

The Effect of Bank Competition on the Cost of Credit: Empirical Evidence from the Visegrad Countries

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Abstract: The effects of bank competition on the cost of credit are a much-debated topic in Small and Medium enterprises financing. In this paper, we would like to examine the relationship between the cost of credit and interbank-competition in the context of Visegrad countries - the Czech Republic, Poland, Hungary, and the Slovak Republic. The dataset of this paper comes from two different sources, the firm level data provided by the latest version of the Business Environment and Enterprise Performance Survey that was conducted by the European Bank for Reconstruction and Development and the World Bank during 2012 to 2014, and the country level bank competition measures are collected from the Global Financial Database, updated in 2017 [3]. We have examined bank competition with four measures, including structural bank concentration measure and three non-structural (Lerner Index, H-Statistics, and Boone Index) measures. We find evidence that bank competition has a positive effect on the cost of credit and hence, our results are in-line with prior literature on information-based theories of bank competition. We have also assessed the firms in terms of their information opacity (micro, small, and medium), and we find that the cost of credit is higher for the information opaque firms. Thus, firm sizes have important implications for bank competition and cost of credit.

Keywords: Cost of credit; bank competition; SME; Visegrad countries

1 Introduction

The small and medium enterprises (SMEs) are the integral of many developed and developing countries, as they generate most of the employment and business activities. However, the growth of the SMEs is largely depended on the availability of external finance. The limited access to bank finance for the SMEs has been an issue that is far from settled in both advanced and emerging countries. The role of banks in facilitating the credit services to the business sectors are extremely vital for the development of private business sectors and for the economic welfare of a country. The banking market structure is considered as one of the important elements that can have a significant effect on the access to finance for firms and to reduce financial constraints.

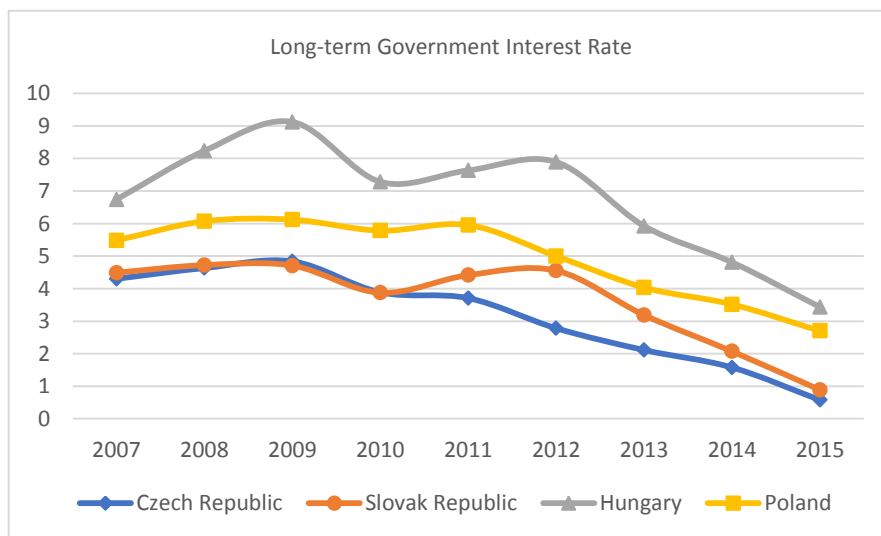
It is well documented in the prior literature that SMEs are facing problems in accessing bank loans due to information asymmetry. The reduction of information asymmetry can increase access to finance for SMEs, reduce loan interest rate, lower collateral requirements and overall facilitates the availability of finance [2] [6] [20] [27] [28]. However, the influence of information asymmetry on reducing financial constraints can be affected by the nature of bank market structure, for example, competition and concentration in the market. The literature on competition-based studies argued the effect of bank competition from two different perspectives. At one hand, the *market power hypothesis* suggests that the bank competition can increase access to finance, reduce interest rates and lower collateral requirements for SMEs [7] [26] [22]. The theory is based on the general economic assumption that higher competition can lower the cost of credit and enables better access to finance. Therefore, *the market power hypothesis* considers interbank competition is preferable for the SMEs by which financial constraints can be alleviated. On contrary, the *information hypothesis* suggests that banking competition can increase financial constraints for firms due to a high asymmetric information and agency costs. The *information hypothesis* argues that higher competition reduces bank incentive to invest in relationship lending and hence higher financial constraints due to more asymmetric information between banks and borrowers [13] [37]. A few literatures discuss that a high competition reduces bank quality of loan screening process [33], and reduces bank incentives in relationship-based lending technologies [23]. Overall, the *information hypothesis* argues that the intensive bank competition is not desirable for SMEs, as it increases financial constraints.

Regardless of the conflicting views on bank competition and financial constraints on SMEs, a great deal of empirical research tested bank market power and information hypothesis in different markets. The banking concentration has a positive effect on financial constraints for SMEs, thus supporting the market power hypothesis [2]. On the other hand, assuming bank competition is opposite to concertation, it is found that the bank concentration has a positive effect on access to finance for SMEs, hence lower credit restrictions [38].

