

## **Has the Financial Crisis Affected the Profitability of Banks in Croatia?**

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### **Abstract**

The authors wanted to find out how recent financial crisis influenced performance of Croatian banks measured with ROA, ROE, NIM and Tobin's Q. Having this aim in mind, we have used many bank-specific, industry-specific or structural variables and macroeconomic variables. The analysis refers to 2007-2015 period. The research is conducted using static panel model on a balanced sample of Croatian banks listed on Zagreb Stock Exchange. The results of the analysis show that crisis dummy variable significantly influences performance but its direction is not uniform. Specifically, the research shows that bank performance improves in crisis period measured with accounting measure of performance, namely ROA, whereas, when employing stock-based measure of performance, i.e. Tobin's Q performance deteriorates during recession. Other explanatory variables that proved to be significant factors when explaining banks' profitability are leverage, growth rate of assets on bank level, interest income to interest expenses ratio, market share and inflation. However, their direction varies depending on measure of performance being used as well as on the period covered by the analysis. The authors have also reported the results of the analysis for the whole period, i.e. 2007-2015, as well as for the crisis period, i.e. 2009-2013 and non-crisis period, covering 2007-2008 and 2014-2015, separately.

**JEL classification numbers:** G21, O16, L25

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## 1 Introduction

Over the past few decades, a number of significant changes occurred in the Croatian banking system. Privatization, adoption of new regulations as a condition of joining the European Union, the recent financial crisis, to name a few.

According to [1], as financial intermediaries, banks play a crucial role in the operation of most economies. Banks account for 72% of assets of all financial intermediaries in Croatia. This suggests that the study of banking sector performance is of great significance.

Determinants of banks' profitability as well as influence of crisis on banks' performance have attracted attention of many scientists. However, the motivation for this study stems from the lack of country specific studies that have examined the significance of both bank specific, industry specific and macroeconomic variables as determinants of bank profits in Croatia by distinguishing crisis and non-crisis period.

ROA, ROE and NIM are often employed in models when determining factors influencing banks profitability. However, the authors wanted to make the results more robust and less sensitive to how the profitability is measured by introducing both accounting and stock-performance indicators. Therefore, besides ROA, ROE and NIM, Tobin's Q was introduced in the model as dependent variable as well.

Although there is a wealth of published materials available dealing with determinants of banks' performance, this is, according to our knowledge, the first study of its kind ever conducted for the banking market such as Croatian. Not only did we measure profitability with all four of these variables, but we have also reported the results of the analysis for the whole period, i.e. 2007-2015, as well as for the crisis period, i.e. 2009-2013 and non-crisis period, covering 2007-2008 and 2014 and 2015, separately. In this way, this research contributes to the scientific development of the studied issue.

In the analysis, we use a balanced panel of annual data from 2007 to 2015 for a sample of Croatian banks. The selection of banks included in the sample was constrained by limited data availability. Since we have tested the influence of crisis on banks' profitability measured by ROA, ROA, NIM and Tobin's Q, our dataset includes only those banks listed on Zagreb Stock Exchange (ZSE). Moreover, banks for which observations were not available for all the years covered by the analysis were dropped from the sample. Therefore, our final sample consists of eight banks per each year covered by the analysis (which make about half of the market in terms of market share) making a total of 72 observations.

Most of the variables were calculated using the data sourced from annual reports available through web pages of Zagreb Stock Exchange (ZSE), Croatian National Bank as well as bank corporate web pages. Moreover, Thompson Reuters database was used to complete market capitalisation data. The macroeconomic data was taken from Croatian National Bank web pages relating to Statistics – main economic indicators.

The research is conducted employing static panel model using *STATA* version 11.0. The paper comprises of the main drivers influencing banks' profitability, including bank-specific variables including; size - based on total assets, size - based on total number of employees, leverage, age, assets growth (on bank level) and interest income to interest expenses ratio, structural factors such as; ownership and market share, and macroeconomic variable such as inflation.

The rest of the paper is structured as follows. Section 2 outlines an overview of the previous research. Section 3 gives a brief overview of the banking sector in Croatia. Section 4 describes variables selection and discusses possible effects of each variable on banks' performance. Methodology is discussed in section 5. Section 6 provides empirical research

and discusses the implication of the results obtained. Section 7 provides conclusions.

## 2 An Overview Of The Previous Research

There is a vast body of empirical literature studying what determines the performance of banks. Therefore, some of these papers are presented below in chronological order.

[2] examined the effect of bank-specific, industry-specific and macroeconomic determinants of bank profitability measured by ROA and ROE using an unbalanced panel of Greek commercial banks spanning the period 1985-2001. Bank-specific profitability determinants comprise ratio of equity to assets, loan-loss provisions to loans ratio as a proxy for credit risk, rate of change in labour productivity measured by real gross total revenue over the number of employees, expenses management and size based on assets. Industry-specific profitability determinants include ownership and concentration, while macroeconomic profitability determinants cover inflation expectations and cyclical output. The authors report the results only for the model with ROA as dependent variable, since the estimations based on ROE produced inferior results. Specifically, the coefficient of the capital variable is positive and highly significant, reflecting the sound financial condition of Greek banks. Moreover, the authors find productivity growth has a positive and significant effect on profitability as well as expected inflation. Moreover, credit risk influence seems to be significant and negatively related to bank profitability as well as the operating expenses meaning that there is a lack of efficiency in expenses management. Business cycle, however, significantly affects bank profit but the authors find that the coefficient of cyclical output almost doubles when output exceeds its trend value. In contrast, when output is below its trend, the coefficient of cyclical output is insignificant.

[3] analyse determinants of bank profitability before and during the crisis using the sample of 453 commercial banks in Switzerland over the period from 1999 to 2008. The authors separately consider the pre-crisis period from crisis years, i. e. 2007-2008. Their profitability determinants include bank specific, industry-specific and macroeconomic variables with performance measured by ROA and ROE indicators. Some of profitability determinants are the growth of a bank's loans relative to the growth rate of the market, the share of interest income relative to total income, the term structure of interest rates and the funding costs. Moreover, they also consider factors such as bank age, regional population growth and the effective tax rate. The findings reveal that the cost-income ratio is relevant for the return on assets before the crisis only, whereas the negative impact of the loan loss provisions relative to total loans is much stronger during the crisis. Furthermore, the negative effect of state ownership on bank profitability does not hold during the crisis, while it holds for foreign bank ownership, providing some evidence that the financial crisis did indeed have a strong impact on the banking industry.

[4] examine how a bank's risk and return on assets, its activity mix and funding strategy are influenced by bank's size including both absolute size (measured by the logarithm of its total assets) and its systemic size (measured by its liabilities-to-GDP ratio). The analysis is done on a large sample of international banks over the period 1991-2009. The main findings are that a bank's rate of return on assets is shown to increase with its absolute size, but to decline with its systemic size. Bank risk, in turn, increases with absolute size, and appears to be largely unaffected by systemic size. The authors also find evidence of market discipline on the basis of systemic size consistent with the view that systemically large banks may become too big to save, while they do not find international evidence of reduced

market discipline on the basis of a too-big-to-fail status due to larger absolute size. Most importantly, their results suggest that bank growth may increase bank's rate of return in relatively large economies but even then at a cost of more bank risk. In smaller countries, growth may have reduced a bank's rate of return on assets, and increased bank risk. To sum up, these findings suggest that bank growth has not been in the interest of bank shareholders in smaller countries, while there are doubts whether shareholders in larger countries have benefited.

[5] analyses empirically the factors that determine the profitability of Spanish banks for the period of 1999-2009 by applying the system-GMM estimator. The sample comprises 89 Spanish commercial banks, savings banks and credit cooperatives with ROA and ROE as profitability measures. Independent variables include factors related to asset structure, asset quality, bank capitalization, financial structure, efficiency, size, and revenue diversification. The author also employs concentration as an industry specific variable as well as macroeconomic variables including annual growth rate of real GDP and inflation. Moreover, the author includes dummy variables to control for bank type and time effects. Some of the findings are that the high bank profitability during the analysed period is associated with a large percentage of loans in total assets, a high proportion of customer deposits, good efficiency, and a low credit risk. In addition, higher capital ratios also increase bank's return, although this finding applies only when using return on assets (ROA) as the profitability measure. The author finds no evidence of either economies or diseconomies of scale or scope in the Spanish banking sector.

