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The firm-specific and macroeconomic determinants of the financial structure of construction companies in selected European countries

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Abstract: This research builds on previous studies in the field of financial structure and develops knowledge for the construction industry in eight selected countries in Central and Eastern Europe – Visegrád Group, Austria, Bulgaria, Slovenia, and Romania. The aim of the research is to examine the influence of profitability, asset structure, the GDP growth rate and the reference interest rate on the level of total, long-term and short-term debt of companies. The research period is from 2009 to 2018. The main conclusion of the research is the finding that the amount of debt of selected construction companies is most affected by the determinants of the external environment – the development of the economy and the reference interest rate. This conclusion applies regardless of the size of the companies. The direction of the resulting impact differs, as each of the economies underwent a different economic development during the period under review. The interest rate negatively affected the amount of debt of Polish, Romanian and Hungarian companies, given the higher interest rates in these economies; the remaining companies have a positive impact. The impact of the GDP growth rate on the amount of debt is mainly negative for Romanian companies regardless of size, medium-sized Polish and Austrian companies, and large Czech companies; a positive effect was found for the remaining companies. Economies have grown for most of the period under review, and negative impacts may mean taking advantage of profits, which usually grow during periods of prosperity and are a cheap source of funding. This does not necessarily mean economic problems and, as a result, declining debt due to the unavailability of debt financing.

Key words: Asset structure, construction, financial structure, GDP, reference interest rate, rentability

JEL Classification: G32

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Introduction

During their life cycle, companies need different financial amounts to fund their business activities. The capital or financial structure captures how these activities are financed. The second concept is important for this research – the financial structure, which includes all corporate sources of funding. These resources are usually divided into own and debt ones, as well as long-term and short-term. One of the basic responsibilities of every financial manager is to choose the optimal ratio of own and external sources of financing. Also, as it comes to research, this topic has been constantly discussed by economists for almost a century. Due to the large amount of literature, it can be assumed that there is no universal theory of capital structure, as stated by Myers (2001). However, there are several basic sources economists draw from. The first is the work of Modigliani and Miller from 1958, "The Cost of Capital, Corporation Finance and the Theory of Investment". This work is considered the basis of modern corporate finance and the authors claim that whether the company is in debt or not has nothing to do with the value of the company and the cost of capital. This work is followed by other authors, from which two basic theories of capital structure emerged. Brealey et al. (2011) and the trade-off theory seek the optimal amount of debt using a balance between tax benefits and the cost of possible financial distress. On the other hand, Myers (1984) and the pecking order theory created a "ranking" of funding sources considering clearly own resources to be preferred to external ones.

These three basic sources were followed up and still are followed by other authors. As a result, new theories, new models, new determinants and new approaches to the formation of capital structure have emerged. From the beginning, economists focused mainly on highly developed countries and often listed companies, where data availability was an advantage. Over time, economists have begun to address other companies, especially in other countries such as China (Chen, 2004), Nepal (Gajurel, 2006), India (Handoo and Sharma, 2014), Bosnia and Herzegovina (Bajramović, 2017), Vietnam (Vo, 2017 and Huong, 2018), and Nigeria (Yinusa et al., 2017). This was an important turning point; when examining the capital/financial structure, the results depended on the selected country, selected industry, selected sample of companies and its size, the size of the companies themselves and, last but not least, an important aspect was also the fact whether the economies were examined individually or were put into one panel. In that case, the results cannot be generalized to individual economies.

The aim of this research is to determine the influence of four selected determinants on the financial structure of construction companies in eight selected economies. Specifically, it is the effect of profitability, asset structure, GDP growth rates and the reference interest rate on the amount of total, long-term and short-term debt of companies.

The contribution of the research was to be based on the size of the sample, which includes a total of 54,637 companies from eight European economies. Of the total number, there are 50,792 medium-sized companies and 3,845 large and very large companies. Two panels are created for each country according to the size and these are then subjected to testing. If we look at previous research, the authors in most cases focused on a certain sample of companies – such as 10, 20, 100 companies or listed companies, etc. Analysis of such a large sample is not very common. At the same time, the division into individual economies and sizes is not common. For example, Klapper et al. (2002), Hernádi and Ormos

(2010, 2012), and Hanousek and Shamshur (2011) also deal with the economies of Central and Eastern Europe, but the economies are examined as a whole, so the effects in individual countries cannot be seen, which is quite limiting.

The authors are also motivated by the lack of more studies for the countries of Central and Eastern Europe and at the same time for the construction industry. The authors found only a few studies analyzing only construction. A very small number of studies were found which included construction, but as part of a panel of several different sectors, and again the results are quite limiting, as the results can only be applied to the whole sample and not to the individual industries and countries.