While several studies examined the effect of bank market power in relation to access to finance [29] [41] [1] [31], in this paper, we intend to follow a different path by examining the effect of bank market power on the cost of credit for SMEs. By using the World Business Environment Survey (WBES) [4], shows that the high cost of credit is the first and foremost problems for SMEs that restrict the firms to access bank loans. Therefore, considering the importance of the cost of credit in SME financing, the objective of this current paper is to understand the association between bank market structure and its effect on pricing of SME loans.

In Figure 1, we can see the long-term government bond interest rate in the Visegrad countries. The purpose of this figure is to analyse how the interest rates have evolved over the time during the pre-and post financial crisis in the Visegrad countries. The figure shows that in the beginning of the financial crisis (2007) the interest rate in the Czech and Slovak Republic was about 4%, and the rate increased by about 1% in 2009. However, we can see that the interest rate declined for both countries in 2010. The interest rate for both Hungary and Poland is higher than the Czech and Slovak Republic. The interest rate significantly increased in Hungary during the financial crisis, from about 6.5% in 2007 to about 9% in 2010. It could be the fact that the government was providing incentives to the investors to invest in the local bonds to collect funds to invest in the banking and other sectors. In Poland the interest rate is quite stable during the after the financial crisis, which is about 6% until 2011. However, the interest rate declined steadily after 2012 for all Visegrad countries.

Figure 1
Long-term government interest rate



Source: OECD (2015)

The current research is based on the Visegrad countries (the Czech Republic, the Slovak Republic, Poland, and Hungary). We have selected the Visegrad group on purpose because the Visegrad countries are strategically important for the European Union. On top of that, we can provide cross-country evidence from the central European countries. This paper contributes to the existing literature on the cost of credit and bank market competition in several ways. First, the competition measures of this paper are a combination of structural and non-structural measures. Second, the sample of firms are from the Visegrad countries and so far, this research is the first empirical evidence from the Visegrad group in relation to the cost of credit and bank market structure. Third, we provide a new evidence based on firm information opacity and its impact on the cost of credit.

The rest of the paper is organized as follows. Section 2 discusses the current literature on market power and its implications on access to finance and cost of credit. Section 3 presents the data set and describes the variables and empirical methodology. Section 4 discusses the descriptive and estimation results. Section 5 concludes the paper.

2 Literature Review

From a theoretical perspective, lending to SMEs requires to build-up a long-lasting relationship by which it is possible to acquire soft-information and to minimize information gap. The decrease of information asymmetry or information mismatch may positively affect access to finance for SMEs and hence minimal financial constraints. However, in competitive market banks have less incentives to provide loans based on relationship banking, because in a competitive environment a borrower can easily switch from one bank to another. Hence the minimum value added to the bank from investment in relationship banking [9]. Nevertheless, when a bank has market power it can try to develop a long-lasting relationship with the borrower by which a bank can extract exclusive private information from the borrowers [38]. Information based theory suggests that a bank can give-up immediate rent or profit margin from borrowers when they have market power, but they can take the advantage later when the bank will have superior authority over the borrowers [38]. However, the situation is opposite for banks that are operating in a competitive market. They may ask for the higher rate of interest from the borrowers' due to competitive pressure. The authors proposed that the bank market power can increase the investment in relationship banking that simplifies information asymmetry and alleviates financial constraints for SMEs. However, different authors argues that, banking competition gives opportunity for the bank to develop a more private banking relationship with the borrower and invest more in relationship lending technologies. In doing so a bank can create its superiority over other lenders by eliminating price competition [30].

The current research on banking literature examined the effect of bank competition and concentration from different perspectives such as access to finance, cost of credit, collateral requirements, financial constraints, discouraged borrowers and so on. The studies related to access to finance and bank market power provide evidence that high bank concentration can increase financial constraints on SMEs, hence, excessive bank competition is related to a greater access to finance. In this regard, [2] examined the effect of banking concentration and its effect on access to credit in developing countries and found that banking concentration is associated with higher financial constraints for SMEs. A study by [13], provided evidence from a sample of SMEs in 119 emerging countries and found that banking concentration is associated with higher financial constraints and thus, they supported the view of market power hypothesis and suggested that in emerging markets high concentration is not desirable. Similarly, [32] found that bank market power reduces access to credit for SMEs with respect to 53 developing countries. However, they argue that the negative effect of bank market power is reduced depending on the countries that are financially developed and well-structured credit market. Likewise, they find that availability of a credit information sharing system can diminish the effect of bank market power.

The empirical research on bank competition-based studies argues that the choice of competition measures can affect significantly on the outcome of results and the interpretation of results may differ by the competition indicator [11]. Therefore, it is an important issue to select the competition measure that best explains the bank market structure of the country. However, the appropriate selection of competition measure is a debatable issue in bank finance research, because different countries have different banking systems and that can affect the results of any cross-country research.

