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**ASSESSMENT OF THE CONCENTRATION
AND EFFECTIVENESS
OF LITHUANIAN COMMERCIAL BANKS**

VILNIUS UNIVERSITY
FACULTY OF ECONOMICS

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AND EFFECTIVENESS
OF LITHUANIAN COMMERCIAL BANKS**

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INTRODUCTION

Nowadays, the limitation of government intervention into economic globalization and integration processes create favorable conditions for the commercial banks. As a result, competition among them emerges. The fact of increasing competition within the sector of commercial banks by itself leads to the change of financial areas market players' behavior change through separate actions and solutions.

The change of market concentration (change of a certain market owned through ratio) makes company owners and stakeholders search for the new solutions to ensure the existing level of dominant market position or gain a better one as an example. Keeping the idea of being effective and attractive to national and foreign investments and private customers, banks start influencing services related with money lending, bank capital, efficiency, leading to a direct impact on the existing and new clients. It is obvious that the role of banks in the financial sector is crucial for each country's economy and fully relates to the market structure. The evidence of market structure and bank performance relation is based on each banks' and market database. The growing amount of banks in one market can have a strong impact on the country's economy growth and on banking service costs.

In common understanding, competition is usually regarded as a positive phenomenon which has an effects on service quality, prices, innovation, and efficiency. An important question is how banks can behave, or what actions can be taken by banks if a market change happens. In the end of the bookwork, we will try to answer what actions can be taken or suggested the government to protect customer needs and fair competition.

The purpose is to supplement the existing scientific literature on the new findings or confirm the existing theories of dependency between the concentration index level and changes in commercial banks' behavior in the market. This will be done by assessing the level of the concentration index in the banking sector on selected Lithuanian banks' business results and activity.

1.

COMPETITION AND BANKS' EFFECTIVENESS

1.1. Competition definition review and its power

The business strategy of gaining a significant share of the market comes to be one of the main competition driving forces. The success level of financial company entirely depends on its ability to go with the same speed as the market grows by increasing or ensuring the same degree of income (Ginevičius, 1998). Many studies and observations have shown that commercial banks' competition or the lack thereof may have an adverse impact on the economic development. It causes banks' passiveness (Gale, 2004); according to the authors, more concentrated sectors keep the ability to diversify the range of risks and resources. Also, there are several economic theories that interpret the competition differently. Firstly the theory was mentioned by earlier theorists like A. Smith (1981), the Scottish political economist. A. Smith maintained that free competition and trade are the best mechanisms to stimulate the economic growth of a country or a region. His insights were based on observing his entire community members. Part of them were producing goods that others were willing to buy. In the book "Wealth of Nations" A. Smith proposes that everyone spends money on things he needs most, that the competitive buying and selling bring collaboration between individuals' needs and people wealth. A. Smith tells: "Market and competition should be the regulators of economic activity, and tariff policies were destructive" (Smith, 1981). According to the author, the division of labor supports managers with a bigger chance of productivity rise. He also states competition to be a result of agreed upon business practice and rejects any monopoly power on this basis. In the book "On the Principles of Political Economy and Taxation" D. Ricardo points up that goods made and sold in complete conditions have a relation to the costs of labor which was needed while producing goods (Ricardo, 1821). Additionally he indicated that the price reflects supply and demand. These observations become the permanent base for the classical theory of economics. Later, on these assumptions J. S. Mill made

an additional review in his book "Principles of Political Economy" (Ashley, 1909). The author draws a line between the earlier proposed economic principles and the real economic situation and the competition conditions goods are served and produced. Shortly, the classical theory delivers the mechanism of competition as a price change which is independent of market players.

The neoclassical theory bases on the market structure. The understanding of the theory is based on the idea that the market system cannot ensure a fair income distribution and resource allocation, and only free trade and government regulation can lead to economic growth and competition.

The driving force of neoclassics is the possibility to produce a service or other kind of good out of a strict resource. The idea of neoclassical theory focuses on savings, capital accumulation and technical progress explaining this as primary sources of economic growth. The neoclassical literature poses that the larger savings are the bigger capital per worker will be. As the theory beginners, William Stanley Jevons, Carl Menger, Loon Walras can be named.

In the economic literature, there are also possible some narrower definitions. For example, Gordon understands competition as the relationship between some number of market players who sell familiar products or services to the same number of market customers (Gordon, 1988). According to "Sunk Cost and Market Structure: Price Competition, Advertising and the Evolution of Concentration" (Sutton, 1991) definition of competition, the game goes through a number of competitors who are associated with a lower price. The theory provides a persuasive case supported by a range of models and empirical evidence including numerous case studies and econometric analysis. There are extensive endogenous sunk costs usually develop differently from other industries with less entry and greater concentration. Stanikūnas in his book "Konkurencijos politika: teorija ir praktika" is defining the competition as follows: "the process which competed for the economic benefits, although the primary goal may not always be additional profits" (Stanikūnas, 2009).

To summarize the definition of competition, it is obvious that for each market participant it is important to have an increase of their own share as compared to others in order to achieve business goals. From a customer's perspective, competition brings a positive impact and is essential as it brings an opportunity to choose a better product with a lower price among the competitors.

In the theories of economics, the monopolistic competition presented by Krugman is characterized as the best model of competition. There are two key assumptions made for companies by his theory able to differentiate its product from that of its rivals (Krugman, Obstfeld, 2008). The prices charged by its rivals give the idea of ignoring the impact of its price on the prices of others. However, in reality, in the market we can find other competition models such as oligopoly or monopoly.

According to the theory of Kottmann presented in his book “Die Bewertung der Konzentration in der Kreditwirtschaft”, the relation between the ratio of concentration and competition degree fully depends on bank service products, service as such in a geographical area (Kottmann, 1974). This finding offers an insight into the regulation of the banking market liberalization as a negative phenomenon – the introduction of the principles of liberalism and promoting competition in the banking sector for, example, by reducing requirements for the establishment of banks. Summing up the review of the scientific literature, it must be stated that competition as a process can take place in several ways presented in Table 1.

Table 1. The competition explanation

Theory	Followers	Competition explanation
Classical theory – price change depending on market players is the driving power of competition	Adam Smith (1776), “Wealth of Nations”	Labor supports managers with the bigger chance of productivity rise
	Ricardo (1817), “Principles of Political Economy and Taxation”	Goods and service sold in competitive conditions have a relation to supply and demand
	Mill (1848), “Principles of Political Economy”	Goods and conditions drive competition
Neoclassical theory – bases on market structure	William Stanley Jevons (1869), “The Substitution of Similars”	Costs can be lowered by efficiency improved if resources tend to increase the quality also
	Carl Menger (1871), “Principles of Economics”	Price is the output of Buyers’ and sellers’ interaction and their evaluation of goods and services
	Loon Walras (1874), “Principe d’une théorie mathématique de l’échange”	Sellers and buyers should be free to exchange and produce

Source: compiled by author based on literature review¹.

¹ Table based on theories of Krugman (2008), Sutton (1991), Smith (1904), Walras (1874), Carl Menger (1871).

From the classical and neoclassical theories we can conclude that the neo-classical school believes savings and investment to be unequal, whereas the classical theory states the opposite. Basing primary ideas on the current marketplace, there are two different regulations: the first one is the free market where government plays the purest role, and the second one is regulated by the authorities market. As a literature review suggests, it is an also a relation between the banking concentration index such as a high competitiveness level, and the competition method which helps us to identify the trend of commercial banks' actions. The theoretical literature states that there is a position when competition can affect the bank risk-taking. The competition as such drives the margins of banks, making them either less or more dependent on the number of competitors in a certain market (see "Policies For Banking Crises: A Theoretical Framework", Repullo, 2004).

According to earlier reviews, monopolistic competition can increase stability, but for a high competition it can cause an instability effect (Martinez-Miera, Repullo, 2010). Based on the literature study, we can make an assumption that a stronger competition can decrease interest rates, but it also means that banks need to start working more efficiently. On the other hand, if a bank operates in a highly concentrated market, it should be efficient, make all resource inputs to create a bigger profit and to receive an obvious output. If the processes are efficient, it means that we have an extra profit for the further development. Additionally, efficiency allows us to play with prices to the customers by decreasing them to gain a bigger market share causing the market concentration change. These relations mean that we will try to check their actual relationship in efficiency increase and interest rate decrease of an individual product and the concentration ratio at that time. The insights and studies in the future could show how smaller banks in the financial area act in case of a low concentration. Even with a price decrease, as is written in a review in the book "Impact of Bank Competition on the Interest Rate Pass-through Euro Area" (van Leuvensteijn, Sorensen, Bikker, van Rixtel, 2008) it can be hard to gain a share of the market if there are lots of players. According to the classical theory, market suppliers could suggest a completely different additional product to attract new clients, and not only playing with price. Also, a small bank or branches should be even more efficient to allow themselves to decrease the price.

1.2. The level of concentration and competition

In this part, we observe banking concentration and effects on the market through different literature sources reflecting opinions about market concentration and its participants' relation to each other. It should be mentioned that part of economists the increasing amount of market participants define as a directly increasing competition and a decreasing concentration. Others propose that competition is increased by a more proactive market participants' behavior which later could lead the weakest market participants towards bankruptcy. The relation between concentration and competition reflects even the fact that for obvious competition on financial area calculation and define we calculate an area we need concentrate. The importance of bank concentration used for explaining competitive level in the financial industry as the result of market structure. Concentration ratios also reflect the changes in concentration as participants enter and leave the market. The definition of concentration ratio is a percentage of market shares between geographical market players (Kwoka, John E. Jr., and Lawrence J. White, 2004). The concentration ratio is used to determine the market structure and the competitiveness level of the market.

There are different ways how to calculate the concentration ratio. If the concentration ratio is high, a few large companies, which also mean less competition, regulate the market. If the concentration ratio is low, the market members are very competitive, and any of them has a significant share of the market (Table 2). There are three main concentration execution models (Stanikūnas, 2009):

- horizontal competition among in the same area competing players;
- vertical competition in different areas competing players;
- conglomerate competition among unrelated players who do not compete with one another.

Also, Stanikūnas (2009) defines that there is a straight relation between the concentration and the competition model.

According International Monetary Fund publications, the bigger competition through low concentration improves banks' effectiveness and arises economic growth. Such actions at the same time can destabilize banks as the main players start acquisition processes searching for bigger profits, which can cause dissatisfaction of the customers.

Table 2. Degree of the concentration index and the market definition

Concentration ratio	Market definition
<30%	Concentration level in an exact business area is quite low and completion is high, defining such a market situation as perfect completion
30–40%	Monopolistic market
>40%	Oligopoly market
Over 100 %	Absolute monopoly market

Source: compiled by author based on literature review².

Observing the financial segment as such, there is always notable a higher concentration level than in other markets (Davis, 2007). Such positioning was proposed for the same reasoning as for bigger banks' concentration. Players with primary power can generate more significant capital reserves and face a less external economic threat, otherwise, in terms of the small concentration and high competition, banks pay higher interest rates on deposits. As a result, the banks' profit from income is reduced, increasing the bankruptcy possibility. Also, if there are only several leading banks in the market, the level of suffering from economic problems the country faces touches all on a similar level, which causes an adverse effect on the whole country's economy. On the other hand, several players are more oriented to follow everyday actions and politics in prices and product creation, satisfying customers' needs. For the government, it is also easier to regulate several leading banks instead of many small participants and to protect the customer.

Considering the concentration in the banking segment, there is also a vulnerability positioning. The pillar of such a negative opinion about banking concentration is based on the price increase of certain business products. The main negative effect on the customer is that banks start increasing interest rates on credits and other services. In this case, private companies are obligated to evaluate their business projects and to ask for the financing only of the most possibly successful risky projects. At the same time, financing of risky projects causes an additional risk to the same banks and the country economy (Deltuvaitė, Vaškelaitis, Pranckevičiūtė, 2007). To sum up the above, Table 3 "Banking concentration approach" is presented.

² Table based on the theory of Stanikūnas (2009).

Table 3. The banking concentration approach

Approach type	Vulnerability	Stability
Description of approach	Price increase to customer. Bank risk unnatural force.	Price decrease and similar politics in behavior.

Source: compiled by author according to literature review³.

To ensure small based competition in the market, separate European agreements have come into force with the regulation of the Treaty on the Functioning of the European Union. According to the European Agreement Establishing, Lithuania must ensure requirements set in Articles 101, 102 and 107 (Stanikūnas, 2009). Upon Article 101(1) of the TFEU:

1. The following shall be prohibited as incompatible with the internal market: all agreements between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the internal market, and in particular those which:

- (a) directly or indirectly fix purchase or selling prices or any other trading conditions;
- (b) limit or control production, markets, technical development, or investment;
- (c) share markets or sources of supply;
- (d) apply dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;
- (e) make the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.

2. Any agreements or decisions prohibited pursuant to this Article shall be automatically void.

3. The provisions of paragraph 1 may, however, be declared inapplicable in the case of:

- any agreement or category of agreements between undertakings,
- any decision or category of decisions by associations of undertakings,

³ Table based on theories of Deltuvaitė, Vaškelaitis, Pranckevičiūtė (2007) and Davis (2007).