There is therefore considerable scope for research to examine this industry on its own. At the same time, it is important to constantly expand knowledge for individual determinants, as external determinants in particular are again not large in selected countries and overall, the resulting coefficients are statistically insignificant, and therefore it is necessary to include these determinants as much as possible in research to make recommendations.

The remainder of this paper is organized as follows. Section 1 provides a review of the literature. Section 2 includes the characterization of the research methodology, data, and variables. Section 3 describes the results of the analysis of variable dependencies. Section 4 presents the conclusions.

Literature overview

As indicated in the introduction, the choice of the ratio of own and external resources is one of the basic activities of the finance department of each company. It must be said that the financial or capital structure and the decision on its form are influenced by a number of factors. These determinants can be divided into those that affect the capital structure within the company and those that come from the external environment of the company. Factors from both of these groups are represented in this research. Specifically, this research will examine the impact of profitability, asset structure, non-debt tax shield, macroeconomic development and the reference interest rate on debt level, which will take three forms – total, long-term and short-term. This chapter will then discuss previous studies that address these determinants. At the same time, the literature search will focus more on the countries analyzed in this research (V4, Austria, Bulgaria, Slovenia, Romania). Before analyzing the specific determinants, it is worth noting that all factors can have both positive and negative impact on the debt level.

The impact of profitability differs, according to the two basic theoretic concepts mentioned in the introduction. Trade-off theory assumes a positive impact of profitability on the indebtedness level, as with the growth of profitability, companies should not face the risk of bankruptcy and thus the costs of possible financial distress should decrease. It is obvious that if a company does not appear to be problematic with certain risks, its indebtedness may increase. This impact has been confirmed in studies by e.g. Klapper et al. (2002) for 97,000 small and medium-sized companies from the Czech Republic, Bulgaria, Poland, Hungary, Romania, Slovakia and Slovenia, Pinková (2012) for medium and large Czech automotive companies for the period 2006–2010, Aulová and Hlavsa (2013) for 16,075 Czech agricultural companies for the period 2004–2010, Mokhova and Zinecker (2013) for Slovenian companies for the period 2006–2011, Růčková (2015a, 2015b, 2017)

in the Czech Republic and Hungary for energy, manufacturing and construction companies for the period 2006–2014, and Škuláňová (2020) in Hungary for mining companies for the period 2009–2017. On the contrary, the pecking order theory assumes a negative impact of profitability on the indebtedness level, which is evident from the financing sources' ranking. The leading position is held by internal resources, which in the case of increasing profitability, may be, e.g., retained earnings. This connection has been confirmed, by e.g. Nivorozhkin (2002, 2005) for 12,000 Hungarian companies during 1992–1995 and for Bulgarian, Czech, Polish and Romania companies during 1997–2001, Bauer (2004) for 74 Czech companies for the period 2000–2001, Weill (2004) in Bulhagia, the Czech Republic, Hungary, Poland and Romania for 1996–1998, De Haas and Peeters (2006) for countries from extended V4 without Austria for 1993–2001, Delcoure (2007) in the Czech Republic, Poland a Slovakia during 1996–2002, Črnigoj and Mramor (2009) for Slovenian companies for the period 1999–2006, Hernádi and Ormos (2010, 2012) for 26,868 small and medium-sized companies from Central and Eastern Europe for 2002–2007 and for 498 companies from the same countries during 2005–2008, Jõeveer (2013) for listed and unlisted companies from the Czech Republic, Bulgaria, Hungary, Poland, Romania and Slovakia during 1995–2002, Mokhova and Zinecker (2013) for extended V4 except Slovenia during 2006–2011, Prędkiewicz and Prędkiewicz (2015) for 12,241 Polish small and medium-sized companies, Růčková (2015b, 2017) in Poland and Slovakia for construction and manufacturing companies during 2006–2013, and Škuláňová (2020) in Slovenia and Bulgaria for mining companies for the period 2009–2017.

In the case of asset structure, a positive impact on long-term debt and a negative impact on short-term debt are usually expected. The positive impact was confirmed, for example, by Klapper et al. (2002), Nivorozhkin (2002), Delcoure (2007), Hernádi and Ormos (2010, 2012), Mokhova and Zinecker (2013), and Škuláňová (2020) in Australia. On the contrary, the negative impact was stated by Klapper et al. (2002), Nivorozhkin (2002), Mokhova and Zinecker (2013), and Škuláňová (2020) in Hungary and Slovenia. This expectation is based on the choice of the variable this determinant is usually represented by, and that is the ratio of tangible assets to total assets. Tangible assets are those a company can use as collateral for additional indebtedness, such as a mortgage for a production hall. At the same time, intangible assets cannot be used as collateral, and in the event of problems in the company, these assets are very difficult to sell, as stated by Titman and Wessels (1988). However, in the case of this determinant, of course, there may be different impacts that arise due to several pitfalls associated with this factor. There is one important thing in the construction industry. In the case of long-term debt, rather negative impact can be expected, as this sector is characterized by a large number of inventories that cannot be used as collateral for long-term loans, as confirmed by Růčková (2015a) in Poland, the Czech Republic, Hungary and Slovakia for construction companies for the period 2006–2013. At the same time, this research may have different impacts in samples of the UK companies, as it has been found that market-oriented financial systems tend to have a negative impact, while banking-oriented systems tend to have rather positive impact (Antoniou et al., 2002 for companies from Germany during 1987–2000, the United Kingdom for 1969–2000, France during 1983–2000 and Acedo-Ramirez and Ruiz-Cabestre, 2014 for British, French, Italian, Spanish and German companies for the period 1998–2008).

