)
T_A				
GUAR_A				
ADJ R^2	0.580816	0.460640	0.607406	0.60222
AIC	−6.812457	−1.037405	−6.848724	−1.150844
DW	1.984980	2.06826	1.424248	1.94265
F-stat.	8.967140	5.910775	8.116944	7.191387
	Model 3		Model 4	
	Dependent variables		*Dependent variables*	
	ROA	*ROE*	*ROA*	*ROE*
c	−0.00838	−0.20982	−0.011288	−0.25466
	(−0.91837)	(−1.36216)	(−1.33025)	(−1.71876)
M		0.91095*		
		(1.90843)		
L_A	0.04398***	0.49316*	0.036044**	0.56375**
	(3.046170	(1.87443)	(2.31235)	(2.11955)
E_P	−0.05838***		−0.05274***	
	(−3.63495)		(−3.24871)	
DEP_A	−0.09892**	−1.64095**	−0.09762**	−1.7117**
	(−2.19722)	(−2.15708)	(−2.20275)	(−2.20475)
C_A				

Table 4   Cross-section models of multiple linear regression (continued)

	Model 1		Model 2	
	Dependent variables		*Dependent variables*	
	ROA	*ROE*	*ROA*	*ROE*
T_A	−0.164756	0.53417		
	(−1.07814)	(0.19242)		
GUAR_A			0.109372	2.02654
			(1.228273)	(1.32897)
ADJ R^2	0.51476	0.44556	0.522960	0.415267
AIC	−6.666136	−1.00982	−6.683165	−0.988673
DW	1.899121	2.02927	2.037493	2.186528
F-stat.	7.099976	5.620759	7.303491	6.444720

*denotes significance at the level of 10%; **denotes significance at the level of 5%;
***denotes significance at the level of 1%; *t* statistics are in parentheses.

   Source: Authors' calculation

The coefficient of variable L_A usually has a very high significance level, and always a positive sign in all our models. These results are in line with Demirguc (2000) and with Saksonova (2013). The variable that represents equity divided by total liability has a negative sign in all models. This means that, when a bank uses more equity for its financing, it can expect to achieve worse financial results measured by ROE and ROA. This finding is in line with Berger (1995) and Spathis (2002). It seems that if a bank increases other deposits, this will have a negative influence on its performance. Other deposits are in fact demand deposits where bank deposit its funds in other bank or other financial institution. Although these funds are acceptable as they are a key component of the M1 – money supply and they typically have no fees attached; interest rates related with these funds are generally lower. Consequently, these deposits are not the best bank investment choice and today they do not bring a satisfactory return for the bank. So, this negative sign could be expected. The similar result we can find in Ekpo and Mbobo (2016) and Saksonova (2013).

   According to adjusted R^2 and value of Akaike information criterion (AIC) the best cross-section model in Table 5 is:

$$ROA_i = -0.01 + 0.0516M_i + 0.0277L\_A_i - 0.0413E\_P_i - 0.114DEP_i + 0.209C\_A_i + u_i,$$

(8)

This means the following:

- if the bank market share increases for 1% ROA will increase for 0.0516% points

- if a bank increases the share of loans in its assets for 1%, ROA will increase for 0.0277% points

- if a bank decreases the quantity of equity that it uses compared to total assets for 1%, ROA will increase for 0.0413% points

- if a bank decreases the share of other deposits in total assets for 1%, ROA will increase for 0.114% points

- in this model Cash to assets is not significant.

With this model, we explain 60.74% of the ROA variability.

Table 5 Fixed effect panel models of multiple linear regression

	Model 5	Model 6
	ROA	ROE
DEBT_INS_A	–0.066164*	–0.910662
	(–1.6752)	(–1.4598)
CBDEP_A	–0.005004	0.817100*
	(–0.1627)	(1.6826)
DEP_A	–0.014884*	–0.26545*
	(–1.6623)	(–1.0245)
FA_A	–0.004236	0.225410
	(–0.1555)	(0.5240)
FIX_A	–0.729182***	–10.15219**
	(–2.5068)	(–2.2098)
C_A	–0.302471	–3.283117
	(–1.1493)	(–0.7899)
L_A	0.027051**	0.323858
	(1.9697)	(1.4930)
C	0.010145***	0.104168***
	(14.4710)	(9.4071)
ADJ R^2	0.170674	0.093755
AIC	–7.388865	–1.869542
DW	2.298551	1.977948
F-statistic	2.522901	1.76556

*denotes significance at the level of 10%; **denotes significance at the level of 5%;
***denotes significance at the level of 1%; *t* statistics are in parentheses.