- any concerted practice or category of concerted practices, which contributes to improving the production or distribution of goods or to promoting technical or economic progress, while allowing consumers a fair share of the resulting benefit, and which does not:
 - (a) impose on the undertakings concerned restrictions which are not indispensable to the attainment of these objectives;
 - (b) afford such undertakings the possibility of eliminating competition in respect of a substantial part of the products in question.

Article 102 prohibits abuse of the dominant position on the market:

Any abuse by one or more undertakings of a dominant position within the internal market or in a substantial part of it shall be prohibited as incompatible with the internal market in so far as it may affect trade between Member States.

Such abuse may, in particular, consist in:

- (a) directly or indirectly imposing unfair purchase or selling prices or other unfair trading conditions;
- (b) limiting production, markets or technical development to the prejudice of consumers;
- (c) applying dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage;
- (d) making the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.

In Lithuania, competition is based on 2004 May EU Commission regulation. According to Lithuanian rules, concentration is considered under control if a participant's total income during the years of concentration are more than 14,500 mln. Euro and if one of the two concentration participants has more than 1,45 mln. Euro. The target of the concentration control is to protect the customer interests, competition (not monopolistic) support.

The concentration according to the law literature can be divided into three groups:

- horizontal competition – among the existing or future competitors operating at the same level of the supply chain;

- vertical competition – among the firms operating at different levels, i.e. agreement between the manufacturer and its distributor;
- conglomerate competition – among firms providing totally different services no competition is possible.

The biggest part of happening concentrations did not cause any big threat to competition, however, part of them can regulate the market competition. The horizontal competition is one of the most dangerous as it reduces the number of market players within the same industry. Vertical competition usually has no negative impact, except for the fact that it can create barriers to new market enterprises. Some obstacles can appear as a shadow or result of proactive market participant's actions. Competing with each other, they start improving services' or products' level with the case customer dependency or, in other words, loyalty. The loyalty by itself creates a barrier for new market entries as customers are already adapted to the existing financial provider. Also, market players can create barriers artificially. Markets with different consumer segmentation or needs bring additional actions to banks. They start investing in new products' creation to ensure a dominant position or just improve and not to lose it. Conglomerate competition in itself can bring harm only if a company or a bank can provide financial support for other products at the same time pushing from the market the existing participants (Stanikūnas, 2009).

The primary cases where banks participate or join concentration agreements are distinct advantages to decrease competition, to reduce costs. At the same, the increasing concentration reduces the feeling of competition as there are fewer market participants (Hitt, 2001). All these changes can cause an adverse effect on consumers (such as a price increase, change in the quality or service level). There is also a theory (Berger, DeYoung, Genay, Udell, 2000) telling that the biggest impact on bank consolidation both in every European country and in the world has the desire to increase efficiency in activity. The concentration agreements (M&A) additionally as such was made with an anti-competitive purpose as any of the same customer segment does not have a desire to compete or cannot do it. In such action of price fixing, banks can stay expensive and produce a bigger profit. In the real market practice, there are only a few players, and the market can be called

monopolistic. In the case of agreement, at least two parts must be in a competition. Such agreement also means that competition happens in selling, buying goods or any other services. Such competition additionally means the price difference.

The easiest way to understand that there is an anticompetitive conduct (cartel) is to try understanding the essence of the agreement:

- 1) no simple, fast explanation on price calculation;
- 2) a new market player's price is lower than of the current players in the same market;
- 3) a significant price decrease for goods and services in case a new player enters the market.

In such a way, the analysis of agreements among the competitors can provide information on the anticompetitive behavior of the undertakers.

1.3. The concentration ratio calculation

There are different methods to measure the degree of market concentration. All these models present the concentration ratio which also reflects the competitiveness of the market. The concentration ratio as such is a measure that reflects the market situation whether it is highly participated by the market players or not.

The concentration ratio also indicates the percentage of the market share. Usually, the concentration ratio is calculated based on three or four largest companies of a particular market. According to the literature, if there are only several large firms in the market, the concentration ratio is high. On the contrary, if there are lots of different companies in the market, the rate should be low in case every participant has no significant market share.

The K bank concentration ratio CR_k can be named as the most well-known, common and simple way to measure the concentration for banking firms. There is no exact description for choosing an appropriate value for k. The index range varies from zero to unity. However, in his article "A Critique of Empirical Studies of Relations Between Market Structure and Profitability" A. Phillips did a hatchet job, proposing that the concentration ratio ignores the size of odds of the leading companies, explaining that small market players can make a bigger one and start competing (Phillips, 1976). The index can be rated from 0 to 100. According to the concentration percentage, there is a split to explain the exact market competi-

tion. If the ratio equals to 0%, the market competition is defined as perfect non-monopolistic, and every participant will not have a significant share in the market. The concentration of 100% reflects a full monopoly. A low concentration can be defined if the ratio is between 0% and 50%. The concentration in the range from 50% to 80% describes the market as an oligopoly and at the ratio between a 80% and 100% is called highly concentrated, moving from the oligopoly to a monopoly level.

The market concentration is defined by the formula:

$$CR_k = \sum_{i=1}^n S_i$$

where S_i reflects the market share and k defines the leading banks' amount.

Herfindahl–Hirschmann (HHI) – another popular measurement widely used by authorities. According to theory, it is not very clear that the HHI is the most appropriate measure (Sander, Kleimeier, 2004). The main pro is that the HHI makes a complete use of the information accessible from the allocation of market positions. The pros of this measurement are that HHI increases the voidance of taken banks which also means a function of the numbers of market players (Adelman, 1969).

$$HHI = \sum_{i=1}^n S_i^2$$

By definition $(1/n) < HHI < 1$, n is identified as the amount of banks in the financial industry. The maximum concentration of a unity appears to indicate the existing market monopoly. The minimum of the concentration $(1/n)$ identifies that every market player or bank takes an equal share of $1/n$. However, HHI has a limitation. M. Adelman described the sensitivity of HHI to several cases, the number of banks in the financial industry and the inequality of market share among different players. Dive tells that the HHI index becomes less sensitive if there are too many different industry participants. The HHI can be calculated as a sum of the squared market shares of companies. If there is a clear monopolistic market of one main 100% holder, the HHI of $(100)^2 = 10,000$. For the current past time, the Herfindahl–Hirschman index is still used as most trustful one in empirical works.

Usually, the index is used with the structure-conduct-performance (SCP) paradigm. According to it, the higher concentration can reduce the efficiency, and at the same time the concentrated market can be the result of the efficient company's performance. The the HHI ratio below 0.01 reflects a very competitive market. For the ratio less than 0.15, the market share is assumed as a non-concentrated. The ratio over 0.25 means a high concentration.

The Rosenbluth index (RI) relates as obvious to the concentration curve. As compared with CRk, it takes an accurate account of each item considered (Bikker, Haaf, 2000). The sellers are ranked by market share from highest to lowest as before. The iS_i defines the share of every market participant, which should be multiplied by its position (rank) on the market. The maximum value of RI occurs when $n = 1$. The minimum value can be defined when participants have the same size on the market and equal to $1/n$ of anyone of the payers having same market share.

$$RI = \frac{1}{2C}; \quad C = \sum_{i=2}^n iS_i - \frac{1}{2}.$$

The Hall–Tideman index (HTI). Its main difference from the previously mentioned indexes is that in the calculation there is taken the number of market participants and not only their market share part (Bikker, Haaf, 2004):

$$HTI = \frac{1}{2 \sum_{i=1}^n iS_i - 1}.$$

The U index (U). The author suggests that this index depends mainly on the number of companies being considered and the inequality of shares of these companies defined by Davies (1980) (Bikker, Haaf, 2004).

$$U = \left(\sum_{i=1}^n S_i (S_i n^{\frac{\alpha-1}{\alpha}}) \right)^{\alpha},$$

where S_i is a generally accepted measure of inequality, α is the constant or a parameter, and n is the number of banks.

The Hannah and Key (HKI) index is completely different from those above mentioned, as in its calculation elasticity is taken into account:

$$HKI = \left(\sum_{i=1}^n s_i^\infty \right)^{1/(1-\infty)}; \quad \infty > 0, \infty \neq 1.$$

The comprehensive industrial concentration index (CCI) is usually used in industry (Horvath, 1970). This model is related with the HHI index, however, the CCI differs as it takes into account the company that has the biggest market share. The index reflects the squared share. Differently from the HHI, the comprehensive industrial concentration index is more sensitive to changes in shares.

$$CCI = s_1 + \sum_{i=1}^n s_i^2 (1 + (1 - s_i)).$$

The Hause index is one of the most difficult ones of other measurements (Bikker, Haaf, 2004) as it takes the HHI index as a base:

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

Entropian (E). The entropy index Theil (T) is a measure figured by Theil (Theil, 1967) and is used as a measure of concentration. This index relates to the analysis of the possibility that the event X is p . In case there is a confirmation of the event, the degrees of surprise emerging vary in the opposite direction to p .

$$E = - \sum_{i=1}^n s_i \log_2 s_i.$$

The entropy index helps us to define whether other companies influenced the customers. If the ratio value is close to zero, the market concentration is concentrated on the maximum volume.

The **Gini coefficient** is named after Corrado Gini, the Italian statistician who discovered this ratio and described it in his work "Variability and Mutability" in 1912. The ratio values from 0 to 1, where 0 defines the perfect income equality and 1 the inequality. The coefficient is usually used to measure income inequality (Dixon, Weiner, Mitchell-Olds, Woodley, 1987).

The **Lerner index** is one more index that reflects separate companies' market power. This index was defined by Abba Lerner in 1934 (Lerner, 1944) The ratio can be defined in the range of 1 to 0. In case the Lerner index equals to 1, company

has high market power, and in case $L = 0$ there is no power of a certain company on the market.

$$L = \frac{P - MC}{P}.$$

The value P in the formula reflects the price of a certain company. The MC presents the margin cost of a company. The negative side of such a calculation is that it is hard to collect all prices and costs of all market participants.

As practice shows, the HHI is widely used in empirical work. Most of competition authorities around the world, including the Lithuanian Competition Council, in their work apply the HHI for the assessment of concentration in different markets.

1.4. Bank efficiency

In traditional economic literature, there is a position telling that competition plays the leading role in bank profitability. The theory suggests that new enterprises on the market can directly influence the present market companies' profitability, although the degree of market concentration is affected by market participants' amount and makes relevant changes in efficiency of those participants of the market. The topic covers also a relation between consumers and suppliers and market entrance regulation. The same thoughts can be found in the Bikker and Haaf work (Bikker, Haaf, 2004). They also pose that capital adequacy keeps the driving role in bank profitability, helping to reach efficient services, the desired price and products by the business or a private consumer. This also means that separate regulations should be taken to achieve the goals. These actions can control deposit policy, interest rates, and other requirements. Additionally rules need to control market entry conditions, to require the minimum capital ratio to absorb the market shock. The more efficient banks can price their services in a competitive way. The technological solutions, the simplified process take an advantage in efficiency increase in case of competition. Talking about the efficiency important to remember that commercial banks create value to shareholders, there are numerous tools to evaluate bank efficiency and results. There are many bank performance indicators presented in the documentation. As an example, Stankeviciene and Mencaite

took the AHP model to measure the performance of Lithuanian commercial banks (Stankeviciene, Mencaite, 2012).

According to the literature theories, there are two approaches to efficiency estimation:

- stochastic frontier approach (SFA),
- distribution free approach (DFA).

The stochastic frontier approach is usually used as a tool to predict the economic cost efficiency. The first researches on the stochastic frontier approach were done at the beginning of the seventies. The beginners of approach were Battese and Coelli (1995), Lovell and Schmidt (1997). However, it is important to mention that the SFA approach is more suitable for calculating the efficiency in the technology industry, there are visible outputs and inputs. This approach was quite critical in case of economic growth of nations at that time.

The distribution-free approach (DFA) is based on the Charnes, Cooper, and Rhodes (1978) model known as the data envelopment analysis (DEA). Later the DFA was observed by Berger in 1993 (Berger, Humphrey, 1997). He has indicated that the approach assumes cost differences to cost inefficiency are stable for a long time and are based more on intuitive assumptions (Charnes, Cooper, Rhodes, 1978).

There are already separated bank efficiency researches done previously combining the SFA and DFA approaches. One study was dedicated to 477 Swiss banks. Sheldon made a review in 1994. In his report, he writes that the SFA result was 3.9%. However, the DEA showed 56%. Next, one paper of measuring efficiency costs was made regarding 270 Italian banks by Resti. Based on his results, both values of DFA and SFA were relevant. The DEA equaled to 68.1%, and SFA was equal to 69.5% (Resti, 1997).

Summarizing approaches described in the literature, there is a disagreement in between the parametric and non-parametric methods themselves. However, there are two measures of every bank measuring the efficiency process additionally, which is quite popular for measuring bank efficiency.

The first one is the return on equity (ROE). The relation between the market concentration and the banking sector was checked by Alfumi and Awad. They examined the performance and efficiency through the ROE and the market concentration ratio of Jordanian banks. As a results, they presented a significant sta-

tistically relevant relationship between ROE and the concentration ratio and even the bank size (Alfumi, Awad, 2003). The next measure of bank efficiency (ROA), known as return on assets, was checked by Sufian and Chong in 2008. In their report they tell that they have also used other internal bank factors such as credit risk, diversification. They examined the Philippines banks' profitability during 1990–2005 (Sufian, Chong, 2008).