### 3 Banking Sector in Croatia

The banking system in Croatia has passed through very fast and invasive changes since the beginning of 1990s. A plausible way of representing the changes in Croatian banking system could be by dividing these changes in 3 elementary phases.

The 1st phase took place from 1990 until 1995. At that time, Croatia started building its national banking sector.

The 2nd phase, generally called *privatization*, comprises the period from 1995 until 2000 mainly characterized by privatization of state owned banks. In that particular moment, foreign banks have entered Croatian market by buying some local banks. During this process, that took place at the end of the war that was going on in Croatia, several new local banks went through bankruptcy.

The 3rd phase, phase of consolidation, has started in 2001 and it is still in progress. The characteristics of this phase are increased competition among new owners and the formation of new strategic plans of international banks in Croatia.

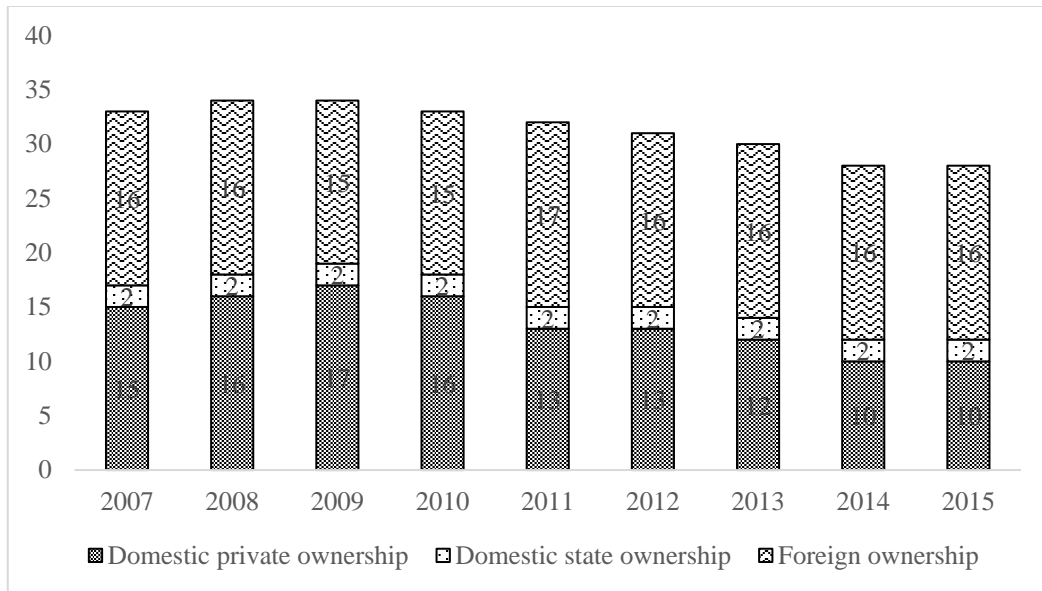


Figure 1: Number of banks operating in Croatia and their ownership structure

A very important issue when it comes to banking industry in Croatia is the problem of ownership. According to the data obtained from annual report published by Croatian National Bank, at the end of 2015, 28 banks were operating in Croatia. At the beginning of 1990s, e.g. in 1993, there were 43 banks operating in Croatia and none of them were in foreign ownership. The first foreign owned bank in Croatia started to operate in 1994. At the beginning of the 21<sup>st</sup> century, in 2001, 43 banks were also operating in Croatia but 24 of them were in foreign ownership. The significant increase in the share of foreign owned banks began in 1999 when the share of foreign owned banks in total assets was 39.9%. Figure 1 and Figure 2 show ownership structure of banks and their share in total bank assets for the period 2007 – 2015. On average, during the aforementioned period, 50% of number of banks were in foreign ownership but their share in total bank asset is on average 90%. It is clear that, today, foreign owned banks are dominating the banking sector in Croatia.

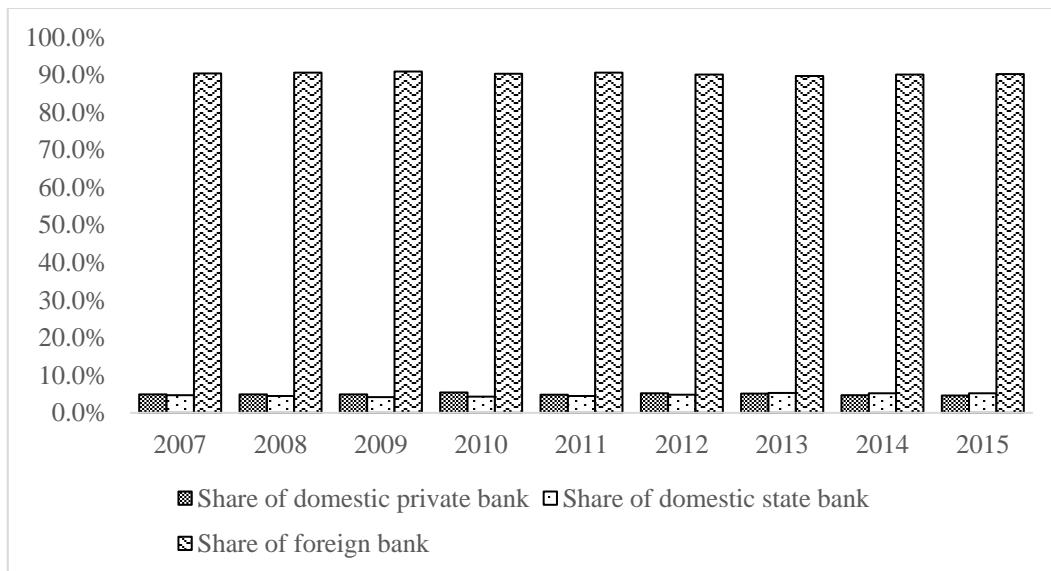


Figure 2: Total bank assets ownership structure

In 1990s, banks were primary oriented to non-financial corporations and their focus was primary on borrowing money to corporations. This trend was changed in the beginning of 21<sup>st</sup> century when share of loans given to households in total loans has become greater than share of loans to non-financial corporations. This ratio is showed by Figure 3. In the period from 2007 to 2015, on average, share of loans to households was 46%, share of loans to non-financial corporation was on average 36%. In recent years (as it can be seen in Figure 3) share of loans to central and local government and social security funds is increasing. In the period 2007-2015, on average, share of loans to central and local government and social security funds was 15%. One of the reasons for increasing the share of loans to central and local government and social security funds is definitely government turning to domestic market where conditions for financing were less rigorous than conditions on global market. One of the reasons for rigorous conditions for financing on global market was decreased credit rating.

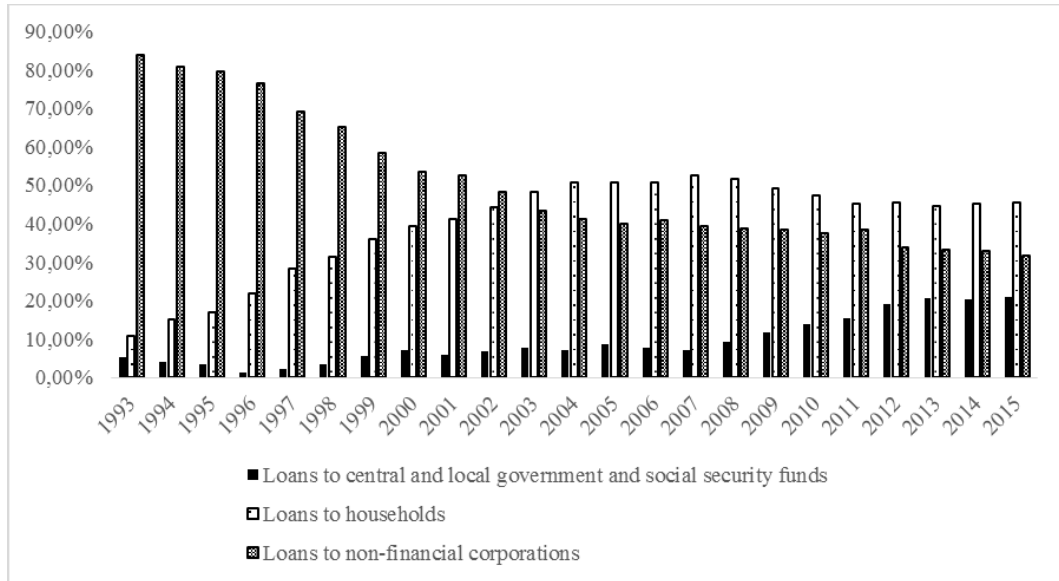


Figure 3: Bank loans structure in Croatia

When it comes to profitability of banks in Croatia, according to the data obtained from annual report published by Croatian National Bank, most of the net income comes from net interest income. As shown by Figure 4 for the period 2007-2015, the share of net income in banks' total net operating income was 70%, on average. The second largest source of net operating income was net income from fees and commissions with its average share of 21%. The smallest share was net other non-interest income with average share of 9%.