A few recent empirical studies analyzed structural and non-structural measures of competition by which they can enhance the validity and robustness of the research. [30] examined credit constraints in 69 developing countries by including both structural and non-structural measures (Concentration ration, Lerner index, Boone and H statistic) of competition and the paper finds that bank competition can alleviate credit constraints for SMEs. The results show that the banks evaluate loan applications less strictly when competition is higher. On the other hand, countries with less bank competition face higher credit rationing due to high bank concentration. [11] used Panzar – Rosse H - statistic as a proxy for bank competition measure in their analysis of 16 countries and they find that bank competition has a positive effect on the growth of firms those are largely depended on bank finance and the result is true for countries those have high competition in the market. Hence, bank competition can facilitate access to finance and growth of firms. [42] provides more evidence on bank market power and financial constraints from a sample of 20 European countries and they find that the bank competition relates to lesser credit restrictions on SMEs. To measure financial constraints, they have used the [17] investment sensitive model and the

Lerner index is used to capture the market power and it is found that in a competitive market SMEs are less sensitive to their investment policy. [7] examined the effect of bank competition and access to finance through the availability of trade credit in Spain and the authors show that in a competitive market SMEs have more access to trade finance and hence, supporting market power hypothesis. [34] examining the relationship between bank competition and the availability of finance in the Italian market and find that bank competition has a positive effect on SMEs access to external credits. Thus, they find that bank competition can minimize financial constraints on SMEs.

While most of the papers examined the issue of access to finance and bank competition, a few studies are done on how bank competition affect the pricing of loans. The preliminary research by [38] reported that bank competition has a positive effect on the cost of credit and that means that higher the competition higher is the cost of credit. [42] used a sample SMEs from 20 European countries and they have used two-structural and two non-structural measures of competition. The results reveal that the bank competition can increase the cost of credit. The authors also observed the effect of competition on the pricing of loans based on firm information opacity and they find that small and medium firms need to provide more interest rate on their borrowing than the large firms. It is argued that small firms encounter the information problems more than the large firms and thus competition has a harsher effect on the firms that are depended on relationship-based lending. Therefore, the above studies are supporting the information hypothesis of bank competition. However, [22] showed that bank competition can relax the lending terms by reducing collateral requirements and interest rates on loan contact. Hence, empirical studies on bank competition and its relationship with the cost of credit are mixed and that is why we have chosen to examine the issue in the context of Visegrad countries.

3 Data, Method and Variables

3.1 Data

This paper utilizes data from the Business Environment and Enterprise Performance Survey (BEEPS) that was conducted by the European Bank for Reconstruction and Development and the World Bank during the period of 2012 to 2014. The survey is performed to understand the overall business environment and the enterprises' performance-related factors in 30 transition and emerging countries including European, Central Asian countries and Russia. The survey covered 1,374 firms in four examined countries – 254 from the Czech Republic, 310 from Hungary, 542 from Poland, and 268 from the Slovak Republic.

According to the aim of the paper, the small and medium enterprises are defined, under the Convention of the Organization for Economic Co-Operation and Development (OECD) and the guidelines are given in the survey, as enterprises with a maximum of 250 employees. After refining the dataset by excluding the missing variables and the large firms from the sample size, the analysis involves 1,296 records about firms for descriptive statistics, and 230 firms have disclosed information about the cost of credit in the survey. Regardless, of the firm-level data from the BEEPS survey, we have collected the country level competition measures data from the [3], Global Financial Database, which is updated in 2017.

3.2 Variables

To analyze the impact of bank competition on the cost of credit for SMEs, we have collected the cost of credit information from the BEEPS survey question “Q46 - What is the annual nominal interest rate (in percent) of the most recent line of credit of loan”. The Cost of credit is our main dependent variable in the context of the research. A detailed list of variables is presented in Table 1.

In this paper, we have a few firm-level control variables such as Firm size (Size), Firm age (Age), Largest Owner (Largest Own), Borrower Experience (Experience), Audit (Audit), and Innovation (Innovation). Firm size (SIZE) is counted based on the number of full-time employees the firm had during the BEEPS survey. We assume to find an inverse relationship between the size of the firms and the cost of credit because the larger firms would face lesser information opacity problem than the smaller ones and can access loans with a lower interest rate [24] [35]. We control for firm age (Age), which is measured by years the firm is in operation. We also expect to find an inverse relationship between firm size and the cost credit, because the older firms may have a better business relationship with the banks and other external lenders due to their long existence in the market and hence, they may access loans with better credit terms, such as lower interest rate [5].