The earlier researchers of banking performance, such as Wall, show that profitable banks also had the lower interest rates (Wall, 1985). The differences in the statistics of return of the assets of commercial banks helps us not only with understanding the country economic situation but also explain certain banks' behavior in a definite market. The return on assets (ROA) determines a company profit built on bank total assets. This measure was known as the most precise measure of banking activity according to direct bank result, as it shows how operations or bank actions' optimization relate to the volume of bank resources. Differently from other profitability ratios, the ROA includes all assets of a company. This measure is widely used across different areas. That is why the ROA is best to compare similar companies.

The return on assets is calculated as a company's annual income divided by total assets and presented as a percentage:

$$\text{ROA} = \text{net Income after tax (annual income)} / \text{total assets.}$$

As a rule, investment professionals indicate ROA no less than 5%. The exception is applied only to banks which aim to 1.5% of ROA and above.

There are many different studies related to bank profitability, market concentration and bank efficiency (Smirlock, 1985). Still all market participants face both the government and competitors pressure. This fact leads to decreasing performance costs and investment in projects that will make them more competitive and efficient as compared with other market players of the same segment.

Return on Equity (ROE) is known as the most trustful measure in comparing a company's profitability with that of other market participants in the same industry. This measure is also one of the most valued indicators describing business profit. The ROE is shown as a percentage of calculation:

$$\text{Return on equity} = \text{net income} / \text{shareholder's equity.}$$

The ROE describes how effectively money in a company is working. In general, it is believed that ROE in the 15–20% range presents good levels of investment quality. Basing on earlier researchers of the Macedonian banking system on the terms of 2005 and 2010, there was an insight made that market interest rates affected commercial bank profitability. The idea of borrowing for a short time and lending for a long one may provoke a significant number of banking failures. Guru, Staunton, Balashanmugam (2002) figured that an increased interest ratio was related to bank profitability decrease.

2.

COMPETITION AND BANK STABILITY

2.1. Sources of the instability of banks

The instability of the financial sector, especially in the economic crisis time which broke out in the summer of 2007, disrupted the structure and functioning of the industry. In order to preserve investors' confidence and restore viability, the public policy responded to the crisis with liquidity and capital injections, implicit and explicit guarantee schemes as well as direct rescues and asset purchases. Public support backed major mergers aimed at rescuing distressed banks. While many small banks were going to liquidation, some middle and large-sized financial institutions have not been allowed to fail. The scope and cost of these crisis management measures are unprecedented.

To avoid similar systematic crises and rescue costs in the future, it is important to understand how and to what extent the elements of the structure and functioning of the financial system and its regulation led to the crisis. On the macroeconomic side, the factors included a prolonged low interest rate and global imbalances following the Asian crisis, which contributed to the emergence of bubbles in stock markets and in real estate markets. On the microeconomic side, high leverage, executive compensation and financial innovation could have led financial institutions to exploit the bubble and take excessive risk (Allen, Carletti, 2009).

Competition is also a factor both in the causes and in the chance to improve the situation. Important changes in the structure and the functioning of the financial system in the past two decades included domestic consolidation and regulatory reforms, as many restrictions on entry and operation were lifted. These changes affected industry concentration and the intensity of competition. At first look it appears that some countries with more concentrated banking sectors, such as Australia and Canada, did not suffer serious effects from the crisis and have not made use of public money to bail out financial institutions. Similarly, France, where the

banking sector is relatively concentrated, appears to be in a stronger position than Germany where banks' market shares are more scattered, but we will show that differences in structure do not explain all of the differences in how the crisis affected different countries. Other factors, such as the banks funding structures and the regulatory environments, have been at least as important (Adrian, Brunnermeier, 2009).

A theoretical analysis of competition and financial sector stability finds their relationship to be controversial. Competition has long been thought to reduce stability by exacerbating risk and reducing banks' incentives to behave prudently. That view has recently been countered by the argument that competition in the loan market may reduce the risk of banks' portfolios (Allen, Babus, Carletti, 2009). Competition could also increase the probability of runs on individual banks and the risk of contagion stemming from the failure of individual financial institutions; however, those predictions of negative effects of competition on systemic risk may not be robust.

Empirical studies of the relationship must deal first with the difficulty of measuring competition in the financial industry. Characteristics such as information asymmetries in corporate borrowing, switching costs in retail banking and network externalities in payment systems take the financial industry outside the traditional structure-conduct-performance paradigm. Measures of structure and concentration do not measure competition among financial institutions accurately. Other variables, linked more directly to price levels and changes, must be used. Yet by either type of measure, the results of the empirical studies are also controversial. Structural and non-structural measures of competition are found to be both positively and negatively associated with financial stability, depending on the country and the sample analyzed, and the measure of financial stability used.

The relationship among concentration, competition, and stability thus remains unclear. More research is needed before conclusions can be drawn about the effects of competition on the current crisis. The relationship between competition and financial regulation also deserves more attention. Some theoretical studies show that, if competition had detrimental effects on financial stability, appropriate regulatory measures could correct or prevent those effects. The experience of some countries, such as Japan, where financial liberalisation without adequate changes in the regulatory and supervisory frameworks was followed by a banking crisis,

supports this point. Thus, rather than restrict competition or encourage concentration in the financial sector, a better solution would be to design and apply better regulation.

Instability problems also arise on the banks asset side. Their great reliance on debt and the private information that banks possess on their borrowers may induce them to take excessive risks in their investments or in granting loans. This type of risk is much more pronounced in the financial sector than in others, both because banks' assets are more leveraged and more opaque and because banks' liabilities are insensitive to asset risk due to deposit insurance or implicit state guarantees.

Financial institutions are more closely interlinked than firms in other sectors. The failure of an individual bank may lead to the failure of other financial institutions. This risk of contagion, one of the most distinctive features of the financial sector, is at the core of public interventions and the need to regulate the system. Contagion could result from banks' direct linkages, in the interbank markets or payment systems, or indirectly from the interdependency of their portfolios (Adrian, Brunnermeier, 2009)

The severity of the risk of contagion depends on the size of the failing bank and the shape of networks among banks, among other things. When a financial institution is in distress, its contribution to the risk of the system as a whole increases in the leverage, the size and the maturity mismatch of the bank in distress. Its contribution depends also on how widespread the interconnections among banks are, as this affects the correlation of banks' portfolio returns. Banks in clustered networks hold very similar and thus highly correlated portfolios. Each bank faces a low probability of distress; but, once a distress has occurred, the risk that this propagates in the system is greater.

The crisis has highlighted the importance of the funding structure of financial institutions. Traditionally, banks raised funds through retail deposits. Now, banks have started raising large fractions of their funds in the form of wholesale short run debt from mutual funds, particularly in the United Kingdom and the United States. Unlike deposits, this short-term debt must be rolled over frequently and is not insured. Recent experience has shown that this liability structure may become very problematic in times of crisis. The academic literature has started analyzing the so-called rollover risk as an additional source of banks' instability (He and Xiong, 2009).

The adequate liquidity and smooth functioning of the interbank market are essential to preserve the soundness of financial institutions. After the turbulence in the interbank market, academic research has also started analyzing market freezes and the link between asset prices and financial stability. Several scenarios can lead to a market freeze. Banks may start hoarding liquidity and stop trading on the interbank market when there is great uncertainty about aggregate liquidity demand. They may hold assets that are illiquid in order to avoid fire sales induced by the limited market liquidity. They may also stop lending in the interbank market when the asymmetry of the information about the quality of the borrowing banks is too great.

Financial innovation has also turned out to be an important source of financial instability. Instruments like loan sales or credit default swaps originated as a way to improve risk sharing and risk management. However, more recently they have been associated with greater risk in the banking system. Transferring credit risk may induce banks to retain only the most illiquid toxic assets in their portfolios or lower banks' incentives to screen and monitor borrowers appropriately. This makes it more difficult for banks to sell assets in their portfolios in case of need, and it worsens the quality of lending standards. Moreover, by transferring risk on to other financial institutions, banks are allowed to reduce their capital holdings and increase leverage. This contributes to reducing lending standards and worsening the fragility of the financial sector further. And transfer of credit risk may also be a source of contagion among financial institutions, because it makes their balance sheets more similar and thus sensitive to the same shocks as those, for example, stemming from changes in asset prices (Duffie, 2007).

Reducing systemic risk and preserving a stable financial system are principal motivations for regulation and safety net arrangements, in the form of deposit insurance and lender of last resort. Deposit insurance, if complete, prevents bank runs as investors are certain to be repaid. In a strict sense, the lender of last resort relates to the provision of liquidity by the central bank to individual banks in distress. Although there is a long-standing debate in the academic literature as well as in policy making about the optimal form and the precise role of the lender of last resort, there seems to be a general consensus that, at least in normal market conditions, this instrument should not be used to deal with individual bank insolvencies. In other words, the central bank should provide liquidity to illiquid but

solvent banks. This should prevent a widespread use of public money and thus limit the moral hazard problem implicit in any insurance or guarantee scheme.

But distinguishing illiquidity from insolvency is difficult, even for central banks. In theory, as long as markets are sufficient to deal with systemic liquidity crises, there should be no need for central bank loans to individual banks. However, the interbank market may stop working properly, as the recent crisis has shown, and then even illiquid but solvent banks are unable to obtain the necessary liquidity. In such circumstances, the lender of last resort, and more generally some form of public intervention, may be necessary to avoid the propagation of an individual bank distress to the entire system.

Whenever the social cost of a bank failure is larger than its private cost, it becomes necessary to offer public support to individual institutions. However, this should not imply a systematic and indiscriminate rescue of all banks. As it reduces the private cost of risk taking, the lender of last resort or any public support, as any insurance scheme, induces banks to take greater risk. Thus, only the banks having a systemic impact should receive public support. These are more likely to be large-size banks and banks occupying key positions in the payment system or in the interbank market.

Even when appropriately designed, bailouts and public intervention have some important drawbacks. They generate disparities between small and large banks with negative competitive consequences for the former. They keep inefficient institutions alive. They create the expectation of future support, thus worsening the excessive risk taking problem, which is a particular concern for banks that are systemically important. This so-called – too big to fail – problem has become particularly worrying after the massive public interventions in recent years and the large size many banks reached in the last decade (Demirguc-Kunt, Detragiache, 1999).

2.2. Competition and stability in financial sector

Competition in banking should produce the same effects as competition in other sectors, to improve efficiency and foster innovation, thus leading to a greater variety of products, lower prices, wider access to finance and better service. Several features of the financial sector depart from the textbook competition model. These include barriers to entry information in corporate relationships, switching costs,

network effects and elements of non-price competition that can be used as strategic variables and sources of rents. Of course, many other sectors of the economy share these features to a greater or lesser extent.

In the theoretical academic literature, the link between competition and stability remains an unresolved issue (Carletti, 2008). Until the 1980s, the view was that competition worsens stability. Intense competition was seen as favouring excessive risk taking on the asset side and thus leading to a higher likelihood of individual bank failure. Recent studies, on the other hand, have shown that competition may be beneficial for banks' portfolio risk.

The idea behind the so-called charter value hypothesis is that higher profits induce banks to limit their risk exposure in order to avoid failure and enjoy high returns. As competition puts pressure on margins and reduces a bank's charter value, banks have an incentive to take more risk. Furthermore, competition can affect the channel through which financial innovation contributes to financial stability. If, on the one hand, credit derivatives improve stability because they improve risk share, on the other hand, they also make it more attractive for a bank to acquire more risk. This latter effect dominates when credit markets are competitive, thus contributing to the destabilising effect on lending incentives. Recent work shows how a greater bank competition could instead improve stability. The underlying intuition is that the borrowers' conduct also affects the risks of the banks investment projects, and that effects of competition on incentives of the entrepreneurs that are using the money are different from effects on the banks that are lending it. Greater competition in the loan market would lead to lower interest rates on loans, and lower margins on their loans would increase risks for the banks. But on the other side of the transactions, those lower interest rates would increase the return on investment for entrepreneurs who borrow the money. The prospect of higher return would encourage entrepreneurs to expend more effort to succeed, thus reducing the risk to the bank of default. Depending on which of the two effects dominates, competition leading to lower lending interest rates could make bank portfolios safer. These effects are complex, but they do imply that theoretical predictions of a negative relationship between competition and risk taking need not be robust (Boyd, De Nicolo, 2005).

On the liability side, the relationship between competition and financial fragility also looks controversial. Runs and systemic crises could occur either as a

consequence of a co-ordination failure among depositors or as rational responses by depositors to a bank's impending insolvency. Most studies of these sources of financial fragility assume a banking system that is perfectly competitive, ignoring the effects of different market structures and strategic interaction among banks. A few studies have looked at the interaction between fragility and market structure. One conclusion is that panic runs could occur in all competitive conditions. Panic runs result from co-ordination problems among depositors and network externalities, and these features need not depend on the degree of competition for deposits. On the other hand, there might be a relationship, too. More competition may worsen bank fragility: by raising interest rates on deposits, more competition may exacerbate the co-ordination problem among depositors, leading to a panic run, and also increase the probability of fundamental runs. Competition also affects the functioning of the interbank market. Banks with surplus liquidity and market power in the interbank market might face choices, with opposite effects. They might deny funds to deficit banks, forcing inefficient asset liquidation and increasing the probability of bank failures. Or they might help troubled banks in need of liquidity in order to prevent contagion. This occurs only when competition is imperfect, as otherwise banks are price takers on the interbank market and cannot influence the price level with their action. Thus, again, the relationship between competition and the stability of the interbank market remains controversial. If competition worsens stability by encouraging too risky behaviour, then one way to correct that effect would be to restrict competition, by measures such as ceilings on interest rates or limits on entry. But another way to address the problem would be regulation to discourage and discipline risky actions. Risk-adjusted deposit insurance or appropriate capital requirements would help control risk taking, even in the presence of intense competition (Matutes, Vives, 2000).