As for the impact of the GDP development on debt levels, it is necessary to be aware of how the economic cycle works in order to explain the effects. As it expands, corporate profits grow, bankruptcy risk declines, the outlook is optimistic, and indebtedness alone

does not seem so risky and may rise. Conversely, in a recession, companies have more difficult access to credit, which usually reduces debt. However, it is the growth in profitability and positive forecasts that may result from the use of internal resources. The reason is the composition of the company's profit, which also includes retained earnings, which are an advantageous source for financing business activities, and therefore the debt may decrease. Negative binding was confirmed by the following authors: Cheng and Shiu (2006) for 45 countries during 1998–2001, Bastos et al. (2009) in 388 companies from Mexico, Brazil, Argentina, Chile and Peru during 2001–2006, Bokpin (2009) for 34 emerging countries for 1990–2006, Hanousek and Shamshur (2011) for listed and unlisted companies from V4 during 1996–2006, Jõeveer (2013) for listed and unlisted companies from the Czech Republic, Bulgaria, Hungary, Poland, Romania and Slovakia during 1995–2002, and Mursalim and Kusuma (2017) for 94 Indonesian companies during 2008–2012. On the contrary, a positive relationship was found by Hanousek and Shamshur (2011), Salehi and Manesh (2012) for 59 Iranian companies during 2001–2006, Çekrezi (2013), and Mursalim and Kusuma (2017) for 153 Malaysian companies for the period 2008–2012.

Given the interest rate definition, it is obvious that companies will prefer to get most debts at the least cost – the lowest possible interest rates. There are several studies that have addressed this variable. Yinusa et al. (2017) in the case of 115 Nigerian non-financial listed companies during 1998–2012 stated that most developed economies have low-interest rates; on the other hand, developing countries often have very high rates, and therefore, short-term loans prevail. At the same time, these groups of countries differ in the quality of the institutional, legal, and regulatory environment. As a result, a positive link between interest rates and debt is expected in developed countries, while a negative link is expected in developing countries. Unfortunately, the results of other studies so far do not show much to these statements of Yinusa et al. (2017). Khémiri and Noubbigh (2018) dedicated themselves to five sub-Saharan countries (South Africa, Ghana, Kenya, Nigeria, Zimbabwe) during 2006–2016. None of those countries is developed, and yet the resulting coefficients are positive. The reason for this is the selected rate, which is nominal in this case, and thus reflects inflation, which has also been shown to have a positive relationship. Therefore, the relationship between debt and the interest rate is positive. Çekrezi (2013) examined 53 non-listed companies from Albania during 2008–2011, also not being a developed country, but the resulting relationship was positive. For developed countries, they are represented by the United States in Hatzinikolaou et al. (2002) by companies from the Dow Jones Industrial Index during the time period 1978–1997. However, even here the resulting link did not meet expectations, as positive dependence was not expected.

Despite the fact that the GDP and interest rate coefficients are often statistically insignificant, it is worth using these determinants because eight countries are tested in this research and at least some of them could be statistically significant, which would contribute to extending existing knowledge.

Data and methodology

This research deals with companies of eight economies – the extended Visegrád Group (the Czech Republic (CZ), Slovakia (SK), Poland (PL), Hungary (HU), Austria (AT), Slovenia (SI), Romania (RO), and Bulgaria (BG)). The extended Visegrád Group was

selected due to the lack of studies considering these countries. Companies belonging to the group F – Construction according to the NACE classification are the subject of the research. This sector was selected with regard to the fact that the impacts of two external determinants are also analyzed. Construction output is considered an indicator of economic development, so there is a close link to the GDP growth rate. At the same time, this research is part of a broader research project examining individual industries, primarily from the primary, secondary and tertiary economic sectors. This group is further divided into three divisions – Construction of buildings (residential dwellings), Civil engineering (e.g. roads, canals, bridges, pipelines) and Specialized construction activities (e.g. demolition, painting, roofing activities, plumbing services).