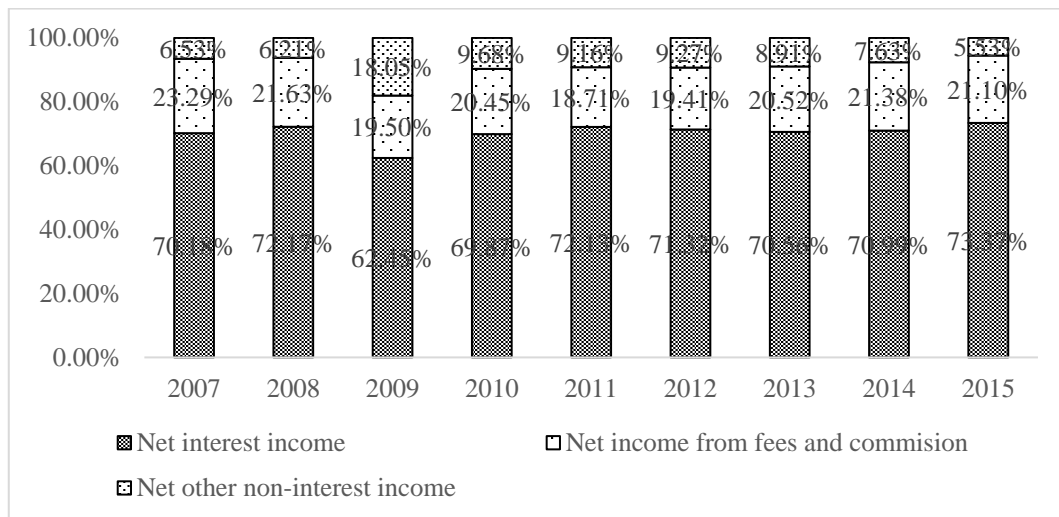


Figure 4: Banks net income structure

Figure 5 shows the profitability of banks for the period 2007-2015 measured by net interest margin (NIM), return on average assets (ROAA) and return on average equity (ROAE). Net interest margin for the observed period is positive and amounts to 2.6% on average. ROAA and ROAE are positive for the entire period except in 2015. The income statements

of banks in 2015 were strongly affected by regulatory changes aimed at alleviating the position of debtors with loans in the Swiss francs or indexed to the Swiss franc and the attempt to make their position equal to the position they would have been in if they had borrowed in Euros. Among one-off expenses, the single largest expense, expressed as the cumulative cost of conversion in expenses on provisions, totalled EUR 0.89bn. As a result, overall expenses on provisions reached their historical high and exceeded net operating income (before loss provisions), which resulted in an aggregate loss from continuing operations (before tax) of EUR 0.62bn.

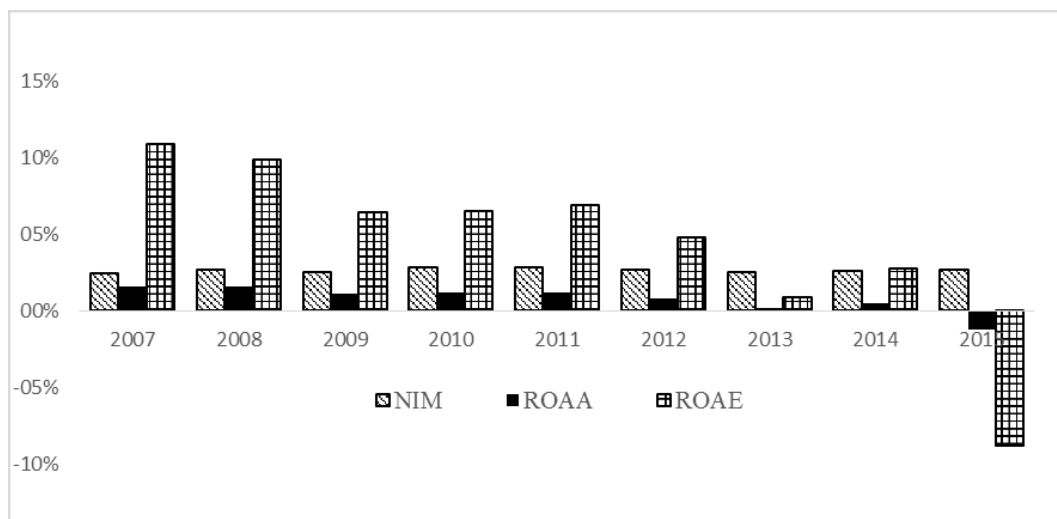


Figure 5: Banks profitability in Croatia, measured by NIM, ROAA and ROAE

#### 4 Variables Selection

Dependent variables measuring profitability in our model include: return on assets (ROA), return on equity (ROE), net interest margin (NIM) as well as Tobin's  $Q$ .

The return on assets (ROA) and return on equity (ROE) are often employed as measures of banks' performance (e.g. [6] [7]). Although some authors (e.g [8]) argued the appropriateness of ROE indicator as banks' performance measure, we have opted for these measures since Croatian National Bank also uses the same indicators of profitability. The *return on assets* (ROA) is defined as the ratio of net profit after tax over total assets multiplied by 100, while the *return on equity* (ROE) variable is computed as the ratio of net profit after tax over total equity multiplied by 100. *Net interest margin* (NIM) is calculated as net interest income to total assets multiplied by 100. This variable is often employed in bank profitability studies such as in [9], [10] and [11] since it focuses on profit earned on interest activities. For *Tobin's Q* (TOBIN\_Q), however, we use an approximation defined as the sum of the market value of shares plus the book value of debt to book value of total assets.

Since the aim of the paper is to determine the influence of crisis on banks' performance, independent variable referring to *crisis* is a dichotomous dummy variable (CRISIS\_DUMMY) that equals one if the country is going through crisis and zero otherwise. The basis for selection of the year in which the dummy variable takes the value



of one is the growth rate of GDP. Specifically, a dummy variable equals one for the years 2009 through 2013 when negative GDP growth rates were registered, and zero otherwise. A large body of empirical studies has investigated the role of different factors influencing bank performance. Based on these studies, according to [12], determinants of bank profitability can be broadly categorised into three groups: (i) bank-specific factors, (ii) structural factors and (iii) macroeconomic factors. Taking into account relevant theory and data availability, a number of control variables have been chosen for each category. Therefore, description of variables used in our study is structured using this classification. *Bank-specific variables.* Bank-specific determinants of profitability typically include factors controlled by bank management. In this study, the authors have opted for variables such as bank size (based on both total assets and number of employees), leverage, age of the bank, bank's growth and interest income to expenses ratio.

*Size* variable is introduced to account for the existence of economies or diseconomies of scale in the banking market. It is calculated as the natural logarithm of total assets (LN\_ASSETS) as well as the natural logarithm of total number of employees (LN\_EMP). [13] suggests that large companies generally outperform smaller ones because they realize economies of scale and have the resources to attract and retain managerial talent. This is supported by the work by [14]. As stated by [15], the effect of a growing size on profitability is proved to be positive to a certain extent, although, in study by [16], size proved to be insignificant in all of the relevant regressions. Moreover, according to [17], for banks that become extremely large, the effect of size could be negative due to bureaucratic and other reasons. Therefore, the influence of size variable on profitability is ambiguous.

*Leverage* variable (LEV), being a proxy for solvency risk, is calculated as total debt to total assets ratio. Since higher values of debt indicate higher levels of risk, this variable is expected to be negatively related to performance. This view is supported by [18] stating that, to the extent that book capital is an accurate measure of bank solvency, better capitalized banks are expected to be less fragile. However, high indebtedness, based on the agency cost theory, can positively influence firm performance because leverage can be treated as a tool for disciplining management. Therefore, the predicted sign of this variable is ambiguous.