In this current paper, we also control for firm ownership structure and its effect on the cost of credit. As per the agency theory, firms having concentrated ownership and those operated and controlled by the same individual have less and sometimes may have zero agency costs [16] [25]. Thus, we presume to find a negative relationship between ownership concentration and the cost of credit. Because less agency cost may reduce the credit risk of the firm, and may induce lenders to provide loans with a lower price. Additionally, we control for borrower experience and its effect on the cost of credit. Borrower experience is counted by the number of years the top manager within the current business or related businesses. It is found that the cost of credit is lower for an experienced borrower than of the younger borrower [35]. Because, an experienced borrower can maintain the business better than an inexperienced borrower and hence, it signals lower credit

risk of the firm. Therefore, banks and other external lenders can provide loans with lower interest rates. On the other hand, [21] contend that an experienced borrower can have more bargaining power with the creditors in compared to an inexperienced borrower and which may lead to a lower cost of credit. Hence, we expect to find a negative relationship between the cost of credit and borrower experience. Afterwards, we control for firm financial reporting status and its relationship with cost of credit. We measure financial reporting status of the firm with audit (Audit) report. The Audit is a dummy variable that takes one if the business has an audited financial statement and zero otherwise. It is widely discussed in prior literature that when a firm has its financial statement audited by external auditors, it can help to minimize information asymmetry between firms and the creditors and thus can receive loans with lesser credit restrictions [34] [30] [39]. Therefore, we expect to find a negative relationship between the audit report of the firm and cost of credit. Because a third party certified financial statements may increase lenders confidence on the borrower and provide loans with a lower cost of credit. Finally, we control for firm innovation activity and its impact on the cost of credit. It is argued that innovative firms are more information opaque compared to the non-innovative firms. Thus, innovative firms face higher credit restrictions than the non-innovative ones [18] [29]. Considering the above theoretical arguments surrounding the innovative SMEs, we expect to find a positive effect of bank competition on the cost of credit.

Table 1
Definition and sources of variables

Variable	Definition	Source
Cost of credit	Annual interest rate on loan	BEEPS
<i>Firm-level control</i>		
Size	Size of the firm, measured as the number of full-time employees	BEEPS
Age	Age of firm, measured as the number of years that the firm has been operating	BEEPS
Largest. Own	Percentage ownership of the firm held by the largest shareholder	BEEPS
Experience	Experience of top manager measured in years	BEEPS
Audit	Equals 1 if the firm financial statement is checked by external auditors (0,1)	BEEPS
Innovation	Equals 1 if the firm has introduced any new products within the last three years	BEEPS
<i>Competition measures</i>		
H-stat.	A measure of the degree of competition	Beck et al. (2000)
Lerner	A measure of market power in the banking market	Beck et al. (2000)

Boone	A measure of the degree of competition based on Profit - efficiency in the banking market	Beck et al. (2000)
CR5	The asset share of the five largest banks in total banking system assets	Beck et al. (2000)

Source: This table presents variable definitions and sources of the data set. BEEPS = Business Environment and Enterprise Performance Survey.

3.2.1 Competition Measures

The goal of the current research is to inspect the relationship between bank competition and the cost of credit and thus, it is necessary to select appropriate measures of bank competition. The literature on competition-based studies classified bank competition into two segments: structural indicators and non-structural indicators. With respect to structural indicators, the theory suggests that the excessive concentration in the banking sector can be considered an opposite to bank competition and in a concentrated market a bank can ask for higher loan rates from the borrower by which it can generate more profits than in a competitive market. The commonly used structural bank competition measure is concentration ratio, which is in inverse proxy of competition and is proxied by asset share of the largest five banks in the overall banking market (Cr). We intend to use concentration ratio as a measure of structural measure of bank competition.

Apart from the concentration ratio, in this paper, we have employed three (Lerner index, H statistics, and Boone index) non-structural measures of bank competition. The Lerner index captures the market power of a bank and that is analyzed by the difference between output prices and marginal costs of inputs. The output prices are observed by total bank revenue in terms of its assets, and the marginal costs are calculated from an estimated translog cost function of three inputs (labor, physical capital and deposits; a detailed methodological explanation is cited in [31] with respect to output. The greater values of the Lerner index are associated with a lesser bank competition. That means that when a bank can set higher prices over the costs, it has more market power. Because in a competitive market, it would be difficult for a bank to charge higher prices than the marginal costs due to competition from other banks.

In this paper, we further introduced Panzar-Rosse H statistics [37], which is also a commonly used competition measure in banking literature. The Panzar-Rosse model measures the elasticity of bank revenues to its input prices and it shows that under certain condition the prices of inputs vary conditional on the intensity of competition in the market. The H statistics value gives information about the degree of competition in a market and by which it is possible to understand the competitive nature of the banking industry in a market [37]. When a market operates under a perfect competition, the H-statistic equals 1. Whereas under a monopoly, an increase in input prices results in a rise in marginal costs, a fall in output, and a decline in revenues leading to an H-statistic less than or equal to 0.

And, H-statistic is between 0 and 1, when the banking sectors operate under monopolistic competition.