As you saw above, the interrelation between regulation and competition is complex. On the one hand, regulation can help mitigate the potential negative effects of competition on banks risk taking. On the other hand, however, badly designed regulation can distort banks' incentives even further. Theory predicts that higher charter values and thus less competition would give banks more incentive to contain risk. However, if higher charter values are a result of an inefficient regulatory policy such as the bailout of inefficient institutions, then banks would still have incentives to take risk. This suggests again that the design of financial

regulation matters at least as much as the market structure for the stability of the banking sector.

A plausible prediction from theory would be that, once a certain threshold is reached, an increase in the level of competition would tend to increase risk-taking incentives and the probability of bank failure. This tendency could be contained by reputational concerns, by the presence of private costs of failure for managers or by properly designed regulation. Regulation and safety net arrangements play an important role in the relationship between competition and stability. A properly designed regulation can help mitigate the problem of too much risky behaviour that can potentially derive from competition. However, a badly designed regulation as well as the anticipation of widespread public support can themselves contribute to worsen banks' incentives to take risk. Thus, it is not only the market structure that matters for the stability of the banking sector. An appropriate regulatory and supervisory framework seems at least equally important. As in any other industry, effective market discipline, the internalisation of future losses and a correct mechanism for pricing risk are crucial elements for encouraging healthy and prudent behaviour by agents operating in the financial sector.

2.3. Measuring competition in the banking sector

Upon literature analysis, three approaches have been used to measure competition in the banking sector, which are analyzed in turn below.

First of all, structural measures of competition. Familiar measures of market structure, such as concentration ratios, the number of banks and the Herfindahl–Hirschman index (HHI) are still widely used in empirical work. These measures originated in the structure–conduct–performance (SCP) paradigm linking the structure of a market to influences on firm behaviour and thus sector performance. One prediction of the SCP approach is that higher concentration would encourage collusion and reduce efficiency. The SCP paradigm has well-known weaknesses. Structure may not be exogenous, but instead it might be the result of firms' behaviour. A more concentrated market structure could be the result of better, more efficient performance, contrary to the predictions of the SCP paradigm. There is no consensus on the best variable for measuring market structure in banking, while performance is typically measured with variables such as net interest margins or

profitability, which can be influenced by factors other than the degree of competition, such as a country's macroeconomic situation or the level of taxation.

The second approach assesses competitive conditions in terms of contestability. Variables like regulatory indicators of entry requirements, the presence of foreign ownership, formal and informal entry barriers and activity restrictions measure the threat of entry in the sector and thus its contestability through the degree of entry and exit.

The third approach measures the intensity of competition directly, in the way prices or outputs respond to costs. Many recent studies of banking use the so-called H-statistic, based on the Panzar and Rosse methodology which proxies the reaction of output to input prices. The H-statistic is calculated by summing the estimated elasticities of revenue to factor prices; a value of one indicates perfect competition, a value of zero (or less) indicates monopoly, and intermediate values indicate the degree of monopolistic competition. Other studies use the Lerner index, which expresses market power as the difference between the market price and the marginal cost divided by the output price. The index ranges from a high of 1 to a low of 0, with higher numbers implying a greater market power.

The theoretical pillar for direct measures is stronger than for structural measures, but direct measures have drawbacks, too. For example, the H-statistic imposes restrictive assumptions on banks' cost functions. Its conclusion that increases in input prices make total revenue and marginal costs not to move together in imperfectly competitive markets is only valid if the industry is in equilibrium, which in practice is very rarely the case. Its single measure neglects differences among banks like size, product, or geographic differentiation. Still, this approach is increasingly used in empirical research because it measures banks' behaviour and thus competition directly. The Lerner index is a better way to distinguish among the different products, but it has the problem that it requires information on prices and marginal costs, which is very difficult to gather.

The evidence measuring the level of competition in banking systems is scarce. Most studies of competition and the factors driving it have been conducted at the country level, because bank-level data sets comparable across countries have been not available until recently. The meagre evidence available shows that competition varies greatly across countries, but the extent of the variation depends on the data sets used and the period analyzed. One conclusion emerges clearly from the

studies: countries with fewer entry and activity restrictions tend to have a stronger competition. By contrast, structural variables do not have a significant impact on competition. Contestability appears to be more important than market structure in explaining the strength of competition in banking. Competition is found to decrease significantly with bank size. This may be because large banks are in a better position to collude with other banks, or because large banks are more likely to operate in product or geographical markets where there are few competitors. The nexus competition–stability is the empirical evidence. Evidence measuring the relationship between competition and stability is also scarce. Like the theoretical predictions, the empirical results are ambiguous. Studies based on bank-level data in individual countries reach contrasting results depending on the sample and the period analyzed. Cross-country studies find a positive relationship between competition and stability in the banking sector. These same cross-country studies also find a positive correlation between concentration and stability. These correlations imply that a higher concentration may not promote stability by dampening competition; rather, this effect might instead be produced through channels such as gains from diversification. The findings underscore once again that basic measures of concentration, such as concentration ratios or the number of banks, are not good proxies for the degree of competition. (Claessens, Laeven, 2004). At a minimum, they must be complemented with measures of features such as size distribution, reflecting the skewness of the banking market and thus the heterogeneity of banks and markets. In line with the theoretical findings, cross-country evidence finds also that an appropriate regulatory framework can help mitigate the potential negative effects on the stability of the greater competition following a process of deregulation. Financial liberalisation is found to be beneficial where the institutional and regulatory frameworks are developed and well-designed. Theoretical literature tends not to distinguish among competition, concentration, and size, making the implicit assumption that concentration and size are suitable inverse measures of competition. In contrast, in the empirical literature the distinction among concentration, size, and competition is of particular relevance.

Studies differ in the sample and period analyzed and in the methods used to measure competition and stability. Earlier studies tend to measure competition with structural variables such as concentration ratios or the number of banks, while more recent studies use the Lerner index or the HHI. Stability is measured

with variables capturing an individual bank distress or systemic distress. Individual bank distress, that is proximity to bankruptcy, can be measured by the z-score (the sum of the capital–asset ratio and return on assets weighted by the standard deviation of return on assets) or by the non-performing loan ratio (the ratio of non-performing loans to total loans). Systemic distress can mean either systemic risk, which is typically measured by the correlation of banks stock returns, or actual systemic crises when banks are unable to fulfil their intermediation function.

Most studies of individual countries test the relationship between competition and risk taking. Earlier studies on the United States banking system support the charter-value theory. A study looking at 85 large United States bank holding companies between 1971 and 1986 finds that the reduced market power as measured by the market-to-book asset ratio induces banks to reduce their capital cushions and increase the interest rates on large certificates of deposits (Keely, 1990). These results indicate that the erosion of charter values caused by various deregulation measures contributed to the greater bank fragility in the United States during the 1980s as they led to lower capital cushions and higher risk premiums reflected in the spreads of a large certificate of deposits. Several later studies of the United States confirm a negative relationship between market power and banks' risk. Bank-level studies of other countries support, at least partly, the charter value theory. A study analyzing the Spanish banking sector in the years 1988–2003 find a strong evidence that competition, as measured by the Lerner index for various commercial loan products, is negatively correlated with bank risk as measured by the proportion of a bank's commercial non-performing loans. (Jemenez, Lopez, Saurina, 2007). Similar results, although less strong, hold for the Lerner index calculated for the deposit market. Notably, in this study, the standard measures of market concentration (C5, the Herfindahl–Hirschmann index and the number of banks operating in each market) are not found to affect the ratio of non-performing commercial loans. Similar results of a negative relationship between competition and stability are obtained in a study of Russia for the period 2001–2007, where stability refers to the occurrence of actual bank failures rather than to risk-taking measures.

A few, mostly descriptive, historical studies examine the efficiency and stability properties of banking systems in different countries. Competitive conditions are often considered as one factor in efficiency. Some results point to a negative link between competition and stability. For example, a study of the Canadian and

United States banking systems between 1920 and 1980 shows that Canadian banks had lower failure rates than the United States banks. The study relates this difference to the oligopolistic market structure of the Canadian banking system, but it does not find evidence of monopoly rents in the deposit and loan rate levels (Jemenez, Lopez, Saurina, 2007). A comparison of balance sheets shows that Canadian banks were more profitable than the United States banks. The findings suggest that Canadian banks were both more stable and more efficient – but not less competitive – than their US counterparts. A study of Spain and Greece in the last decade finds a stronger evidence that the banking system in Spain was both more competitive and more stable than the banking system in Greece. By contrast, an analysis of the United Kingdom and the German banking systems during the last decades finds evidence that banks' profits were consistently higher in the United Kingdom than in Germany, but those profits were also more variable and thus more unstable. The higher profits were due to higher non-interest income and lower staff costs. The lower volatility in Germany was related to a lower inflation and less competition, in particular from foreign banks. The banking system in the United Kingdom thus appears to have been both more competitive and less stable than in Germany, consistent with the possibility that there is a trade-off between competition and stability in banking.

Studies of the relationship between competition and stability are still scarce due to the lack of available and comparable data until recently. In general, these studies can be divided into two groups. The first group focuses on the relationship between competition, concentration and risk taking by individual banks. Results vary depending on the sample considered and the measures of competition and stability employed. The second group focuses instead on the impact of competition and concentration on the systemic stability of the banking sector. Results in these studies suggest that both competition and concentration have a positive impact on financial stability. A study using both a cross-country data set on 134 countries for the period 1993–2004 and a cross-sectional sample on the US in the year 2003 provides evidence of a positive relationship between competition and stability. The study finds that banks in markets with a higher HHI are more likely to fail. But when stability is measured as the overall bank risk, the relationship between competition and stability is less clear. A study using data for 8235 banks in 23 developed countries has found that market power, as measured by the Herfind-

ahl index and the Lerner index, increases loan portfolio risk but decreases overall risk exposure. The reason for these apparently contrasting results is that banks tend to offset the higher loan risk by holding more equity capital, and this reduces in turn the overall risk. Boyd, De Nicolò and Jalal (2009) and Berger, Klapper, Turk-Ariss (2009) find these results in a sample of 9000 banks from 89 developing and developed countries to depend on various banking system, regulatory and country characteristics in a sample of 69 countries over the period 1980–1997. The main findings are:

- bank concentration, as measured by the share of assets of the three largest banks in total banking assets, is (robustly) negatively correlated with financial crises. That is, more concentrated banking systems are less likely to suffer systemic banking crises;
- the likelihood of a financial crisis is lower in countries where regulation allows more entry, foreign ownership and a wider range of activities, and where the institutional conditions stimulate competition. To the extent that this kind of regulation increases the contestability and the competitiveness of the banking sector, this result suggests that more competition is associated with more stability.

As the analysis suggests, the positive effect of concentration on stability is likely to depend on better possibilities for larger banks to diversify risk. There is no evidence that the positive effect of concentration on stability depends on the market power that banks enjoy in more concentrated systems. These results are confirmed in another cross-country study where competition is measured directly with the H-statistics (Schaeck, Cihak, Wolfe, 2009). In a sample of 45 countries over the period 1980–2005, the study finds that more competitive and more concentrated banking systems have a lower probability of a systemic crisis. The results of cross-country studies highlight that competition and concentration have independent effects on bank stability. One possible reason relates to a measurement issue. At least for some products, competition has a local dimension which cannot be captured through national and consolidated measures of concentration. Another possible reason is that concentration has an independent effect on stability through channels other than competition that relate to risk diversification and size.

The analysis of the channels through which concentration might affect stability is the subject of studies of bank mergers and market power. The focus is on

whether mergers and thus concentration lead to a better risk diversification. The results depend crucially on whether the analysis allows for portfolio adjustments.

Mergers among banks are typically found to reduce the risk of the merging parties, but only if portfolio adjustments are not considered. For example, a study comparing the pre- and post-merger characteristics of 256 acquisitions by the United States bank holding companies between 1984 and 1993 finds a lower post-merger risk as measured either by the standard deviations of the returns on equity and on assets or by the z-score measure of default risk (Craig, Santos, 1997). Similarly, another study that simulates different consolidation strategies among bank holding companies with data from 1994 finds that interstate expansion should lead to a lower insolvency risk. The results suggest that mergers reduce banks risk because they allow banks to achieve greater diversification benefits (Beck, Demirgüç-Kunt, Levine, 2006 and Schaeck, Cihak, Wolfe, 2009).

The link among financial regulation, competition, and stability has many aspects. As shown, regulatory measures promoting competition, such as lower barriers to entry and fewer restrictions on bank activities, improve systemic stability. Competition may affect also the effectiveness of regulation in promoting stability. A study including 421 commercial banks from 61 countries finds that capital regulation is effective in reducing risk-taking, as measured by the ratio of non-performing loans, in countries where the banking system is more competitive, as measured by a lower level of concentration (Behr, Schimidt, Xie, 2009).