*Age* variable (AGE) equals the natural logarithm of the number of years since the bank was founded. The influence of this variable on performance is unclear. On one hand, we can expect that bank's age positively affects performance due to longer experience and tradition, but older firms may be less capable to convert employment growth into growth of sales, profits and productivity, as stated by [19]. Work by [20] work supports the negative influence of age on performance stating that corporate aging could reflect a cementation of organizational rigidities over time. Accordingly, costs rise, growth slows, assets become obsolete, and investment and R&D activities decline. In addition, older firms are more likely to have a rigid administrative process and more bureaucracy. [21] states that investment opportunities may be limited for firms in the later stages of their life cycles. As stated by [22] the theoretical postulates and empirical evidence are equivocal, at best, on impacts that age has on firm-level performance, and it is likely that the true nature of the relationship is very environment-specific, and highly dependent on a number of institutional factors.

Bank's *growth rate* variable (GROWTH) refers to the growth of assets and it is calculated as  $\frac{assets_t - assets_{t-1}}{assets_{t-1}} \times 100$ . Banks with increasing growth rates should experience improved performance. Paper by [23] shows that asset growth increases profitability

indicators for most banks, worldwide. The authors note, however, that for the vast majority of banks, growth appears to offer a trade-off between risk and return, while for the systemically largest banks; asset growth may simultaneously lower return on assets as well as return on equity and increase risk.

*Interest income to interest expenses* variable (IIER) is calculated as interest income to interest expenses ratio representing bank operations efficiency. Higher IIER values indicate better performance; therefore, the impact of IIER on bank performance is expected to be positive.

*Structural – industry specific variables.* The second group of determinants describes industry-structure factors influencing bank profits that are not a direct result of managerial decisions. These include ownership and market share.

*Ownership* variable (OWN) was introduced in the model as a dummy variable taking the value one if bank is domestically owned and zero if a bank is in foreign ownership. Foreign owned banks are expected to perform better, which is consistent with the notion that international investors facilitate the transfer of technology and know-how to newly privatized banks, as explained by [24]. Moreover, [25] citing Buch (1997) assert that the foreign investors bring state-of-the-art technology and human capital to domestic banks encumbered by the legacies of the centrally planned era that Croatia also used to be a part of. On the contrary, hypothesis that domestic ownership leads to more profitable banks can be explained by [26] stating that foreign banks do not rely on local deposits and can raise equity capital internationally. Due to diversification and the resulting lower cost of capital, foreign banks might provide a price advantage to borrowers in host countries by charging lower interest rates than domestic banks that can lead to lower profitability levels.

*Market share* variable (MS) is calculated as assets of an individual bank divided by the total assets of bank industry in a particular year. It is employed in the model to test the relative-market power hypothesis that argues that only large banks with some “brand identification” can influence pricing and raise profits, as stated by [27]. Therefore, a positive relationship of this variable on bank profitability is expected.

*Macroeconomic variables.* The last group of variables relates profitability to the macroeconomic environment within which the banking system operates. According to the relevant literature e.g. [28], [29] and [30], GDP growth is often used as the main indicator of the aggregate economic activity. However, due to the high correlation of dichotomous variable DUMMY\_CRISIS with GDP growth, this variable has been excluded from further consideration.

Along with GDP growth, the authors also include another macroeconomic indicator such as *inflation rate* (INF) that should provide additional information regarding the impact of the macroeconomic environment on banks’ performance. According to [31], this variable is likely to be associated with high nominal interest rates and it may proxy macroeconomic mismanagement, which adversely affects the economy and the banking system through various channels. Moreover, it provides evidence on whether the local currency provides a stable measure of value in long-term contracting [32].

Summary of all variables and their definitions, along with descriptive statistic for total period of investigation, are presented in Table 1, while Table 2 presents descriptive statistic for variables in crisis and non-crisis period separately.

Table 1: Definition of the variables and descriptive statistics for total period of research

| Variable | Name                                       | Description  | Total period (2007 - 2015)  |           |         |           | Obs.     |    |
|----------|--|--------------|---|-----------|---------|-----------|----------|----|
|          |  |              | Mean  | Std. Dev. | Min.    | Max.      |          |    |
| 1        | Return on assets                           | ROA          | Net profit after tax overall total assets ratio   | -0.1937   | 2.5763  | -14.9594  | 1.7087   | 72 |
| 2        | Return on equity                           | ROE          | Net profit after tax overall equity ratio   | -4.2881   | 28.6720 | -183.5238 | 33.7046  | 72 |
| 3        | Tobin's Q                                  | Tobin's Q    | Sum of the market value of shares plus the book value of debt to book value of total assets | 0.9631    | 0.2319  | 0.0061    | 1.4252   | 72 |
| 4        | Net interest margin                        | NIM          | Net interest income to total assets   | 2.5813    | 0.6842  | 0.6190    | 3.9985   | 72 |
| 5        | Leverage                                   | LEV          | Total debt to total assets ratio  | 0.8525    | 0.1790  | 0.0052    | 1.1621   | 72 |
| 6        | Growth rate                                | GROWTH       | Relative growth of assets   | 7.4281    | 18.3562 | -25.6218  | 119.9726 | 72 |
| 7        | Size 1                                     | LN_ASSETS    | Total assets, natural logarithm   | 22.4640   | 1.7674  | 20.7441   | 26.5880  | 72 |
| 8        | Market share                               | MS           | Assets of an individual bank divided by the total bank industry assets                      | 5.7085    | 9.2458  | 0.2844    | 26.9358  | 72 |
| 9        | Ownership                                  | OWN          | Dichotomous variable that equals 1 if bank is domestically owned and 0 otherwise            | 0.5972    | 0.4939  | 0         | 1        | 72 |
| 10       | Size 2                                     | LN_EMP       | Total number of employees, natural logarithm  | 6.0708    | 1.3166  | 4.8520    | 8.8051   | 72 |
| 11       | Age  | AGE          | Number of years since the bank was founded, natural logarithm                               | 3.2297    | 0.6132  | 2.4849    | 4.6151   | 72 |
| 12       | Inflation                                  | INF          | Inflation rate  | 2.1889    | 1.8824  | -0.5000   | 6.1000   | 72 |
| 13       | Interest income to interest expenses ratio | IIER         | Interest income to interest expenses ratio  | 1.9280    | 0.4215  | 1.2035    | 3.6681   | 72 |
| 14       | Crisis variable                            | CRISIS_DUMMY | Dummy variable that equals 1 if the country is going through crisis and 0 otherwise         | 0.6667    | 0.4747  | 0         | 1        | 72 |

Table 2: Descriptive statistics of the variables; crisis and non-crisis period

| Variable | Name                                       | Crisis period |           |         |          |         | Non-crisis period |           |         |         |          |    |
|----------|--|---------------|-----------|---------|----------|---------|-------------------|-----------|---------|---------|----------|----|
|          |  | Mean          | Std. Dev. | Min.    | Max.     | Obs.    | Mean              | Std. Dev. | Min.    | Max.    | Obs.     |    |
| 1        | Return on assets                           | ROA           | -0.1701   | 2.1321  | -12.8558 | 1.6711  | 48                | -0.2408   | 3.3462  | -       | 1.7087   | 24 |
| 2        | Return on equity                           | ROE           | -7.5849   | 33.9447 | -        | 33.7046 | 48                | 2.3056    | 10.7292 | -       | 12.6340  | 24 |
| 3        | Tobin's Q                                  | Tobin's Q     | 0.9121    | 0.2315  | 0.0061   | 1.1059  | 48                | 1.0650    | 0.2007  | 0.4428  | 1.4252   | 24 |
| 4        | Net interest margin                        | NIM           | 2.5556    | 0.6423  | 0.6190   | 3.7498  | 48                | 2.6327    | 0.7734  | 0.9970  | 3.9985   | 24 |
| 5        | Leverage                                   | LEV           | 0.8342    | 0.2129  | 0.0052   | 1.0082  | 48                | 0.8891    | 0.0642  | 0.8292  | 1.1621   | 24 |
| 6        | Growth rate                                | GROWTH        | 3.4608    | 10.3683 | -19.5806 | 28.2922 | 48                | 15.3629   | 26.8686 | -       | 119.9726 | 24 |
| 7        | Size 1                                     | LN_ASSETS     | 22.5655   | 1.8158  | 20.8048  | 26.5880 | 48                | 22.2608   | 1.6854  | 20.7441 | 25.3866  | 24 |
| 8        | Market share                               | MS            | 5.7346    | 9.3246  | 0.2900   | 26.8645 | 48                | 5.6563    | 9.2847  | 0.2844  | 26.9358  | 24 |
| 9        | Ownership                                  | OWN           | 0.6042    | 0.4942  | 0        | 1       | 48                | 0.5833    | 0.5036  | 0       | 1        | 24 |
| 10       | Size 2                                     | LN_EMP        | 6.0844    | 1.3147  | 4.9628   | 8.8051  | 48                | 6.0434    | 1.3482  | 4.8520  | 8.4585   | 24 |
| 11       | Age  | AGE           | 3.2564    | 0.5966  | 2.6391   | 4.6052  | 48                | 3.1762    | 0.6549  | 2.4849  | 4.6151   | 24 |
| 12       | Inflation                                  | INF           | 1.8104    | 1.2000  | -0.5000  | 3.4000  | 48                | 2.9458    | 2.6644  | -0.5000 | 6.1000   | 24 |
| 13       | Interest income to interest expenses ratio | IIER          | 1.9138    | 0.4390  | 1.2622   | 3.6681  | 48                | 1.9563    | 0.3918  | 1.2035  | 2.8340   | 24 |