Finally, the competition measures we introduced in this paper is the Boone index. Boone [8] introduced a model grounded on the price elasticity of profits to marginal costs. To measure the elasticity, the log of profits (measured by return on assets) is regressed on the log of marginal costs. The estimated coefficient (computed from the first derivative of a trans-log cost function) is the elasticity. Hence, the more negative is the Boone indicator, the greater is the degree of competition because the effect of reallocation is stronger. The basic intuition of the model is that only the efficient banks can earn a higher level of profits in terms of their costs. Additionally, the model explains that the propensity of earnings increases with the competitive nature of the market. That means that, as the market gets more competitive the efficient banks can generate more profits than of the inefficient banks. The Boone indicator is intensively used in the banking literature because it has some advantages over other competition measures [31] [30] [12]. The Boone indicator can reflect the dynamics and non-price related factors in the market, however, there is a limitation exists in Boone index. The Boone index shows the intensity of competition for the overall economy or as a country in total, but it does not capture the regional differences within the country. Hence, the index may not be not well fitted when performing analysis on a large country. Since the regional differences in a banking environment may create differences in overall countrywide banking competition measures. To make the empirical results more understandable, in this paper we used the inverse of Boone index that means that higher the values of Boone index higher is the competition.

3.3 Methodology

The aim of this paper is to examine the relationship between bank competition and the cost of credit in the context of the Visegrad group. The cost of credit is a continuous variable and as a result, we intend to use an OLS regression model that is the best fit for our purpose. The empirical model to be examined as follows:

$$Y_{fct}(\text{cost of credit}) = \beta_1 \text{Firm level controls}_{fct} + \beta_2 \text{Competition}_{ct} + \varepsilon_{fct}$$

Where Y is the cost of credit, and fct represent firm (f), country (c), and time (t). In our baseline model, we have *Firm-level controls* (size, age, ownership, etc.); *Competition* indicates one of our competition measures, and ε_i Is the usual error term. In our model, the impact of bank competition is indicated by β . As already discussed elsewhere, the higher values of competition measures are associated with a lower level of competition (Cr and Lerner) and higher values competition measures are associated with higher levels of competition (Boone index and the H statistics). That can also be said that three of our competition measures are an inverse proxy of bank market competition. Hence, if $\beta > 0$ that means higher

concentration is associated with higher cost of credit and if we find a $\beta < 0$, that means higher concentration is associated with lower cost of credit.

4 Results

4.1 Descriptive Statistics

In Table 2, we present the descriptive statistics of our full sample. The Table shows that the average cost of credit is about 8.15% of our sample. However, the maximum cost of credit is about 70%, which is tremendously high. This preliminary result may highlight that the SMEs sometimes need to pay an extremely high price for their loans, regardless of the nature of competition in the banking sector. Considering the firm level determinants of the cost of credit, we see that an average firm employs 33 employees and hence it could be said that most of the firms in our sample are in the range of small firms (10-49). If we consider the firm age, it is possible to see that the average maturity of the SMEs is about 18.5 years. However, the sample suggests that the firm age ranges from 1 to 81 years. That may highlight that our sample covers both mature and just newly established firms. As per the ownership structure of firms, we find that SMEs are highly concentrated with 77% of concentration, hence that may reflect that SME owners are more likely to keep their control over the firm by holding a large share. In terms of borrower business experience, we can see that the mean experience of the borrower is about 21 years. Considering the borrower experience, we may find a negative association with the cost of credit because an experienced borrower may have more bargaining power in comparison to the inexperienced borrower. The descriptive statistics suggest that about 34% of SMEs in our sample have their financial statement audited. The audited financial statement can have a significant impact in determining the cost of credit since, it shows the quality of the firm's financial information also reduces information asymmetry. With respect to innovation, we can see that about 31% of the SMEs have introduced new products within the last three years. The result may reflect that the SMEs in our sample countries are not actively participating in innovation activities.

With respect to the competition measures, we find that the banking sector is highly concentrated in our sample with a five-bank concentration ratio of 68.42% (CR). On the other hand, we can see that the Lerner index was in between 0.13 to 0.40 during the survey period, and H statistics show that it ranges from 0.61 to 0.70, whereas, Boone index was 0.01 to 0.16.

Table 3 shows the cross country analysis of cost of credit and the differences in competition measures in our surveyed countries and compared with the EU average and also with OECD countries.

Table 2
Descriptive statistics (Total sample)

Variable	Obs.	Mean	Std. Dev	Min	Max
Cost of credit	230	8.15	7.27	0.00	70.00
<i>Firm characteristics</i>					
Size	1296	32.91	45.53	1.00	245.00
Age	1292	18.34	8.87	1.00	81.00
Largest. Own	1267	76.38	26.21	0.00	100.00
Experience	1228	20.41	9.86	1.00	57.00
Audit	1286	0.34	0.47	0.00	1.00
Innovation	1295	0.31	0.46	0.00	1.00
<i>Competition⁵ measures</i>					
CR5	1296	68.42	13.41	53.66	88.52
Lerner	1296	0.29	0.09	0.13	0.40
H-stat.	1296	0.63	0.05	0.61	0.73
Boone	1296	0.07	0.05	0.01	0.16

Note: Firm level variables are authors calculation based on the BEEPS survey and competition measures are obtained from the Beck et al. (2000) GFDD database.