It does not need to be effective in countries with highly concentrated banking systems. Moreover, as predicted by theory, an appropriate regulatory framework may mitigate the potential negative effects of competition on stability. Some studies provide evidence of this by testing how the effect of financial liberalisation, used as a proxy for greater competition, on banking stability depends on the regulatory framework. The wave of financial deregulation and liberalisation in the financial sector started in the 1970s. Many regulations, such as the rules limiting interstate banking, were relaxed or repealed, and financial institutions became much freer to choose their activities and prices, to develop new products and expand into new areas or countries. As competition intensified in many segments, a major process of consolidation started in the late 1990 (Group of Ten, 2001).

The era was also marked by a number of financial crises after a long period of stability. In addition to the current one, crises broke out in the United States,

Scandinavia, Japan and Asian countries, among others. These events suggest that liberalisation and competition contribute to financial crises, but a closer examination reveals that the relationship between competition and stability depends on the regulatory framework. Studies of the crises in Scandinavia and Japan show that financial liberalisation can trigger a crisis if it is not carried out properly. Liberalisation that is not accompanied by a careful revision and adjustment of the regulatory framework may become destabilising (Kanaya, Woo, 2000). Some cross-country studies confirm this link between crisis and the quality of regulation (Demirguc-Kunt, Detragiache, 1999). The association between financial liberalisation and the probability of banking crises is found to be positive, but the size of the impact depends on the quality of the institutions and of the regulatory framework. The negative effect is mitigated in countries with a strong institutional environment, a low level of corruption, a good respect of the rule of law, and good contract enforcement. More importantly, financial liberalisation is found to be beneficial where the institutional and regulatory frameworks are developed and well-designed. A good institutional and regulatory framework can check and prevent the behaviour that undermines the stability of the system. To the extent that liberalisation leads to more competition, this evidence suggests that greater competition does not undermine the financial sector stability, if accompanied by a proper regulatory framework.

The last crisis has allowed the use of massive public intervention in the form of liquidity and capital injections, government guarantee schemes and orchestrated mergers. Sharp reductions in interest rates, an instrument that is typically used for monetary policy, have also been used to facilitate liquidity and the functioning of the banking system. The main rationale behind the bailouts has been the fear of contagion, that is, the risk that the failure of one institution would propagate through the system. This fear has led public authorities all over the world to intervene and rescue even middle-sized financial institutions occupying crucial positions in the interbank markets or in particular market segments (Allen, Carletti, 2008).

Positions in the academic literature about the relationship between bank size and risk are based largely on arguments that have been discussed above in terms of stability generally. Evidence provides more support to the argument that large banks are riskier. Most studies focus on the impact of diversification. The results

depend crucially on whether banks compensate the benefits of greater diversification by taking additional risk.

A study examining 122 United States bank holding companies finds that large banks have a lower volatility of stock returns, suggesting a benefit from diversification. But that did not translate into a lower probability of failure for these banks, as measured by lower z-scores (Boyd and Runkle, 1993). Large banks in the United States failed more often than small banks in the period 1970–1986, but less often in the period 1987–1994 (Boyd, Graham, 1996).

Some studies analyze the effects of greater diversification on the risk of individual banks' portfolios. A study of a sample of the United States bank holding companies (BHCs) finds that larger BHCs have a lower stock return volatility, confirming a positive effect of size on BHC diversification. However, this does not translate into reductions in overall risk. The risk-reducing potential of diversification at large BHCs is offset by their lower capital ratios, larger C&I loan portfolios, and greater use of derivatives. This study is an empirical support for the theoretical argument that size-related diversification must not reduce bank insolvency risk (Hellwig, 1998).

The measures adopted during the last crisis are likely to have an important impact on the future structure of the financial industry and thus on competitive conditions in the industry. The numerous mergers that occurred during the crisis have led to a significant increase in the concentration levels of the banking industry in several countries. Between 2005, before the crisis broke out, and 2009, the market share in deposits of the top five domestic institutions increased from 29.3% to 37.3% in the United States and from 58.3% to 61.3% in France. Similar patterns can be seen in the loan markets. The consequences of this increased concentration on competition in the banking industry will very much depend on the exit strategies that will be adopted and the measures that will eventually be imposed on the banks that have received public support. In Europe, for example, several of the banks that have been bailed out or have been involved in orchestrated mergers have been subject to severe measures in terms of size reduction and limits on activities. Banks in the United States may also be subject to restrictions on the scope of activities and limits on concentration, under the plan announced in January 2010 (De Nicolo, Kwast, 2001). An important role will also be played by the new regulatory framework that many countries are likely to implement in the future

in an attempt to improve the stability of the financial system and in particular of systemically important financial institutions. Although concentration and competition are distinct concepts and a concentrated banking sector can still be competitive, nonetheless the extensive academic literature shows that consolidation is likely to reduce competition in the financial sector, in particular in retail banking (Carletti, Hartmann, Spagnolo, 2002).

As conclusions we could say that the academic literature, both theoretical and empirical, is not conclusive about whether competition reduces stability or increases it. The once-dominant view was that greater competition would increase bank risk taking through a reduction of charter value, but recent work challenges that theory. Analysis of the relationship between competition and fragility stemming from the liability side predicts that it can go either way. The empirical evidence is just as controversial. Depending on the sample and the period of analysis, and on the choice among the different ways to measure competition and stability, studies find that greater competition can lead to more stability or to less. Cross country studies find that both concentration and competition have a positive effect on systemic banking stability. This suggests that concentration is not a good proxy for competition, and that the positive effect of concentration on stability is more likely to occur because of better risk diversification opportunities rather than because of increased market power in concentrated banking systems. Nonetheless, some conclusions can be drawn:

- if appropriate regulation and supervision are in place, competition need not reduce stability. Theory shows how regulation could correct or mitigate negative effects of competition on stability. Empirical studies show that pro-competitive regulatory changes that reduce restrictions on entry and activity can improve stability, measured either as individual bank distress or systemic risk. On the other hand, failures of supervision and regulation are factors that reduce stability. Waves of financial deregulation and increased competition are found to be detrimental for stability if not accompanied by appropriate financial regulation. Regulation must take account of market conditions, of course; for example, the effectiveness of standard regulatory tools, such as capital requirements, on bank risk may be affected by market structure;

- the available research does not establish that competition caused the crisis that started in 2007. Certainly, competition can reduce margins. Competition could increase risk taking, in particular if the risk taking was not controlled by appropriate regulation. But the results of both the theoretical and the empirical literature are too ambiguous to draw clear conclusions. With a few exceptions, most studies focus on individual bank stability, which is very different from the systemic crisis that we have observed since August 2007;
- the effects of size and structure on stability may be separate from their effects on competition. Permitting larger financial institutions might not necessarily lead to a lower degree of competition, but larger institutions do seem to take more risk on their portfolios. Whatever the reason for the increased risk, whether it is compensation for their improved diversification or exploitation of being – too big to fail, more attention should be devoted to the issue of an optimal size for financial institutions. The casual observation that the larger banks were also the ones kicking off and experiencing most troubles during the recent crisis seem to support this conclusion. If the principal objective of public policy is to avoid another systemic crisis, that goal would counsel against increasing bank concentration and creating larger banks that are clearly too big to fail, because those steps may reduce stability.

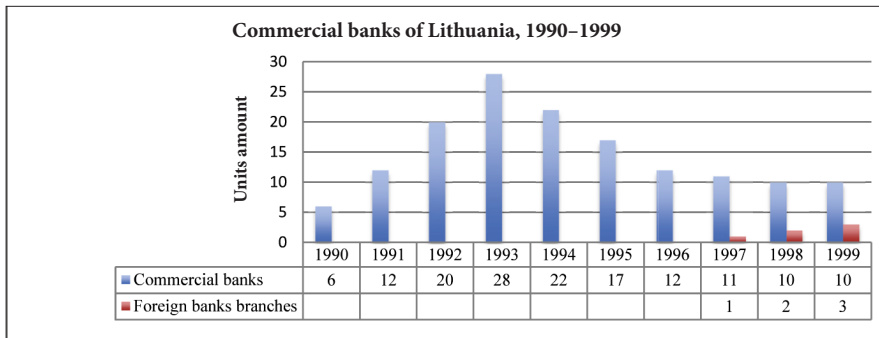
3.

THE BACKGROUND OF LITHUANIAN COMMERCIAL BANKS

The first rush change and commercial banks' growth appeared after the Soviet Union break down. K. Ramonas in the third edition of the journal "Pinigų studijos" mentions that the main goal of the commercial banks' promotion and attraction was the business area of Lithuania and private companies' spread (Ramonas, 2002).

From the chart below we can easily see the rapid growth of commercial banks. In 1993, in Lithuania already functioned 28 commercial banks (Table 4).

Table 4. Commercial banks of Lithuania, 1990–1999



Compiled by author according to the Lithuanian Central Bank data.

Today, based on the Lithuanian Republic Bank Law, a bank is presented as a credit institution which is established in the Republic of Lithuania and is supported with a license to make financial operations. The first law explaining commercial bank activity was created in 1992.

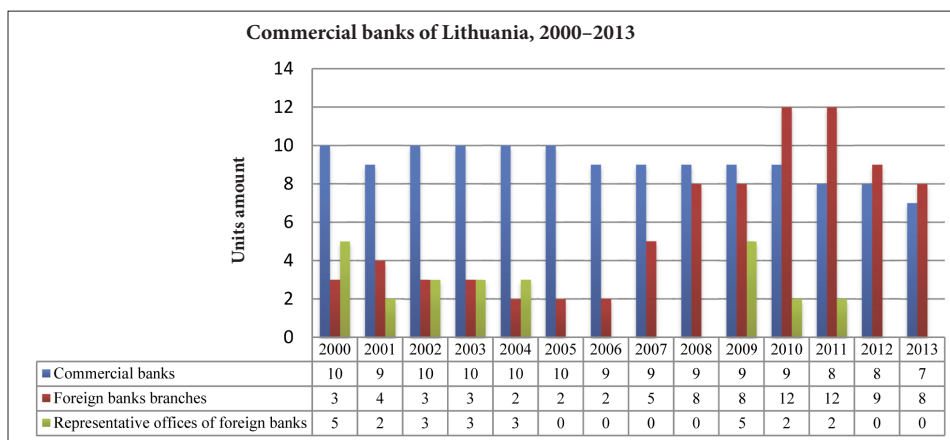
In 1997, the Lithuanian central bank issued a law upon which commercial banks' independent auditor companies should review their reports. From 2002,

there was a regulation amended, describing commercial banks' regular activity results presented to the public, based for an separate indicators and numbers on exact period of time.

At present, commercial banks' activity is regulated by the law of the Lithuanian Republic banks, which entered into force in 2004. The law also provides demands to commercial banks' risks regulation. According to Article 47 second part, there is a demand to make deferments to reduce the possible risks. Also, banks are responsible for evaluating credit risks of each deal and transaction. The Article 48 describes mainly normatives about capital, liquidity, loans. On the other hand, a bank performs operations which are restricted according to rules, but at the same time allow to complete actions. The acceptance of deposits, loan granting differentiate banks from other financial institutions which offer financial solutions (Hefernan, 2005).

Considering the case of Lithuania and the current position on the market, the amount of players in the banking area is changing. Table 5 shows the difference in terms of 2000–2013 years.

Table 5. Commercial banks of Lithuania, 2000–2013



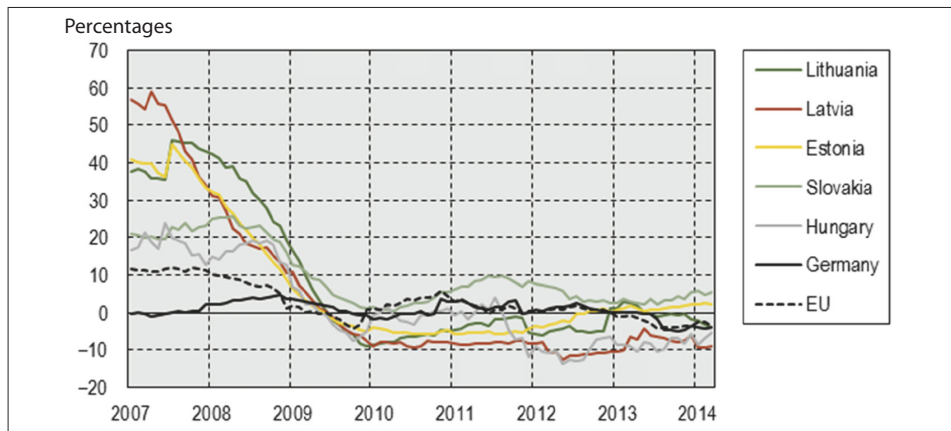
Compiled by author according to the Lithuanian Central Bank annual reports 2000–2013 data.

Today, in the year 2014, there are 8 commercial banks and 12 foreign branches operating in Lithuania. In case all Lithuanian commercial banks operate as universal banks mainly, the range or variation of services the banks provide is quite similar and covers operations with accounts, deposits, lending, payment cards, etc.

The pricing is mainly one of the factors that influence the decision of a client to choose one of the commercial banks. Similarly as over the world market, the competition and concentration of Lithuanian banks makes an impact on the service and product pricing.