## 5 Methodology

The study, as mentioned earlier, uses balanced data panel of commercial banks in Croatia spanning the period 2007-2015. For the purpose of econometric data analysis, we employed static balanced panel data analysis. Model (1) forms the basis of our estimation.

$$Y_{it} = c + \sum_{k=1}^K \beta_k X_{it}^k + \varepsilon_{it} \quad (1)$$

$\varepsilon_{it} = z_i + u_{it}$ , where:

- $Y_{it}$  is the profitability of bank  $i$  at time  $t$ , with  $i = 1, \dots, N$ ;  $t = 1, \dots, T$  presented with four different measures of profitability; ROA, ROE, Tobin's Q and NIM. By iterating these profitability measures, we account for four different models depending on the independent variable used.
- $X_{it}$  are  $k$  independent variables accounting for bank-specific, industry specific and macroeconomic variables, as discussed above.
- $\varepsilon_{it}$  is the disturbance with  $z_i$  being the unobserved bank-specific effect and  $u_{it}$  being the idiosyncratic error. The presented model is a one-way error component regression model where  $z_i \sim IIN(0, \sigma_z^2)$  and independent of  $u_{it} \sim IIN(0, \sigma_u^2)$ .

While selecting independent variables it is always advisable to keep in mind the principle of parsimony i.e. not multiplying independent variables needlessly for the inclusion of additional variables (with sample size being unchanged) leads to a reduction of the degrees of freedom. As degrees of freedom decrease, there is a greater possibility that the coefficient estimates will not be adequate in terms of their predicting power. Therefore, the aim was to choose as few variables as possible with still being able to obtain the satisfactory explicatory power of the models.

After the final selection of variables, static panel methodology was employed. In static relationships, the literature usually applies least squares methods on Fixed or Random Effects models, as we did. Finally, choosing which of the two models suits the data better, we opted for Hausman test. Hausman test  $p$  value greater or equal to 0,1 indicates that Random Effects model is superior to Fixed Effects model, while Hausman test  $p$  value below 0,1 indicates superiority of Fixed Effects model (for a thorough investigation on Fixed-Effect Versus Random-Effects Models see [33]).

## 6 Empirical Findings

When checking for collinearity among the independent variables, variables with high collinearity coefficients (above 0.7) were excluded from further analysis for the problem of multicollinearity violates the basic statistical assumptions of the econometrical model. Therefore, the pairwise correlation matrix among explanatory variables suggests that variables: size based on total assets (LN\_ASSET), size based on total number of employees (LN\_EMP) and age (AGE) should be excluded from further analysis.

Table 3: Independent variables pairwise correlation matrix

|           | LEV        | GROWTH  | LN_ASSETS  | MS        | OWN        | LN_EMP    | AGE     | INF    | IIER   |
|-----------|------------|---------|------------|-----------|------------|-----------|---------|--------|--------|
| LEV       | 1.0000     |         |            |           |            |           |         |        |        |
| GROWTH    | -0.1599    | 1.0000  |            |           |            |           |         |        |        |
| LN_ASSETS | -0.3338*** | -0.0725 | 1.0000     |           |            |           |         |        |        |
| MS        | 0.0217     | -0.1104 | 0.8641***  | 1.0000    |            |           |         |        |        |
| OWN       | 0.0876     | 0.1391  | -0.5574*** | -0.611*** | 1.0000     |           |         |        |        |
| LN_EMP    | 0.0463     | -0.1504 | 0.8723***  | 0.9732*** | -0.6802*** | 1.0000    |         |        |        |
| AGE       | 0.0818     | -0.1395 | 0.7976***  | 0.9569*** | -0.5075*** | 0.9120*** | 1.0000  |        |        |
| INF       | 0.0209     | 0.0557  | -0.0514    | -0.0147   | 0.0224     | 0.0124    | -0.1223 | 1.0000 |        |
| IIER      | -0.0250    | -0.0031 | 0.3430***  | 0.3104*** | -0.3841*** | 0.3965*** | 0.2082* | 0.0849 | 1.0000 |

\*, \*\*, \*\*\* Statistical significance at the; 10%, 5%, 1% level, respectively.

Variables that significantly influenced performance measured by ROA are crisis variable (CRISIS\_DUMMY), growth rate (GROWTH) and inflation (INF). Moreover, they seem to influence profitability measured by ROA in the same direction, i.e. all three of them positively influenced performance. In the second model, where performance is measured by ROE, two variables positively and significantly impacted performance, specifically interest income to interest expenses ratio (IIER) and inflation (INF). The empirical findings are somewhat different when performance is measured by stock-based performance measure, i.e. by Tobin's Q. Variables that significantly influenced Tobin's Q are crisis variable (CRISIS\_DUMMY), leverage (LEV), growth rate (GROWTH) and market share (MS). In the fourth model performance is measured by net interest margin (NIM) with variables growth rate (GROWTH), interest income to interest expenses ratio (IIER) and inflation (INF) being significant.

Table 4: Empirical results for total period of the research

|                        | ROA                   |                       | ROE                   |                       | Tobin's Q              |                        | NIM                    |                       |
|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|------------------------|-----------------------|
|                        | FE                    | RE                    | FE                    | RE                    | FE                     | RE                     | FE                     | RE                    |
| LEV                    | -2.6042<br>(1.6307)   | -2.3290<br>(1.5084)   | -14.3219<br>(19.5464) | -18.4493<br>(17.9621) | 1.01956***<br>(0.0926) | 0.9948***<br>(0.0832)  | -0.5715<br>(0.3686)    | -0.3713<br>(0.3480)   |
| GROWTH                 | 0.0308*<br>(0.0156)   | 0.0348**<br>(0.0152)  | 0.1537<br>(0.1868)    | 0.2430<br>(0.1825)    | -0.0014<br>(0.0009)    | -0.0015*<br>(0.0008)   | -0.0110***<br>(0.0035) | -0.0090**<br>(0.0035) |
| MS                     | 0.4362<br>(0.5629)    | 0.0626<br>(0.0421)    | 5.2910<br>(6.7476)    | 0.5351<br>(0.4377)    | -0.0338<br>(0.0320)    | 0.0036*<br>(0.0020)    | 0.1201<br>(0.1272)     | -0.0060<br>(0.0082)   |
| OWN                    | 0.9630<br>(1.3212)    | -0.2302<br>(0.7755)   | 10.2399<br>(15.8366)  | -2.4307<br>(8.4645)   | -0.0825<br>(0.0750)    | -0.0037<br>(0.0383)    | 0.4665<br>(0.2986)     | 0.0574<br>(0.1603)    |
| INF                    | 0.5766***<br>(0.1456) | 0.5548***<br>(0.1399) | 3.9517**<br>(1.7450)  | 3.7467**<br>(1.6989)  | 0.0099<br>(0.0083)     | 0.1295<br>(0.0079)     | 0.1240***<br>(0.0329)  | 0.1183***<br>(0.0331) |
| IIER                   | 0.5685<br>(0.9192)    | 0.9302<br>(0.6795)    | 18.6882**<br>(9.2820) | 17.7982**<br>(7.9926) | -0.0165<br>(0.0440)    | 0.0012<br>(0.0366)     | 0.9302***<br>(0.1750)  | 0.9838***<br>(0.1543) |
| CRISIS_DUMMY           | 0.9192<br>(0.5987)    | 1.026*<br>(0.5955)    | -4.1942<br>(7.1769)   | -2.9918<br>(7.2266)   | -0.1027***<br>(0.0340) | -0.1015***<br>(0.0336) | -0.0779<br>(0.1353)    | -0.0291<br>(0.1408)   |
| Constant               | -4.2385<br>(4.0272)   | -2.3775<br>(2.073)    | -71.4232<br>(48.2718) | -32.4885<br>(24.5279) | 0.3266<br>(0.2286)     | 0.1450<br>(0.1134)     | 0.1731<br>(0.9103)     | 0.8282*<br>(0.4743)   |
| Model p value          | 0.0027                | 0.0000                | 0.0551                | 0.0016                | 0.0000                 | 0.0000                 | 0.0000                 | 0.0000                |
| R <sup>2</sup> within  | 0.3072                | 0.2871                | 0.2071                | 0.1828                | 0.7626                 | 0.7522                 | 0.5210                 | 0.4906                |
| R <sup>2</sup> between | 0.3414                | 0.6861                | 0.3331                | 0.6241                | 0.1644                 | 0.8928                 | 0.0938                 | 0.6451                |
| R <sup>2</sup> overall | 0.1731                | 0.3675                | 0.1244                | 0.2715                | 0.0884                 | 0.7608                 | 0.1316                 | 0.5191                |
| Hausman p value        | 0.6595                |                       | 0.2495                |                       | 0.6200                 |                        | 0.0391                 |                       |