The table shows that the average cost of credit in the Visegrad countries is about 8.63 % and the lowest interest rate in the Visegrad countries is in the Czech Republic, which is about 5.7%. The interest rate is about 7.06% in the Slovak Republic and for both Hungary and Poland the rate is about 10.81 and 10.84%, respectively. With respect to the average of EU and the OECD countries, we can see that the interest rate is about 3.6 and 3.91% respectively. Therefore the data clearly shows that the interest rate in the Visegrad countries are significantly higher than the other EU and OECD countries. The higher interest rate in the Visegrad countries may impose significant barriers for the SMEs to borrow funds from the external market and that can deter their business growth.

The level of bank concentration (CR5) is extremely high in the Slovak Republic, which is about 90.17%. That might reflect that the borrowers in the Slovak Republic have very limited alternative options to look for external funds where they can bargain for favourable loan terms. In the Visegrad countries, Poland has the lowest level of bank concentration that is about 54.05%. That shows the banking sector in Poland is relatively competitive in compared to the Czech, Slovak or Hungarian banking sector. We can see that the concentration in the Slovak Republic is also higher than the average of the EU and OECD countries. On the other hand, the concentration in other three countries (Czech Republic, Hungary and Poland) are lower than the EU and OECD average. Considering the H-Stat, Lerner index and Boone index, we can see that the H stat is also higher in the Slovak Republic than the other three Visegrad countries, and the result is also

higher than the EU average and OECD average. The Lerner index is comparatively higher in Poland (0.45) and in Czech Republic (0.42) than the Slovak Republic and Hungary and also in compared to the mean of Visegrad countries as well as the EU and OECD countries. The higher Lerner index may reflect that the banks in these countries are able to maintain their product prices higher than their cost of input prices. Therefore, we can assume that the banking sector in the Visegrad countries is comparatively less competitive than the other EU and OECD countries.

Table 3

Cross country analysis of average cost of credit and bank competition measures

	Mean Cost of Credit (%)	Mean Bank Competition Measures			
		H-stat.	Lerner	Boone	CR5
Czech Republic	5.79	0.61	0.42	0.04	78.84
Slovak Republic	7.06	0.74	0.30	0.00	90.17
Hungary	10.81	0.61	0.33	0.07	72.53
Poland	10.84	0.66	0.45	0.02	54.05
Mean V4 Countries	8.63	0.66	0.37	0.03	73.90
European Union (27)	3.6	0.65	0.21	0.05	81.08
OECD Countries	3.91	0.62	0.19	0.02	79.53

Source: Interest rate is based on the BEEPS survey and the all other data is collected from Beck et al.(2000) Global Financial Database.

4.2 Empirical Results

In Table 4, we present the regression results for each of the competition measures and their relationship with the cost of credit. As already discussed, Cr and Lerner index indicate that higher values of competition measures are related to lower levels of competition and conversely, H statistics and Boone index (inverse values of Boone index are used in this paper) suggest that higher values of competition measures are associated with higher levels of competition in the market. In column 1, we see that the coefficients of Cr are negative, similarly, in column 2, the coefficients of the Lerner index are also significant and negative. We find that the coefficients of H statistics are negative but not statistically significant (column 3).

Finally, the results for Boone index shows a positive significant result with the cost of credit (column 4). Hence, if we consider the results for the first two competition measures, it suggests that the higher concentration is negatively related to cost of credit and from the results we may say that the higher level of concentration can help the firms to get loans with lower interest rates. However, the cost of credit is higher when market competition is excessive. The competition

results of our paper corroborate the information hypothesis, where we argue that the competition does have a positive impact on the cost of credit, due to less benefit of banks in investing relationship lending. Hence, lack of information increases the cost of credit for borrowers. The results for Boone index suggest that the high competition in the market can increase the cost of credit and thus our results for all competition measures are in line with the information hypothesis, apart from the H statistics. Therefore, we may say that market competition is not helpful to reduce the cost of credit, rather a concentration structure of the banking system in the Visegrad group is more suitable to reduce the cost of credit for the borrowers. Our results suggest that the structural and non-structural competition measures have similar implications on the cost of credit and the selection of competition measures does not distort the interpretation of our results. The results of this paper are in line with recent literature on bank competition and the cost of credit. [19, 38] who have also found that high bank competition increases the cost of credit and which is mainly driven by the information problems associated with SMEs.