However, the number of commercial banks of Lithuania hasn't changed much, the change in banking operation prices and money lending is fixed according to the Lithuanian Central Bank in the same period. Looking to the Lithuanian situation of the past years according to the Lithuanian Central Bank data (Figure 1), we see a trend of loan portfolio change, which shows that banks have started lending more actively in 2013. The trend of the EU loan portfolio shows an opposite effect in comparison with 2012, which means that the change is not caused by a similar effect or seasonality. The change of the loan portfolio gross is presented in Figure 1.

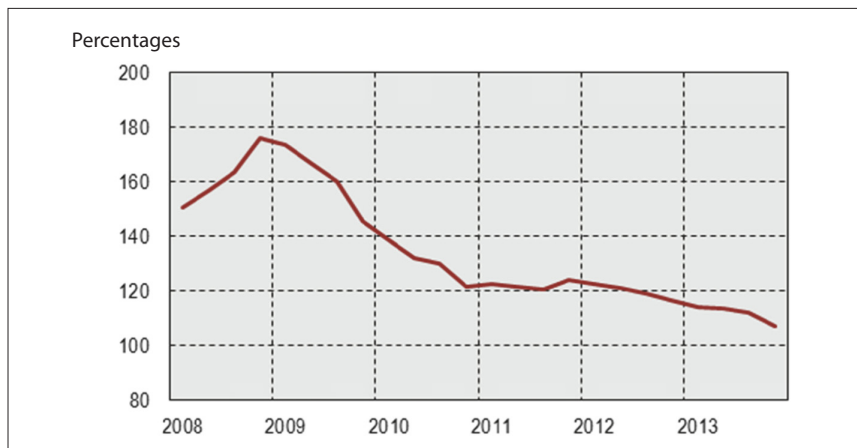
Figure 1. Annual change in the gross loan portfolio of the EU countries



Sources: ECB and Bank of Lithuania calculations.

Comparing with other visible performance indicators of banks, we see that in the same time of 2013 the total loan and deposit ratio (LDR) has also changed. As we see in Figure 2, the ratio was decreasing but didn't reach 100%, which means that banks were still borrowing money to re-loan at higher rates, rather than relying entirely on their own deposits.

However, the trend shows that banks are going to rely their own deposits to make loans to their customers, without any outside borrowing in the nearest future. We also know the fact that in 2013 one of the big Lithuanian commercial

Figure 2. Banks' loan to deposit ratio

Sources: Bank of Lithuania calculations.

banks, known as *Ūkio bankas*, stopped its operations. This fact also helps us to understand that there is a relation between market concentration and bank behavior (Heffernan, 2005). Petersen and Rajan studied the relation between market completion and interest rate change. They have stated that creditors start to smooth interest rates in a less competitive market (Petersen, Mitchell, Rajan, 1995). The past empirical studies cover different countries' financial reviews. Demirguc-Kunt and Huizinga studied 80 countries; the result they have come up with was that in developing countries lower margins are more common than in developed economies. Authors have also tested samples and found that higher interest margins are associated with an increased regulation of market entry by authorities and restricted bank operations (Demirguc-Kunt, Huizinga, 2001). However, there are opposite research results on the relation between market concentration and interest rates. F. Rodriguez-Fernandez reviewed seven countries of the European Union. In the review, he presented the way of measuring and testing his hypothesis. The result shows that there is a negative relation or, in other words, there is no relation between concentration and interest rate margins (Carbó-Valverde, Liñares-Zegarra, Rodríguez-Fernández, 2005).

4.

ASSESSMENT OF THE PARAMETERS AND RESEARCH LIMITATIONS

The assessment is based on secondary data sources of the Lithuanian Central Bank and the Lithuanian Bank Association reports covering 2000–2013 years. The annual researches, overviews, and reports present the behavior results of commercial banks of Lithuania. According to the analyzed and systemized statistical data from audited annual financial statements of the banks a respective market share is calculated. To establish the level of competition in the Lithuanian banking segment and the concentration of the market shares serves, we used data of the Central Bank and the SEB and the Lithuanian economy reports. The HHI and CR3 are calculated according to the number of banks on the market in 2000–2013. Basing on literature theories, the market type of Lithuania is indicated. The results of concentration calculation are compared with a separate bank operational indicators. The regression analysis is taken to indicate the relation and impact of the banking concentration ratio and banks' interest, efficiency (ROE, ROA) and profit. The whole analysis estimates the behavior of commercial banks of Lithuania by investigating the degree of concentration.

Among the possible ways of measuring market concentration, the most popular indicators are taken: the percentage share of the total provision held by the three main commercial banks (Swedbank, DNB, and SEB), as the Lithuanian Central Bank is calculating the market concentration of the financial segment in the same way. Checking both ratios will help truly understand the banking concentration trend and prevent calculation mistakes. The negative thing is that by such calculation small commercial banks are ignored, basing on the opinion that their behavior is related to and affected by the main banks' behavior. Additionally, the HHI ratio is selected as this is the most popular and commonly used ratio calculating the concentration in other countries. The concentration index (HHI) is one main

parameter to indicate the Lithuanian banking industry competitiveness level. The degree of concentration in this work will be calculated from the concentration coefficient. The Herfindahl–Hirschmann index (HHI) can range from 0 to 1 (or from 0 to 10000, where the market shares are calculated as a percentage), where a higher value indicates a higher market concentration. There is a presumption that if the HHI model value exceeds 0.18, the market is highly concentrated (0.1 to 0.18 – average). The HHI model has one serious flaw – the collection of information problem (not valid in cases where the number of banks is small, less than 4). In the paper, four main banks are taken for calculation, coded as b1, b2, b3, b4. The ratios are calculated with the help of the Gretl program.

The research of efficiency in the Lithuanian banking sector will be based on two most frequently used efficiency indicators: ROA and ROE. The statistical data will be taken on 7 commercial banks to understand the whole picture of the market and trends; however, in the regression analysis of ROE and ROA, four main commercial banks of Lithuania will be statistically checked for their relation and dependence to market concentration ratios of CR3.

The interest rate of consumer loan statistics is calculated for commercial banks operating in 2000–2013, presenting the whole trend of drops and increases of a selected term. The collected summarized data are compared with the help of regression analysis to see the relation between bank concentration and price in the market review.

Because assessment was done to understand what actions can be provoked in a bank behavior by the index of bank concentration change, it was decided to analyze the period since 2000 to 2013 as the 14-line sample is the minimum one to compare and see the trend of the exact process. Also, this period was selected since the years of the global financial crisis and recovery in the transition period and covered economic cycle. In this case, the measured 11 years before and three years after the financial crisis began. The sample of three banks for CR_k is taken as mentioned before as such calculation Lithuanian central bank operates. For calculating of CR3 concentration index basis for primary review of market structure of commercial banks of 2013 year considering commercial banks amount of share of assets held by of each bank, amount of loan issued in Litas (Lt) converted to the market share, deposits share, client number on existing market. For HHI concentration we take one more additional bank, which will be also indicated in primary

basis review. Additionally selected banks are representing main products, and their all operations are based on the same government and central bank regulations it is, needless to say, that a sample how to proceed data will represent other big banks.

Regression analysis is considered as a technique for predicting the unknown value and confirm or decline the relation of one variable to another variable. The two variables will always be compared. One undependable we presume will always be concentration ratio, dependable one we presume will be interest rates and efficiency.

The formula used for calculation:

$$Y = \alpha + \beta X + \varepsilon,$$

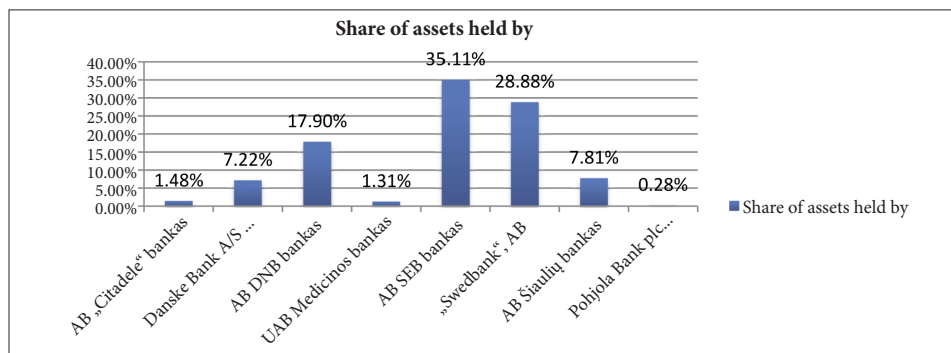
where α shows the line crossing the y axis, βX describes the slope of the line, ε is the term showing the variation of real data up and down the line. The p value is used in the regression method creating a test for coefficients associated with each independent variable. Small p -values present low probabilities and indicate that the coefficient is important for the model with a value significantly different from 0. For example, if a coefficient with the p value of 0.01 is significant at the 99% confidence degree. R^2 ranges from 0 to 100 percent and provides a visual reflect how good the model's predicted values explain the variation. The Adjusted R-Squared value usually is lower than the R-Squared value of model complexity. The main limitation of the study should be considered a limited selection of the banks, which is part of this study and may be limited by representativeness. Also, limitation can be faced in collecting statistical data representing changes in bank performance, as not all banks agree to provide full financial data and cover all history in terms of 2000–2013. The other limitation is that after 2008, two of commercial banks of Lithuania suffered bankruptcy. Additionally, we need to keep in mind that during 2000–2008 the GDP of Lithuania was progressively growing and in term of 2008–2009 financial crises started.

5.

ANALYSIS OF THE CONCENTRATION OF THE LITHUANIAN BANKING SECTOR

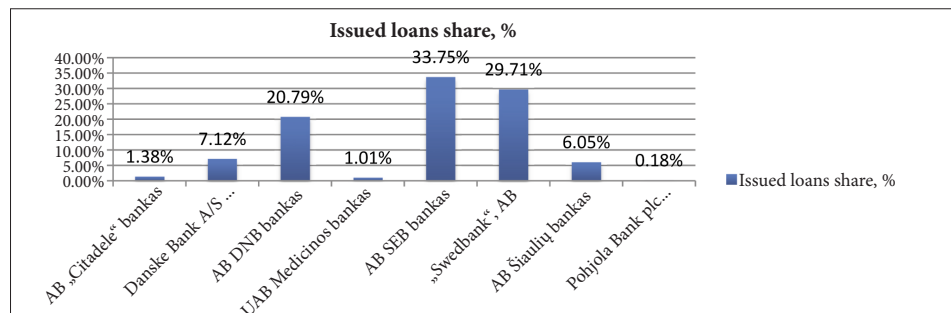
The initial concentration review is basing on the statistical data provided by the Lithuanian Banks Association. The assumption of the main biggest Lithuanian commercial bank payers is based on commercial banks' assets (Table 6), issued loans (Table 7), deposits (Table 8) and clients' number (Table 9).

Table 6. Share of assets of commercial banks by 2013

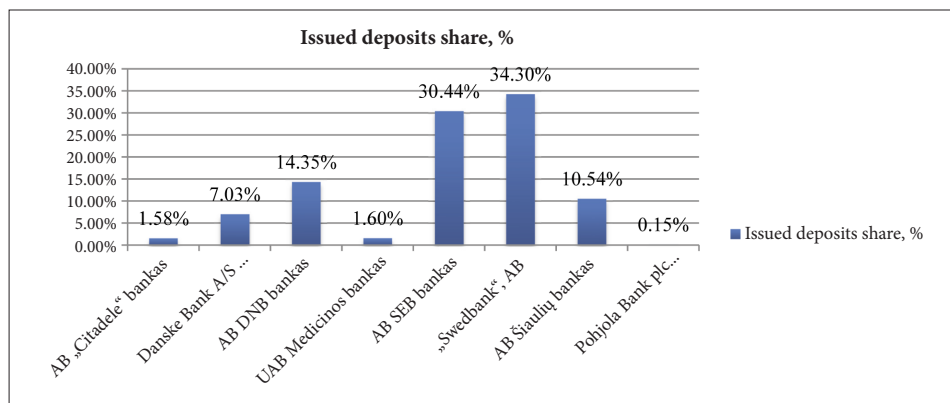


Compiled by author based on the Lithuanian Bank Association data.

Table 7. Issued loans of commercial banks by 2013



Compiled by author upon Lithuanian Bank Association data.

Table 8. Share of deposits of commercial banks by 2013

Compiled by author according to Lithuanian Bank Association data.

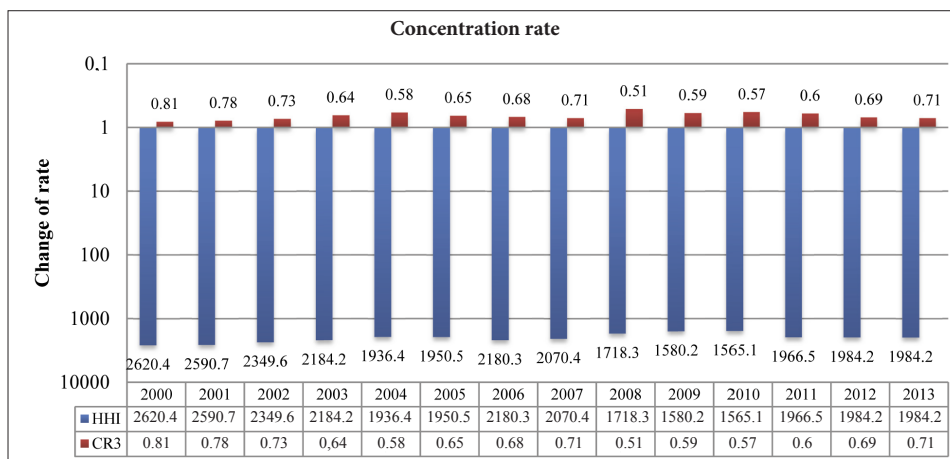
Table 9. Share of clients of commercial banks by 2013

Source: the Lithuanian Bank Association.