\*, \*\*, \*\*\* Statistical significance at the; 10%, 5%, 1% level, respectively.



We split our sample in two subsamples referring to crisis and non-crisis period. Empirical results for crisis period, i.e. for the 2009-2013 period indicate a significant positive influence of inflation on bank performance measured by ROA. In the second model with ROE indicator employed as dependent variable, variables growth rate (GROWTH), interest income to interest expenses ratio (IIER) and inflation (INF) significantly and positively affect performance. When speaking of performance in terms of Tobin's Q, variables leverage (LEV), growth rate (GROWTH) and market share (MS) influence performance in the same direction, i.e. positively. In the fourth model where performance is measured by NIM, only interest income to interest expenses ratio (IIER) variable is significant and has a positive impact on performance measured by net interest margin.

Table 5: Empirical results for crisis period

|                        | ROA                   |                       | ROE                    |                         | Tobin's Q             |                       | NIM                   |                       |
|------------------------|-----------------------|-----------------------|------------------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                        | FE                    | RE                    | FE                     | RE                      | FE                    | RE                    | FE                    | RE                    |
| LEV                    | -1.7984<br>(1.5550)   | -1.3839<br>(1.3780)   | 21.4574<br>(22.7143)   | -13.8224<br>(20.4075)   | 1.0964***<br>(0.0232) | 1.0853***<br>(0.0228) | -0.2740<br>(0.4328)   | -0.2520<br>(0.3902)   |
| GROWTH                 | 0.0516<br>(0.0345)    | 0.0449<br>(0.0302)    | 1.0902**<br>(0.5035)   | 1.0532**<br>(0.4460)    | 0.0013**<br>(0.0005)  | 0.0011**<br>(0.0005)  | -0.0072<br>(0.0096)   | -0.0071<br>(0.0085)   |
| MS                     | 0.0432<br>(0.8631)    | 0.0780<br>(0.0651)    | 8.5574<br>(12.6074)    | 0.9194<br>(0.9250)      | -0.0330**<br>(0.0129) | 0.0026***<br>(0.0010) | -0.1509<br>(0.2402)   | -0.0041<br>(0.0184)   |
| OWN                    | 1.8065<br>(1.3653)    | 0.7633<br>(0.9761)    | 25.6235<br>(19.9431)   | 10.6918<br>(14.2244)    | -0.0007<br>(0.0204)   | -0.0122<br>(0.0155)   | 0.5613<br>(0.3800)    | 0.3210<br>(0.2760)    |
| INF                    | 0.6901***<br>(0.2320) | 0.6670***<br>(0.2153) | 9.1760**<br>(3.3884)   | 8.6488***<br>(3.1983)   | -0.0028<br>(0.0035)   | -0.0011<br>(0.0036)   | 0.0944<br>(0.0646)    | 0.0966<br>(0.0610)    |
| IIER                   | 0.6871<br>(1.0777)    | 1.0399<br>(0.8651)    | 25.4743<br>(15.7420)   | 27.1559**<br>(12.7135)  | 0.0034<br>(0.0161)    | -0.0011<br>(0.0036)   | 1.0531***<br>(0.3000) | 1.0900***<br>(0.2448) |
| Constant               | 2.7518<br>(5.58142)   | -3.2774<br>(2.1514)   | -123.3767<br>(81.5267) | -79.0600**<br>(31.6864) | 0.1811**<br>(0.0833)  | -0.0428<br>(0.0351)   | 1.1490<br>(1.5535)    | 0.3593<br>(0.6089)    |
| Model p value          | 0.0498                | 0.0078                | 0.0173                 | 0.0010                  | 0.0000                | 0.0000                | 0.0116                | 0.0009                |
| R <sup>2</sup> within  | 0.2960                | 0.2830                | 0.3490                 | 0.3296                  | 0.9874                | 0.9844                | 0.3674                | 0.3540                |
| R <sup>2</sup> between | 0.0059                | 0.5118                | 0.3134                 | 0.5588                  | 0.0187                | 0.9847                | 0.0391                | 0.4310                |
| R <sup>2</sup> overall | 0.1531                | 0.3385                | 0.1689                 | 0.4023                  | 0.1894                | 0.9843                | 0.0002                | 0.3693                |
| Hausman p value        | 0.9764                |                       | 0.9272                 |                         | 0.1460                |                       | 0.9433                |                       |

\*, \*\*, \*\*\* Statistical significance at the; 10%, 5%, 1% level, respectively.

In the subsample relating to non-crisis period, only models with ROA and NIM used as dependent variables are considered, since the models, where ROE and Tobin's Q are employed as dependent variables, are not statistically significant. Specifically, banks with lower leverage (LEV) and interest income to interest expenses ratio (IIER) perform better. Variables that are statistically significant in NIM model are growth rate (GROWTH), interest income to interest expenses ratio (IIER) and inflation (INF). However, their direction is not uniform. Banks with better growth opportunities negatively influence performance, whereas interest income to interest expenses ratio (IIER) and inflation (INF) have positive impact on performance measured by NIM.