With respect to the firm level controls, we find that firm size has a negative impact on the cost of credit and the results are stable for all competition measures. Thus, the result suggests that larger firms may have easy access to finance with a lower cost of credit due to their more bargaining power than of the smaller firms or the large firms are more transparent and information asymmetry may not have a detrimental effect on the large firms' credit availability. In terms of firm age, the results show that the cost of credit is higher for the larger firms than of the smaller firms. The results are opposite to our expectation. We expected a negative association with firm age and cost of credit due to their mature business status and that might give the aged and older firms a better credit contract from the bank with a lower cost of credit. However, this result could be the fact that the banks charge more interest rates on their loans from the mature and older firms because they are able to give more interest on their borrowing than of the younger and newborn firms. We have found a positive relationship between the ownership structure of firms and cost of credit, but the results are not statistically significant across our four competition measures. However, we did not find any significant effect of borrower experience, audit, and innovation activities of firms on the cost of credit.

Table 4
Main estimation results

	Dependent variable = Cost of credit			
	CR5	Lerner	H-Stat.	Boone
Competition	-0.123***	-22.056***	-12.637	39.55***
	(-0.039)	(5.310)	(9.680)	(10.058)
Size	-0.0363***	-0.037***	-0.0341***	-0.038***
	(0.011)	(0.010)	(0.011)	(0.01)
Age	0.209***	0.245***	0.246***	0.25***
	(0.011)	(0.056)	(0.058)	(0.057)

Largest_own	0.006	0.010	0.000	0.009
	(0.018)	(0.017)	(0.018)	(0.017)
Experience	-0.031	-0.063	-0.052	-0.069
	(0.048)	(0.047)	(0.049)	(0.0477)
Audit	-0.388	-0.357	-1.091	-0.383
	(1.028)	(0.997)	(1.0156)	(1.002)
Innovation	(-0.573)	0.130	-0.559	-0.15
	(0.948)	(0.941)	(0.968)	(0.938)
Constant	15.143***	12.830***	14.714**	3.66***
	(3.33)	2.405	6.494	(2.03)
R_Squared	0.37	0.41	0.33	0.4

Source: Authors estimation. Dependent variable: cost of credit. Statistical significance at the 10%, 5% and 1% level indicated by *, ** and ***, respectively. Standard errors are in parentheses.

4.3 Empirical Results by Firm Information Opacity

The literature on information-based study suggests that the smaller firms experience the negative effect of competition more than the larger firms. The intuition is that the small firms are more information opaque and hence they need to develop a long-lasting relationship with the banks and by which it is possible to alleviate the information gap between banks and borrowers. However, when there is an intense competition in the market it reduces the bank's incentives to invest in relationship lending because in a competitive environment a borrower can easily switch from one to another bank. Hence, the switching behavior of borrowers is reducing the bank benefits of investment in relationship lending [38] [39]. Based on the above argument, we intend to examine whether market competition does affect the cost of credit of the SMEs due to their information opacity. To test the firm level information opacity, we have segmented the firms according to their sizes (micro, small and medium) and depending on the competition in the market we may expect to find a greater positive association between the cost of credit and micro firms and a lesser impact on the smaller and medium firms. The empirical results are presented in Table 6 and 6.

The results in Table 5 suggest that the effect of bank competition measures on the cost of credit differs according to the firm sizes. Our results suggest that the concentration ratio (Cr) has a positive impact on the cost of credit for micro firms, while a negative effect on the small and medium firms. It could be the fact the in a concentrated market micro firms have fewer alternative options for loans and more importantly, micro firms may not be able to get loans with lower rates not only because of information opacity but also due to their limited capacity in providing collateral or business guarantee [39, 40]. The results for Lerner index suggest that in a concentrated market micro firms provide a lower cost of credit than of the small or medium firms. Hence, the results do support the information

hypothesis that the micro and opaque firms face the negative effect of bank competition more than the medium firms.

The coefficients for the Boone index (Table 6) is positive and statistically significant for the micro and small firms and we did not find any effect of Boone index on the medium firms. These results also support the information hypothesis and we can say that micro and small firms are facing higher loan rates in a competitive market than in a concentrated market. Therefore, information asymmetry can be a significant factor in determining the cost of credit, which is also depended on the nature of the market structure in the Visegrad countries. The results for H statistics is not statistically significant for the micro and medium firms but we have found a negative effect on the medium firms. The results of the H statistics were not significant in our main estimation, but we did find a negative association with the cost of credit, that may imply that when information gap is lower it can lower the cost of credit for the SMEs and higher competition can increase the cost of credit.