Summing up the statistics from Tables 6 to 9, it is obvious that there are three main market players in the financial commercial bank segment. The biggest part of share held by assets takes SEB bank – 35, 11%, followed by Swedbnk – 28, 88%, and the DNB takes the third place – 17, 90%. According to loans issued to customers, the first position belongs to the SEB bank – 33, 75%, Swedbank joins with the second position – 29, 71% with a small difference from the first position. The DNB share is 20, 79%. Comparing deposits issued to customers, by market share in the first position we have Swedbank with 34.30%, the SEB bank joins with 30.44%, in the third place we have the DNB – 14.35%. In addition in the fourth position we have Šiaulių bankas – 10.54% with a little difference of 3.81%. The client share part on the market is also among Swedbank – 38.86%, SEB – 27.66%,

and DNB – 14.64%. Finally, they truly represent three main giants on the financial segment of Lithuanian banks. Further, this primary research paper goes more deeply into analyzing market concentration basing on two market concentration evaluation models. One is the HHI (Herfindahl–Hirschman Index), the other is already used for calculations of the Lithuanian Central Bank. Lately, research contributes to the raised hypothesis approving the relationship between bank market concentration and bank efficiency upon statistical data comparison with Lithuanian commercial banks over a relatively long period – from 2000 to 2013. The findings confirm the relation among market concentration, competition level, and change in banks' behavior. The evolution of Lithuanian commercial banks' concentration is represented in Table 10.

Table 10. Concentration of commercial banks, 2000–2013



Author's calculations based on the Lithuanian Central Bank and the Lithuanian Bank Association statistical data.

As we see from the numbers comparing the results of separate concentration calculations based on HHI and CR^3 ratios, the main trend is obvious. The idea of using the CR^3 index in the calculation of Lithuanian market concentration is reasonable. Looking at the numbers, we can see that the calculation is significant and the numbers are reliable as we can see the same trend in both concentration indexes diagrams. As we see from data in Table 9, in terms of 2000–2004 the both ratios show a similar trend of decreasing concentration. In 2000, the HHI value = 2620.4, and in 2002 it is already equal to 2349.6 points. Checking the CR^3 ratios, in 2000

the meaning is 0.81 and by 2002 0.73. After 2004, there is a drop, from 2005 there is an increase of concentration till the year 2007. In 2007, HHI = 2070.4 points. The CR³ by 2007 reaches 0.71 meaning. Since 2008, there is a continuous concentration in the market drop, which lasts till 2011 and increases by 2013. Looking back to Lithuanian commercial banks' review of the Lithuanian Central Bank in terms of 2011, there was a drop in the commercial banks' number as such banks as "Snoras" and Ūkio Bankas stopped their operation because of bankruptcy; also in 2008–2010 Lithuania, like other countries, faced the economic crisis.

Comparing the number of banking sector players on the market in terms of 2000 to 2013, the numbers reflect that a lower concentration is related to a higher competition on the market and a change in the market share of customers. Also, it is important to mention that by 2011 December the Lithuanian commercial bank "Snoras" was assumed to be bankrupted. This fact has a significant direct impact on the Lithuanian financial segment concentration. The Herfindahl–Hirschman index shows that the HHI rose by 419 points and accounted for 1984 points in 2011 and 2013. This change explains the fact of the market share of banking clients' change. The decreased number of market participants had a direct impact on concentration increase.

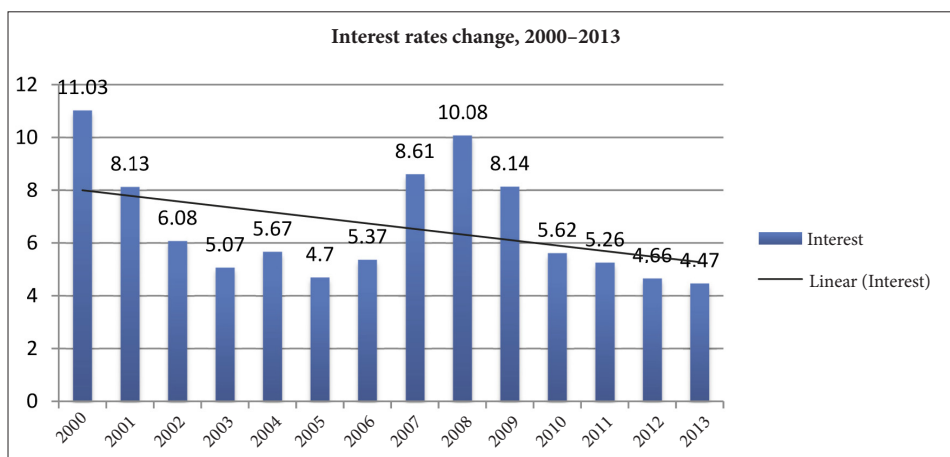
Estimating the concentration ratio calculation results during the observed time and their maximum and minimum rates, we see that the Lithuanian banking segment is quite concentrated. The values of CR³ concentration are in the range of 81–60%, which indicates oligopoly competition, especially in the past years. The HHI value is almost over 1.800 points and is appointed as highly concentrated.

5.1. The assessment of concentrations concerning consumer loan

The next assessment illustrates how the concentration index is connected to consumer loan interest rates of a particular consumer loan. On behalf of the proposed approach, commercial banks facing a high competition level should start playing with prices. According to our hypothesis, the increasing concentration should cause the interest rate decrease. According to different studies, the increasing concentration can effect interest change in two ways. In one way, it can cause the bank to behave of decreasing interest rates on consumer loans. On the other

hand, commercial banks can start increasing deposit interest rates to attract more customers and increase the recent portfolio. Furthermore, competitive pressure in the consumer loan market makes banks under competition to compensate loss interest reduction in loan market income by lowering the deposit rates. As we see in a diagram (Table 11), there is an obvious trend of the average consumer loan interest of the Lithuanian commercial banks. The main changes happen in 2000, and then the interest rate starts decreasing. The lowest value is fixed first in 2005, followed by a small increase and one more drop in 2006. The years 2007–2008 are the years of interest increase, however, from 2009 we already can see a continuous drop of the rate.

Table 11. Consumer loan interest rates change, 2000–2013



Compiled by author according to the Lithuanian Central Bank and the Lithuanian Bank Association statistical data.

Basing on the regression analysis result, the interest rate is taken as (y), the dependent variable which is 'driven' by the independent variable – HHI (x). The result shows and proves that there is an opposite statistically significant correlation between interest rate and market concentration in the Lithuanian commercial banks' market, which means that the lower is the concentration, the higher interest rate appears. As an example of relation in 2008, we have an interest rate increase up to 10.08% as compared to 2007 when the interest rate was 8.61%. The concentration ratio HHI in the same time has also changed from 2070.4 points to 1718.3. This proves the fact of the opposite relation as in 2008 we had the 10.8% interest

rate with HHI=1718.3 points. The lower concentration of 2008 also indicates that there was a competition increase on the Lithuanian market.

To prove additionally the relation between interest rate change and concentration, we check the coefficient R^2 of regression analysis and the p-value. These two values will show which selected variables are statistically significant.

The coefficient R^2 shows the proportion of the variation in y (interest) that is accounted for. It has to be bound in the range 0 and 1:

$$0 \leq R^2 \leq 1.$$

$R^2 = 1$ means the 'perfect ratio' obtained only if the data points happen to lie exactly along a straight line; $R^2 = 0$ is indicated as a neutral ratio, indicating that x doesn't fully reflect y (interest). As we can see from Figure 3, the regression R^2 equals 0.01 what means that it does not fully reflect changes of y (interest) and there can be additional external/internal forces also impacting the result. As far as we know, there from banking concentration primary analysis, there are factors that can impact the change of the interest rate also.

Figure 3. Interest rate linear regression results (detalization)

Interest rate . Linear regression							
Regression statistics							
<i>R</i>	0.11375						
<i>R square</i>	0.01294						
<i>Adjusted R square</i>	-0.09674						
<i>S</i>	1.87971						
<i>Total number of observations</i>	14						
11.03 = 7.9123 - 0,0006 * 2620.4							
ANOVA							
	<i>d.f.</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>p-level</i>		
<i>Regression</i>	1	0.41683	0.41683	0.11797	0.73913		
<i>Residual</i>	9	31.79973	3.5333				
<i>Total</i>	10	32.21656					
	<i>Coefficients</i>	<i>Standard Error</i>	<i>LCL</i>	<i>UCL</i>	<i>t Stat</i>	<i>p-level</i>	<i>H0 (2%) rejected?</i>
Intercept	7.91231	3.82852	-2.88962	18.71425	2.06668	0.06873	No
2620.4	-0.00065	0.00189	-0.00597	0.00467	-0.34347	0.73913	No
<i>T (2%)</i>	2.82144						
<i>LCL – lower value of a reliable interval</i>							
<i>UCL – upper value of a reliable interval</i>							

Calculated by author according to the Lithuanian Central Bank data.

The value of R square in Figure 3 in the model is 0.01, showing that only the change of concentration partly impacts the interest rate change. Based, on the result, we can tell that the hypothesis is proven and there is a relation between market concentration and consumer loan interest change. This means that with the increase of the concentration, in our Lithuanian case, if the market share focuses in between 3, the main market players such as Swedbank, SEB, and DNB start to compete on the market by decreasing consumer loan interest rates, attracting customers to take obligations from one of these main financial market giants.

6.

CORRELATION BETWEEN BANK EFFICIENCY AND MARKET CONCENTRATION

The analysis of a correlation between Lithuanian commercial banks' concentration and efficiency was performed by the indexes of ROE and ROA. As was presumed before, the market concentration should have a direct impact on bank efficiency which is tested by the regression analysis. The commercial bank efficiency in 2000–2013 is presented in Annex 1.

The financial performance of banks continues to vary due to differences in the structure of the business, the level of costs and efficiency of assets in terms of income generation. According to the previously reviewed theory, the proposition is that if the return on assets is equal to the interest rate of bank loans, the bank is working not profitably.

Discussing bank efficiency results at the microeconomic level, the efficiency of banks leads to high costs of financial transactions for customers. Banking fees and loan interest rates are higher than the equilibrium value. The low efficiency of banks, ultimately, may lead even to the import of financial services from abroad.

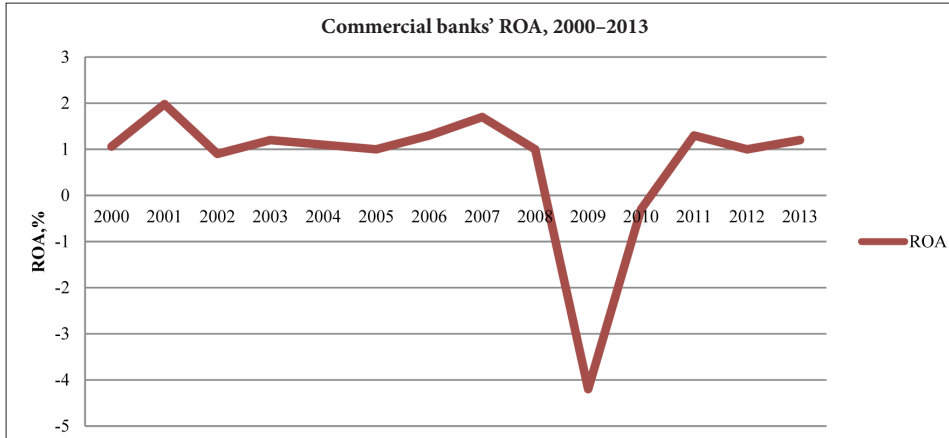
Evaluating the effectiveness of banks requires the solution of a number of fundamental methodological problems. In particular, an adequate analysis of the effectiveness of the bank need to assess the impact which is a result of the interaction of a system of internal and external factors.

External factors, conditions affect the net profit of a bank, which are not in direct contact with the decisions of its management, the cost of borrowed funds (interest rates in the markets of customer deposits, interbank lending, the refinancing rate, currency exchange rates, and the level of the tax burden). As a rule, the bank's management is unable to significantly alter the effects of these factors on the financial results of the bank due to government regulations, competitive pressures and other restrictions.