Table 6: Empirical results for non-crisis period

|                        | ROA                     |                         | ROE                   |                      | Tobin's Q            |                      | NIM                   |                        |
|------------------------|-------------------------|-------------------------|-----------------------|----------------------|----------------------|----------------------|-----------------------|------------------------|
|                        | FE                      | RE                      | FE                    | RE                   | FE                   | RE                   | FE                    | RE                     |
| LEV                    | -54.2352***<br>(4.3315) | -47.0640***<br>(6.7711) | -42.8752<br>(41.8764) | -5.9313<br>(46.7356) | -0.7597<br>(1.1149)  | -0.3202<br>(0.8838)  | -1.8109<br>(2.4344)   | -1.8720<br>(1.9556)    |
| GROWTH                 | -0.0001<br>(0.0089)     | -0.0017<br>(0.0142)     | -0.0099<br>(0.0860)   | -0.0593<br>(0.0978)  | -0.0043*<br>(0.0023) | -0.0033*<br>(0.0018) | -0.0116**<br>(0.0050) | -0.0112***<br>(0.0041) |
| MS                     | -0.5840<br>(0.3395)     | -0.0151<br>(0.0488)     | -3.2254<br>(3.2820)   | 0.4022<br>(0.3371)   | -0.1092<br>(0.0874)  | 0.0026<br>(0.0064)   | 0.1888<br>(0.1908)    | -0.0050<br>(0.0151)    |
| OWN                    | 1.3675<br>(1.1582)      | 0.1399<br>(0.9358)      | 13.3080<br>(11.1978)  | 4.2546<br>(6.4589)   | 0.4485<br>(0.2981)   | 0.0494<br>(0.1221)   | -0.0453<br>(0.6510)   | -0.0009<br>(0.2851)    |
| INF                    | 0.0028<br>(0.0944)      | 0.1310<br>(0.1408)      | 0.4893<br>(0.9127)    | 1.1458<br>(0.9717)   | -0.0173<br>(0.0243)  | 0.0055<br>(0.0184)   | 0.1326**<br>(0.0531)  | 0.1129***<br>(0.0402)  |
| IIER                   | -2.4808***<br>(0.6438)  | -0.2417<br>(0.8925)     | -0.1446<br>(6.2240)   | 4.9133<br>(6.1602)   | -0.1426<br>(0.1657)  | -0.1116<br>(0.1165)  | 0.8320**<br>(0.3618)  | 1.0119***<br>(0.2627)  |
| Constant               | 55.3328***<br>(5.6118)  | 41.7217***<br>(7.0197)  | 49.9012<br>(54.2543)  | -9.2530<br>(48.4511) | 2.4928<br>(1.4444)   | 1.5592*<br>(0.9162)  | 1.3607<br>(3.1540)    | 2.1857<br>(2.0377)     |
| Model p value          | 0.0000                  | 0.0000                  | 0.3411                | 0.4764               | 0.5004               | 0.5364               | 0.0088                | 0.0000                 |
| R <sup>2</sup> within  | 0.9619                  | 0.9042                  | 0.4376                | 0.2446               | 0.3639               | 0.1783               | 0.7703                | 0.7335                 |
| R <sup>2</sup> between | 0.0707                  | 0.6530                  | 0.1144                | 0.2685               | 0.1078               | 0.4533               | 0.0360                | 0.8070                 |
| R <sup>2</sup> overall | 0.1531                  | 0.8373                  | 0.0343                | 0.2459               | 0.0080               | 0.2293               | 0.0999                | 0.7428                 |
| Hausman p value        | 0.0294                  |                         | 0.0936                |                      | 0.7721               |                      | 0.8639                |                        |

\*, \*\*, \*\*\* Statistical significance at the; 10%, 5%, 1% level, respectively.

In the rows below, the models are explained in detail. Specifically, the results show that the latest financial crisis has resulted in an increase of bank profitability when measured by ROA. This finding is not surprising for the banking sectors such as Croatian that has, similar to some other Eastern European countries, registered positive profitability rates in almost entire period observed. The positive effect of crisis, according to [34] citing Chronopoulos et al. (2015), might be the result of a number of ad hoc policy interventions that appeared to prioritize stability during the crisis period. Moreover, according to [35], this result supports the view that banks are able to insulate their performance during periods of downswings. However, this variable takes the opposite sign when performance is measured by Tobin's Q, while in other models it seems to be insignificant factor. Negative impact of crisis variable on Tobin's Q can be a consequence of stock prices decrease that is inherent to crisis periods. For example, Croatian equity index CROBEX decreased in the observed period by 6.9% on average.

Furthermore, banks with better growth (GROWTH) prospects are associated with better profitability measured by ROA. The empirical findings support the thesis that growth opportunities enhance banks' performance and the banks' growth is seen as a prerequisite for achieving sustainable competitive advantage and consequently profitability. However, their direction is not uniform since in the model with performance measured by Tobin's Q and NIM it takes the opposite sign. This variable also takes negative sign in non-crisis period with NIM employed as dependent variable. However, results for crisis period support the thesis that banks with better growth opportunities perform better, at least in terms of ROE and Tobin's Q.

As already stated, inflation (INF) is significantly and positively related to performance measured by ROA, ROE and NIM. The positive impact of inflation has already been evidenced in many papers such as [36] and [37]. It is in accordance with a view offered by [38] that an inflation rate fully anticipated by the bank's management implies that banks can appropriately adjust interest rates in order to increase their revenues faster than their costs and thus acquire higher economic profits. This variable follows similar path in all of the three models (with ROA, ROE and NIM as dependent variables) where it is a significant variable. Empirical results for crisis period subsample confirm largely the above-discussed key results. Specifically, variable inflation appears to be significant and positive in models with ROA and ROE as independent variables. Moreover, when considering non-crisis period, inflation variable also significantly and positively influences performance measured by NIM.

As expected, interest income to interest expenses ratio (IIER) variable significantly and positively influences performance measured by ROE and NIM. The rationale for this can be connected to the positive influence of inflation variable. Specifically, if inflation is anticipated and the banks are not inert in adjusting their interest rates then there is no possibility that the bank costs may increase faster than bank revenues and hence decrease banks' profitability as stated by [39]. Empirical results for crisis period subsample confirm completely the obtained results. However, when considering non-crisis period only, this variable does not act uniformly, i.e. it positively influences performance measured by NIM, whereas it negatively influences ROA indicator.

The coefficients shown in Table 4 suggest significant and positive relation between leverage (LEV) and Tobin's Q, whereas leverage is not significant determinant of performance measured by ROA, ROE nor NIM. The positive result of leverage confirms that found by [40] when profitability is measured by ROAE. Although, a high proportion of customer deposits characterizes the liabilities of the Croatian banks, they appear to have

a positive effect on banks' profitability. As stated by [41], this is possibly because the temporary increase in the cost of liabilities could be compensated by the income derived from other services provided. The same holds for crisis years. On the contrary, in non-crisis period variable leverage negatively influences performance measured by ROE suggesting that banks do not face the difficulties of raising funds with less capital during the non-crisis period.

The empirical findings also suggest positive relation between market share (MS) and performance measured by Tobin's Q. This is supported by the market-power theory that implies that market power comes first in a timing sense followed by higher profits. That is, market power allows banks to manipulate prices, thus leading over time to higher profit as explained by [42]. This also holds for crisis period.

## **7 Conclusion**

In this paper, the authors wanted to examine the influence of recent financial crisis on performance of Croatian banks. Moreover, we have examined how bank-specific characteristics, industry-specific and macroeconomic variables affect the profitability of Croatian commercial banks over the period from 2007 to 2015.

Although determinants of Croatian banks' profitability have already been investigated, we add to the literature in a way that we take into account the impacts of the recent financial crisis by dividing our sample in two additional subsamples, one dealing with non-crisis period and the other one covering crisis years, i.e. 2009-2013.

Moreover, the analysis is conducted using static panel model on the balanced sample of Croatian listed banks with performance being measured by four measures, specifically, ROA, ROE, NIM and Tobin's Q. It is evident from the empirical findings that the variable used to measure performance affects the outcome. The results depend upon the variable used to measure performance; ROA, ROE, NIM or Tobin's Q.

Empirical findings suggest that crisis period affects performance significantly when it is measured by ROA and Tobin's Q, yet, not in the same direction. It seems that banks' profitability in terms of ROA improves in crisis years, which is also the case in some other Eastern European countries. However, Tobin's Q decreases during recession years as a result of falling share prices.

The remaining explanatory variables that significantly influence banks' performance are leverage, growth rate of assets on bank-level, interest income to interest expenses ratio, market share and inflation. The way they affect performance, whether positively or negatively, greatly depends on two factors: (1) the indicator used as the dependent variable and (2) the period under investigation (the whole period, crisis or non-crisis period).

Nevertheless, our results are very consistent with others who have used similar techniques [43] [44] (e.g. Dietrich and Wanzenried 2011; Fok et al. 2004).

Despite all mentioned above, our study has certain limitations. Since we wanted to include additional aspects in our analyses, such as performance measured by stock-performance measure – Tobin's Q, our sample is limited to listed banks only. However, only a small fraction of total number of Croatian banks are listed on Zagreb Stock Exchange. Furthermore, future work might also address some other aspects of banks' profitability by including, for example, corporate governance characteristics.