      Source: Authors' calculation

As mentioned previously, in order to check whether the effects of the bank asset sheet on banking performance are present in the long-run we also set up two fixed-effects panel models for period from 2002 to 2017 that include five largest banks.[1] Table 5 contains the results of two fixed-effects panel models.

According to the obtained results, we can conclude that change in DEBT_INS_A, DEP_A, FIX_A and L_A is statistically important for ROA, and change in CBDEP_A, DEP_A and FIX_A is statistically significant for ROE. Both FE panel models show that change in FA_A, and C_A is not important for the banks' performance measured by ROA and ROE in a long-run. In these models, we do not include M_A variable that represents the market share of the bank. That is because in our panel models we include

only large banks which are the most important for Croatian financial system and for a whole Croatian economy as well.

Our conclusion is in line with Titko et al. (2016) who have explored the drivers of bank profitability in Latvia and Lithuania. They have found a statistically significant positive relationship between bank profitability expressed by ROE and bank size expressed by the volume of deposits.

The comparison of the results from Tables 4 and 5 shows us the robustness of the importance of other deposits in bank balance sheets for ROA and ROE in all six models. This relationship goes in the opposite direction, and it means that if a bank manages to decrease the share of other deposits in its assets it can expect better financial results to achieve. Because of the fact that banks did not report tangible and intangible assets separately in first decade of our analysed period, we could not retain T_A variable in our panel models. Instead of it we used the value of total fixed assets (FIX_A). According to obtained results it seems that incensement of FIX_A in a long-run has negative effects on banks' performance. Our cross-section models indicate that (L_A) has positive effects on banks' performance. In our panel models we confirmed that influence for ROA only. Both types of analysis showed C_A as insignificant variable.

6   Conclusion

Under the conditions of the Croatian bank-based financial system where banks control the largest part of the financial system, where banks take the highest positions on the list of top 500 companies, and where banks produce over one billion Euros of newly created value, it is of great importance to recognise the determinants of their profitability. This paper investigates the asset structure and the impact of its composition and dynamics on bank profitability employing cross-section regression models and fixed effects panel models.

The indicative results of this research could be of great help for the decision-makers in bank asset management and in the process of making other bank-related decisions, such as decisions about the increase in total assets, or similar. Namely, our models suggest that the bank's profitability will increase if the bank manages to increase its market share. This advocates further consolidations and mergers of banks and thus the further decrease in the number of banks in Croatia. Moreover, it is suggested that the bank should try to increase the share of bank loans in total assets, to reduce the share of other deposits in total assets, and to decrease the share of fixed assets in their balance sheet. Of course, these changes have to be made in the context of acceptable risks that also must be taken into account.

The advantage of this research is twofold. Firstly, in order to capture the short-run relationships, the four cross-section models were developed and they include all active banks in Croatia as of the end of 2017. Secondly, for long-run relationships we decided to setup two fixed effect panel models based on data of five banks that make up for more than 73% of overall bank assets.

According to our knowledge, research of this phenomenon is very rare and this is one of the first papers considering the impact of asset structure on bank performance for the Croatian banking sector. The limitation of this paper is that analysis is focused on the influence of only one determinant: the asset side of the bank balance sheet. For future research, it could be recommended to expand these models with other variables that will

describe the influence of capital and liability aspect of the balance sheet, as well as control variables that will describe the given state of macroeconomic conditions that banks are faced with in different time periods, such as GDP per capita, domestic product growth rate, inflation rate and similar.

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Note

[1]The following banks were included in panel models: Zagrebačka banka (26.11%), Reiffeisen bank (8.02%), Privredna banka Zagreb (19.39%), OTP bank (5.02%) and Erste bank (14.62%) and all these banks make 73.16% of total assets in Croatian banking system.