Internal factors, the level of labor costs of employees of the bank, its administrative expenses, advertising and promotion of the bank allow the bank to change itself by taking appropriate management decisions. To change the influence of internal factors does not usually require regulatory approvals, so the bank is relatively free in making these decisions. Considering the full picture of commercial banks' average efficiency data, we see that ROA was quite stable in 2000–2013 except the years of financial crisis. (Table 11). This reflects a drop of the efficiency ratio starting slowly from 2007 and in 2008 with the most negative result of 2009. Comparing the results of separate banks in Annex 6, we can see that already all banks faced a light drop in 2002. Separately checking the year 2008 to 2010, there is a negative increase in every commercial bank of Lithuania in the ROA value. For example, the Swedbank had a drop from 1.9% in 2008 to – 1.11% in 2009 and to – 0.73 % in 2010. The commercial bank DNB faced a drop from 0.5% to – 3.37% in 2009 and had a slight restore by 2010 to 1.09% as the Swedbank did. Taking an additional example of the fourth largest commercial bank Šiaulių bankas, the result was similar. In 2008, the ROA of the bank was equal to 0.9% in 2009 it dropped to – 1.5% and in 2009 to – 1.1%. For a more precise understanding that the data are significant, we can check one more Lithuanian commercial bank FINASTA in the same period of time. The result is more than obvious: the ROA equals to the value of – 7.3% in 2008 and to – 9.1%. To sum up the results, it is important to say that even smaller commercial banks felt the same effect while the concentration ratio of HHI was also dropping.

As it was already discussed, in the whole picture we see that the efficiency faced most changes during 2008–2010. In Table 12, we see a proof of the relation between the market concentration and efficiency.

Also, we can see the similarities in ROE and ROA results in 2005–2006 (Tables 12 and 13) as their increase is obvious. At the same time, we can fix a change in the concentration ratio of the same period as it also has increased from 1936.4 points to 1950.5 from 2004 to 2005 and up to 2180.3 in 2006. Comparing to the loan interest rate in 2004, there was a slight drop of it by already 0.93% (from 5.67% to 4.7%) in 2005. This change tells us also that banks were getting a better profit on assets and were able to decrease interest rates to customers. The same result can be followed on the example of 2000–2001 years. The ROA of 2001 increased already by 1% as compared to 2000, but at the same time the interest rate dropped from

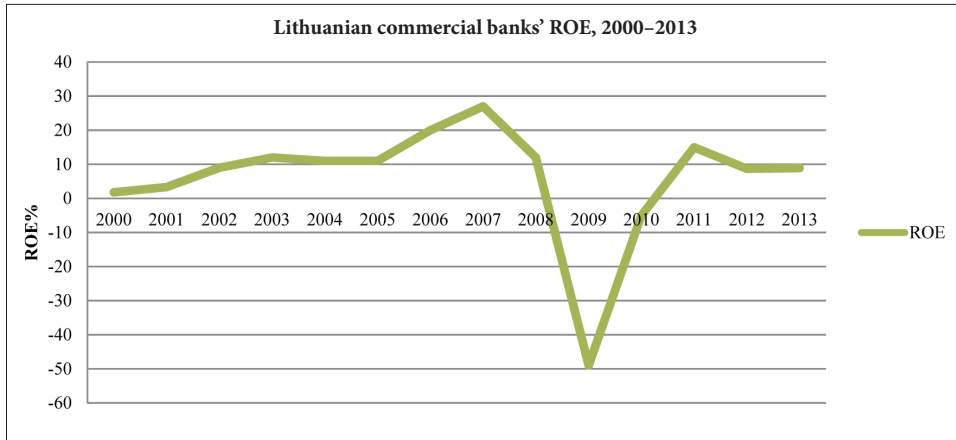
Table 12. Trend of commercial banks' ROA during 2000–2013

Calculated by author according to the Lithuanian Central Bank data.

11.03% to 8.3% from 2000 to 2001, what again proves that the higher efficiency allows to reduce prices. The HHI at the same time did not change strongly. The interest rate decreased from 5.26% in 2011 to 4.47% in 2013. The HHI changed from 1966.5 points in 2011 to 1984.2 points in 2013. The ROA indexes also show a drop in the same period, what means that the concentration has increased, the low competition has a high concentration ratio and causes bank efficiency to increase. At the same time, we see from numbers above the opposite relation between efficiency increase and loan interest drop, what shows that a high competition has a low concentration and causes a loan interest increase.

As bank efficiency can be presented in both return on assets and return on equity, there is a review done by every separate commercial bank of Lithuania. Comparing the average ROE and ROA of Lithuanian commercial banks in terms of 2000 to 2013, they have the same trend. Differently from ROA, ROE started growing from 2005, and the drop of the ratio was more drastic from 2008. After restoring in 2011 it faced one more little drop but kept the same trend of 9–10%.

To compare and understand the full picture, we see that the interest rate in terms of 2007 to 2009 has increased up to its maximum of 10.8%. This again supports that a high concentration makes ROE and ROA increase and the interest drop, and vice-versa.

Table 13. Change trend of Lithuanian commercial banks' ROE, 2000–2013

Calculated by author according to the Lithuanian Central Bank data.

To sum up, there is a straight relation between the market concentration through competition and banks' efficiency and interest rate. To understand and predict future bank actions in behavior and trends if there is no change in the concentration during the upcoming years and the main market players remain the same, banks will not change their pricing a lot; however, if a new market participant will come, banks will have to improve their efficiency to get money to decrease prices on bank products and services. The market concentration itself has a positive and significant impact on the market.

CONCLUSIONS

The paper deals with the nature of changes and evolution in Lithuanian commercial banks' market structure, concentration and output. The theoretical part observes various descriptions of market competition and concentration ratios.

If appropriate regulation and supervision are in place, the competition need not reduce stability. Theory shows how regulation could correct or mitigate the negative effects of competition on stability. Empirical studies show that pro-competitive regulatory changes which reduce restrictions on entry and activity can improve stability measured either as individual bank distress or systemic risk. On the other hand, failures of supervision and regulation are the factors that reduce stability. Waves of financial deregulation and increased competition are found to be detrimental for stability if not accompanied by the appropriate financial regulation. Regulation must take account of market conditions, for example, the effectiveness of standard regulatory tools, such as capital requirements, on bank risk may be affected by market structure.

The available research does not prove that competition caused the crisis that started in 2007. Certainly, competition can reduce margins. Competition could increase risk taking, in particular if the risk taking was not controlled by the appropriate regulation. But the data of both the theoretical and the empirical literature are too ambiguous to draw clear conclusions. With a few exceptions, most studies focus on individual bank stability, which is very different from the systemic crisis observed since August 2007.

The effects of size and structure on stability may be separate from their effects on competition. Permitting larger financial institutions might not necessarily lead to a lower degree of competition, but larger institutions do seem to take more risk on their portfolios. Whatever the reason for the increased risk, whether it is a compensation for their improved diversification or exploitation of being too big to fail, more attention should be devoted to the issue of the optimal size for financial institutions. The casual observation that the larger banks were also the ones kicking off and experiencing most troubles during the recent crisis seems to support

this conclusion. If the principal objective of the public policy is to avoid another systemic crisis, this goal would counsel against increasing bank concentration and creating larger banks which are clearly too big to fail, because these steps may reduce stability.

The arising ideas of commercial banks of the Lithuanian market concentration relation to banks' consumer loan and efficiency are tested through theoretical and empirical parts. The main findings can be covered as follows. First, bank competition can be improved during a short period with interventions of authorities and restrictions regulating market-entering barriers, attracting foreign companies to establish their branches of a certain market area. Second, competition differs across market structure, depending on the type or level of concentration. In case of a high concentration, commercial banks can tend to cartels; however, if the authorities' regulation is strong, banks start compete in a fair way. To ensure banks' stability in case a new market player comes, there should be a regulation declared, obligating banks to have a certain level of property, assets, to prevent a rush reaction on market concentration change. As an example, financial crises could be taken; then banks had to increase interest rates strongly. The negative short-term effect of assets increase will be price increase, but in the longer time period it will ensure stability. The empirical relationship between banks' concentration ratio and banks' ROA / ROE shows that a highly concentrated market focuses on efficiency increase which drives down bank consumer loan rates. The results suggest that a higher concentration can also imply a lower interest rate, but only in case banks have enough assets. Basically, a high concentration is the result of a low competition where the main players can control or keep higher prices, until one of the players has enough property and reserves to decrease price and to gain a bigger market share. Finally, the concentration in commercial banks has a positive effect on bank profitability.

Estimating the concentration ratio calculation results during the observed time and their maximum and minimum rates, we go over assumption that the Lithuanian banking segment is quite concentrated. The values of CR3 concentration are in the range of 81–60%, what means an oligopoly competition, especially in the past years. The HHI value is almost over 1.800 points and is appointed as highly concentrated.

Basing on the regression analysis result, the interest rate is taken as y , the dependable variable which is 'driven' by the independent variable HHI (x). The result

shows that there is an opposite statistically significant relation between interest rate and market concentration in the Lithuanian commercial banks' market, which means that the lower is the concentration, the higher is the interest rate. As an example of relation in 2008, we have the interest rate increase up to 10.08% versus to 2007 when the interest rate was 8.61 %. The concentration ratio HHI in the same time has also changed from 2070.4 to 1718.3 points. This proves the fact of opposite relation as in 2008 we had a 10.8% interest rate with the HHI = 1718.3 points. The lower concentration of 2008 also indicates that the competition in the Lithuanian market increased.

Also, we can see similarities in the ROE and ROA results by 2005–2006 as both increased obviously. At the same time, we can fix a change in the concentration ratio of the same period as it also has increased from 1936.4 points to 1950.5 from 2004 to 2005 and up to 2180.3 in 2006. Comparing to the loan interest rate in 2004, there was a slight drop of it by already 0.93% (from 5.67% to 4.7%) in 2005. This change tells us also that banks were getting a better profit on assets and were able to decrease interest rates to customers. The same result can be followed on the example of 2000–2001 years. The ROA of 2001 increased already by 1% as compared to 2000, but at the same time the interest rate dropped from 11.03% to 8.3% from 2000 to 2001, what one more time proves that a higher efficiency allows to reduce prices. The HHI at the same time did not change strongly. The interest rate decreased from 5.26% in 2011 to 4.47 % in 2013. The HHI changed from 1966.5 points in 2011 to 1984.2 points in 2013.

To sum up, there is a straight relation between the market concentration through competition and banks' efficiency and interest rate. To understand and predict the future bank actions and trends if there is no change in the concentration during the upcoming years and the main market players remain the same, banks will not change their pricing a lot; however, if a new market participant will come, banks will have to improve their efficiency in order to get money to decrease prices on bank products and services. The market concentration itself has a positive and significant impact on the market. In three tested regression models, we have found a relation of interest, ROE and ROA with the market concentration change.

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APPENDICES

Appendix 1

ROA/ROE results of separate commercial banks during 2000–2013

ROA	AB SEB	AB SWED-BANK	AB DNB	AB SIAULIAI	AB SNORAS	UAB MEDICINOS BANKAS	AB FINASTA	UKIO BANKAS
2013	0.9	3.0	2.9	0.2	Bankrupcy	0.3	-0.6	
2012	0.5	1.8	0.8	0.5		0.5	-0.4	-1.0
2011	1.7	3.3	1.0	0.5		-3.1	-9.1	0.0
2010	-0.1	-0.73	-1.09	-1.1	-0.2	-4.1	0.0	-0.7
2009	-6.1	-1.11	-3.37	-1.5	-0.5	0.0	-9.1	-1.7
2008	1.4	1.9	0.5	0.9	0.4	-0.5	-7.3	1.4
2007	2.0	1.6	1.0	1,4	1.3	0.8	1.4	2.1
2006	1.5	1.3	0.7	1.0	1.2	0.8	2.8	1.6
2005	0.8	0.9	0.8	0.8	1.0	0.9	28.6	0.9
2004	1.2	1.7	0.6	0.6	0.6	0,8	3.0	0.5
2003	1.7	1.2	0.6	0.7	0.5	0.9	3.2	0.5
2002	1.7	1.8	0.4	0.9	1.1	0.7	6.2	
2001	1.3	2.9	0.7	1.0	0.4	1.5	0.1	
2000	1.6	2.2	0.6	1.1	1.0	1.2	0.1	

ROE	AB SEB	AB SWED-BANK	AB DNB	AB SIAULIAI	AB SNORAS	UAB MEDICINOS BANKAS	AB FINASTA	UKIO BANKAS
2013	8.7	18.9	4.0	3.4	Bankrupcy	3.1	-11.3	
2012	5.7	13.2	6.5	4.8		5.5	-7.6	-9.1
2011	19.5	27.6	7.5	4.6		-36.1	-5.0	0.2
2010	-0.7	-7.54	-14.7	-9.5	-3.2	-36.3	0.3	-7.8
2009	-79.6	-10.7	-45.9	-11.2	-7.5	0.4	-31.4	-14.8
2008	16.2	45.1	7.5	6.2	4.4	6.5	-25.3	29.2
2007	25.6	55.2	14.7	10.1	14.2	10.6	6.4	42.1
2006	19.7	31.5	10.8	9.0	14.9	7.5	2.9	26.8
2005	9,0	12.0	16.0	9.0	17.6	4.8	21.2	15.5
2004	10.7	17.9	10.5	7.1	5.4	3.7	32.0	7.1
2003	14.0	16.0	8.8	7.4	3.7	3.8	11.8	4.5
2002	15.1	16.1	8.6	8.4	7.7	3.6	20.1	
2001	11.2	25.3	10.2	6.3	1.5	5.5	19.6	
2000	15.3	19.6	9.8	4.5	3.7	4.4	17.4	

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