## **References**

- [1] Demirgüç-Kunt, A. and Huizinga, H., Determinants of commercial bank interest margins and profitability: some international evidence, *World Bank Economic Review*, **13**(2), (1999), 379-408.
- [2] Athanasoglou, P. P., Brissimis, S. N. and Delis, M. D., Bank-Specific, Industry Specific and Macroeconomic Determinants of Bank Profitability, Bank of Greece, Working paper No 25, June 2005
- [3] Dietrich, A. and Wanzenried, G., Determinants of bank profitability before and during the crisis: Evidence from Switzerland, *Journal of International Financial Markets, Institutions and Money*, **21**(3), (2011), 307-327.
- [4] Demirgüç-Kunt, A. and Huizinga, H., Do we need big banks? Evidence on performance, strategy and market discipline, World Bank Policy Research Working Paper No. 5576, (2011),  
[http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1774423](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1774423) (accessed at 10 August 2016)
- [5] Trujillo-Ponce, A., What determines profitability in banks? Evidence from Spain, *Accounting and Finance*, **53**(2), (2012)
- [6] Athanasoglou, P. P., Brissimis, S. N. and Delis, M. D., Bank-Specific, Industry Specific and Macroeconomic Determinants of Bank Profitability, Bank of Greece, Working paper No 25, June 2005
- [7] Dietrich, A. and Wanzenried, G., Determinants of bank profitability before and during the crisis: Evidence from Switzerland, *Journal of International Financial Markets, Institutions and Money*, **21**(3), (2011), 307-327.
- [8] Bonin, J. P., Hasan, I. and Wachtel, P., Bank performance, efficiency and ownership in transition countries, Bank of Finland, Institute for Economies in Transition - BOFIT Discussion Papers No. 7, (2011)
- [9] Ben Naceur, S., The determinants of the Tunisian banking industry profitability: Panel evidence, (2011), Available at: [www.erf.org.eg/CMS/getFILE.php?id=607](http://www.erf.org.eg/CMS/getFILE.php?id=607) (accessed at 10 August 2016)
- [10] Bonin, J. P., Hasan, I. and Wachtel, P., Bank performance, efficiency and ownership in transition countries, Bank of Finland, Institute for Economies in Transition - BOFIT Discussion Papers No. 7, (2004)
- [11] Sameh, J., Bouzgarrou, H. and Louhichi, W., Bank Profitability during and before Financial Crisis: Domestic vs. foreign banks, (2016)
- [12] Athanasoglou, P. P., Brissimis, S. N. and Delis, M. D., Bank-Specific, Industry Specific and Macroeconomic Determinants of Bank Profitability, Bank of Greece, Working paper No 25, June 2005
- [13] Hardwick, P., Measuring Cost Inefficiency in the UK Life Insurance Industry, *Applied Financial Economics*, **7**(1), (1997), 37-44.
- [14] Demirgüç-Kunt, A. and Huizinga, H., Do we need big banks? Evidence on performance, strategy and market discipline, World Bank Policy Research Working Paper No. 5576, (2011),  
[http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1774423](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1774423) (accessed at 10 August 2016)
- [15] Athanasoglou, P. P., Brissimis, S. N. and Delis, M. D., Bank-Specific, Industry Specific and Macroeconomic Determinants of Bank Profitability, Bank of Greece, Working paper No 25, June 2005
- [16] Demirgüç-Kunt, A. and Huizinga, H. Do we need big banks? Evidence on performance, strategy and market discipline, World Bank Policy Research Working

- Paper No. 5576, (2011),  
[http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1774423](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1774423) (accessed at 10 August 2016)
- [17] Athanasoglou, P. P., Brissimis, S. N. and Delis, M. D., Bank-Specific, Industry Specific and Macroeconomic Determinants of Bank Profitability, Bank of Greece, Working paper No 25, June 2005
- [18] Beck, T., Demirgüç-Kunt, A. and Levine, R., Bank Concentration, Competition, and Crises: First results, *Journal of Banking & Finance*, **30**(5), (2006), 1581-160.
- [19] Coad, A., Segada, A. and Terruel, M., Like milk or wine: Does firm performance improve with age?, #1006, (2010), 1-31.
- [20] Loderer, C. and Waelchli, U., Firm Age and Performance, *MPRA Paper* No 26450, (2010)
- [21] Fok, R. C. W., Chang, Y. and Lee, W., Bank Relationships and their Effects on Firm Performance around the Asian Financial Crisis: Evidence from Taiwan, *Financial Management*, (2004), 89-112.
- [22] Majumadar, S. K., The Impact of Size and Age on Firm-Level Performance: Some Evidence from India”, *Review of Industrial Organization*, **12**(2), (1997), 231-241.
- [23] Demirgüç-Kunt, A. and Huizinga, H., Do we need big banks? Evidence on performance, strategy and market discipline, World Bank Policy Research Working Paper No. 5576, (2011),  
[http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1774423](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1774423) (accessed at 10 August 2016)
- [24] Bonin, J. P., Hasan, I. and Wachtel, P., Bank performance, efficiency and ownership in transition countries, Bank of Finland, Institute for Economies in Transition - BOFIT Discussion Papers No. 7, (2004)
- [25] Bonin, J. P., Hasan, I. and Wachtel, P., Bank performance, efficiency and ownership in transition countries, Bank of Finland, Institute for Economies in Transition - BOFIT Discussion Papers No. 75, (2004)
- [26] Fok, R. C. W., Chang, Y. and Lee, W., Bank Relationships and their Effects on Firm Performance around the Asian Financial Crisis: Evidence from Taiwan, *Financial Management*, (2004), 89-112.
- [27] Jeon, Y. and Miller, S. M., Bank Performance: Market Power or Efficient Structure?, University of Connecticut, Economic Working Papers, Paper 2005-23, (2005)
- [28] Bikker, J. A. and Hu H., Cyclical Patterns in Profits, Provisioning and Lending of Banks, *DNB Staff Reports*, 86, Amsterdam, (2002)
- [29] Athanasoglou, P. P., Brissimis, S. N. and Delis, M. D., Bank-Specific, Industry Specific and Macroeconomic Determinants of Bank Profitability, Bank of Greece, Working paper No 25, June 2005
- [30] Demirgüç-Kunt, A. and Huizinga, H., Determinants of commercial bank interest margins and profitability: some international evidence, *World Bank Economic Review*, **13**(2), (1999), 379-408.
- [31] Demirgüç-Kunt, A. and Detragiache, E., The Determinants of Banking Crisis in Developing and Developed Countries, *IMF Staff Papers*, **45**(1), (1998)
- [32] Demirgüç-Kunt, A. and Maksimovic, V., Institutions, financial markets, and firm debt maturity“, *Journal of Financial Economics*, 54, (1999), 295-336.
- [33] Borenstein, M., Hedges, L. V., Higgins, J. P. T. and Rothstein, H. R. „Fixed-Effect Versus Random-Effects Models, in Introduction to Meta-Analysis“, *John Wiley &*



- Sons, Ltd*, Chichester, UK. 2009. doi: 10.1002/9780470743386.ch13
- [34] Sameh, J., Bouzgarrou, H. and Louhichi, W., Bank Profitability during and before Financial Crisis: Domestic vs. foreign banks, (2016)
- [35] Athanasoglou, P. P., Brissimis, S. N. and Delis, M. D., Bank-Specific, Industry Specific and Macroeconomic Determinants of Bank Profitability, Bank of Greece, Working paper No 25, June 2005
- [36] Athanasoglou, P. P., Brissimis, S. N. and Delis, M. D., Bank-Specific, Industry Specific and Macroeconomic Determinants of Bank Profitability, Bank of Greece, Working paper No 25, June 2005
- [37] Demirgüç-Kunt, A. and Huizinga, H., Do we need big banks? Evidence on performance, strategy and market discipline, World Bank Policy Research Working Paper No. 5576, (2011),  
[http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1774423](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1774423) (accessed at 10 August 2016)
- [38] Athanasoglou, P. P., Brissimis, S. N. and Delis, M. D., Bank-Specific, Industry Specific and Macroeconomic Determinants of Bank Profitability, Bank of Greece, Working paper No 25, June 2005
- [39] Ben Naceur, S., The determinants of the Tunisian banking industry profitability: Panel evidence, (2003), Available at: [www.erf.org.eg/CMS/getFILE.php?id=607](http://www.erf.org.eg/CMS/getFILE.php?id=607) (accessed at 10 August 2016)
- [40] Dietrich, A. and Wanzenried, G., Determinants of bank profitability before and during the crisis: Evidence from Switzerland“, *Journal of International Financial Markets, Institutions and Money*, **21**(3), (2011), 307-327.
- [41] Trujillo-Ponce, A., What determines profitability in banks? Evidence from Spain“, *Accounting and Finance*, **53**(2), (2012)
- [42] Jeon, Y. and Miller, S. M., Bank Performance: Market Power or Efficient Structure?, University of Connecticut, Economic Working Papers, Paper 2005-2, (2005)