Table 5
Estimation by firm opacity (1/2)

Variable	Dependent variable = Cost of credit					
	CR5			Lerner		
	Micro	Small	Medium	Micro	Small	Medium
Competition	0.038*	-0.101***	-0.283***	-	-	-
	(0.094)	(0.04)	(0.115)	(12.575)	(6.297)	(16.247)
Size	0.317	-0.030	-0.066***	0.367	-0.045	0.058***
	(0.241)	(0.050)	(0.025)	(0.588)	(0.047)	(0.028)
Age	0.195	0.041	0.170**	0.319	0.0326	0.237***
	(0.626)	(0.077)	(0.092)	(0.224)	(0.072)	(0.093)
Largest_own	-0.063	0.012	0.025	-0.014	0.018	0.026
	(0.051)	(0.019)	(0.003)	(0.049)	(0.018)	(0.048)
Experience	-0.204	-0.061	0.045	-0.189	-0.065	0.081
	(0.155)	(0.052)	(0.110)	(0.146)	(0.048)	(0.114)
Audit	4.642	-2.852***	0.107	4.550	-3.531***	0.881
	(2.786)	(0.989)	(2.935)	(2.619)	(0.910)	(3.479)
Innovation	2.32	-0.211	3.290	2.673	-0.287	-1.584
	(2.436)	(0.978)	(2.986)	(2.311)	(0.919)	(2.951)
Constant	6.82	16.596***	26.958***	13.760***	19.463***	7.366
	(8.489)	(3.741)	(10.653)	(6.777)	(3.098)	(7.444)
R_Squared	0.33	0.43	0.56	0.44	0.53	0.47

Source: Authors estimation. Dependent variable: cost of credit. Statistical significance at the 10%, 5% and 1% level indicated by *, ** and ***, respectively. Standard errors are in parentheses.

Table 6
Estimation by firm opacity (2/2)

Variable	Dependent variable = Cost of credit					
	H-Stat			Boone		
	Micro	Small	Medium	Micro	Small	Medium
Competition	14.30463 (23.644)	-10.538 9.713	-55.040* (29.388)	39.252* (22.95)	54.118*** (12.18)	33.73597 (29.24)
Size	0.284 (0.622)	-0.019 0.051	-0.060*** (0.026)	0.220 (0.60)	-0.050 (0.05)	- 0.064*** (0.03)
Age	0.307 (0.236)	0.078 0.077	0.246*** (0.09)	0.306 (0.23)	0.037 (0.07)	0.243*** (0.09)
Largest_own	-0.058 (0.622)	0.009 0.019	0.016 (0.05)	-0.034 (0.049)	0.021 (0.018)	0.029 (0.047)
Experience	-0.200 (0.154)	-0.084 0.052	0.038 (0.112)	-0.191 (0.150)	-0.072 (0.048)	0.060 (0.114)
Audit	4.62 (2.772)	-3.298*** 0.991	1.439 (3.247)	4.821** (2.696)	-3.491*** (0.914)	1.520 (3.446)
Innovation	2.240 (2.429)	-0.316 1.004	-3.664 (2.624)	2.566 (2.380)	-0.528 (0.926)	-1.472 (2.709)
Constant	-0.453 (16.880)	16.034*** (6.658)	41.624*** (20.497)	4.224 (7.221)	6.972*** (2.225)	2.468 (6.292)
R_Squared	0.33	0.38	0.53	0.39	0.52	0.49

Source: Authors estimation. Dependent variable: cost of credit. Statistical significance at the 10%, 5% and 1% level indicated by *, ** and ***, respectively. Standard errors are in parentheses.

Conclusions

The bank competition and its implications on financial constraints have been an on-going topic in economic literature. The theory of market power hypothesis suggests that bank competition should relax financial constraints by reducing the interest rate on loans, collateral requirements and enhances access to credit to firms. In contrast, the information hypothesis predicts that bank competition can have a significant negative effect on access to credit and can increase financial constraints due to high information asymmetry between firms and banks. Because, in a competitive market, banks are reluctant to invest in relationship lending technologies and hence increases financial constraints due to a high asymmetric information.

In this paper, we examined the effect of bank competition on the cost of credit by using a sample of SMEs from Visegrad countries (Czech Republic, Slovak Republic, Hungary and Poland). To examine the information problems associated with bank competition and the cost of credit, we have used four proxies of bank

competition: concentration ratio, Lerner index, Panzar-Rosse H statistics and Boone index. The results of our paper suggest that the bank competition is associated with higher cost of credit and thus, our results are aligned with existing literature on information hypothesis of bank competition that high bank competition increases financial constraints on SMEs. Therefore, we reject the view that the bank competition can relax the lending terms and enhances access to finance.

We have also segmented the firms in terms of their sizes as per the intuition that micro and small firms may face higher credit restrictions than of the medium or large firms due to information opacity and bank competition. Our results do support that micro and small firms need to provide higher loan rates than of the medium firms. Hence, we find evidence that the effect of bank competition in increasing the cost of credit is larger on the firms those are financially opaque and need to access loans via relationship lending.

The policymakers may implement policies by which excessive bank competition can be alleviated from the market and that can lower the lending rates in the Visegrad countries. It could also be helpful to remove market barriers so that SMEs can access loans with lower restrictions. The effect of bank competition may be lessened by improving the financial literacy of the borrowers and by doing so the borrowers can prepare better loan proposals and more importantly the borrowers can keep their business accounting records more efficiently. Future research can be done to check how country-specific factors affect the cost of credit on borrowing. Additionally, whether banks are charging higher prices not only for high competition in the market but also is there any factors that force them to charge high prices needs to be investigated.

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