The sample examined contains all companies of the Orbis database belonging to this sector. In total, there are 54,637 companies, which are divided by size (according to the Orbis database). Of the total number, there are 50,792 medium-sized companies and 3,845 large and very large companies. In addition to the Orbis database, the World Bank databases for GDP time series and the National Bank databases for interest rate time series were also used. The research deals with the entire industry, regardless of the division during the period from 2009 to 2018.

Table 1. Number of construction companies in individual divisions of the industry

	CZ	SK	PL	HU	AT	SI	BG	RO
	Medium-sized companies							
Construction of buildings	4,255	1,014	7,749	1,348	2,327	355	1,841	3,889
Civil engineering	655	257	2,098	597	147	110	655	775
Specialised construction activities	6,809	1,719	4,801	1,169	4,800	487	1,192	1,743
Σ	11,719	2,990	14,648	3,114	7,274	952	3,688	6,407
	Large and very large companies							
Construction of buildings	214	72	916	106	386	51	94	306
Civil engineering	156	45	325	67	57	35	81	139
Specialised construction activities	111	104	235	45	190	16	34	60
Σ	481	221	1,476	218	633	102	209	505

Source: Author's calculations based on data from database Orbis.

In Table 1, we can see the distribution by individual divisions, countries and sizes. This table shows that most companies are operating in Poland. If we look at Table 2, which shows the latest available data (unfortunately from 2016) on annual production in this sector, we can see that Poland dominates.

Table 2. Annual production value of the construction industry in 2016 (in million Euros)

CZ	SK	PL	HU	AT	SI	BG	RO
25,788.4	8,877.4	57,494.4	7,931.8	46,387.9	4,062.9	5,916.2	17,190.2

Source: Statistics from web portal Statista.com.

The aim of this research is to determine the influence of four selected determinants on the financial structure of construction companies in eight selected economies. Within this goal, four research questions were created:

- RQ1: For total debt, we expect a negative link with profitability and asset structure; and a positive link with GDP growth.
- RQ2: For long-term debt, we expect a negative link with profitability and asset structure; and a positive link with GDP growth.
- RQ3: For short-term debt, we expect a negative link with profitability, asset structure and GDP growth.
- RQ4: What is the impact of the external financing sources' price on the used financing sources?

Variables

The endogenous variable takes three forms – total (DER), long-term (DER_L) and short-term debt (DER_S), which is expressed by using the debt-equity ratio, which is the ratio of company liabilities and equity. The form of liabilities depends on the form of indebtedness.

There are four exogenous variables – profitability (ROA), asset structure (SA), economic development (GDP) and reference interest rate (IR). Profitability is represented by the return on assets, which is the ratio of profit to total assets. Because eight economies with different taxations are compared, profit is expressed as pre-tax profit and interest. As already mentioned in the literature review, there are several indicators for the determinant of asset structure. The most common one is used in this research – the ratio of tangible fixed assets and total assets. The development of the economy is in the form of the GDP growth at market prices and the interest rate is the reference interest rate of the economy. Specifically, these are the used reference interest rates: two-week repo rate (CZ)[3], main refinancing operations (SK, AT, SI)[4], reference rate (PL)[5], central bank base rate (HU)[6], base interest rate (BG)[7] and monetary policy rate (reference interest rate to August 2011) (RO)[8].

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[4] European Central Bank – Key ECB interest rates. Available from: https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html

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[6] Magyar Nemzeti Bank – Base rate history. Available from: https://www.mnb.hu/en/Jegybanki_alapkamat_alakulasa

[7] Българска народна банка – Key Interest Rates and Yield on Government Securities. Available from: https://www.bnb.bg/Statistics/StMonetaryInterestRate/StInterestRate/StIRKeyIRAndYieldOnGS/index.htm

[8] Banca Naţională a României – NBR's Interest rates – Monthly values. Available from: https://www.bnr.ro/StatisticsReportHTML.aspx?icid=801&table=665&column=

Methodology

The only method used in the analysis of the relationships between endogenous and exogenous variables, panel regression, is suitable when the size of the examined sample and the number of variables are considered. However, a simple panel regression is not a suitable tool in this case, as the ten-year time series is relatively short and results become unclear. In addition, the need to have stationary time series may lead to the selection of some time series, as claimed by Průcha (2014). For this reason, a two-stage Generalized Method of Moments (GMM) is used for the analysis. This model eliminates the shortcomings of a simple panel regression – it is suitable for shorter time series, there is no need to verify the stability of data, the model includes checking of the error correlation, and conversely, does not have to include a strict exogenous variable (Arellano and Bond, 1991). Unfortunately, each model has its pitfalls. The GMM method cannot test the heteroskedasticity and autocorrelation of variables, so in order to trust the results, it is necessary to perform a robustness test – there are several of them. In this research, the Sargan test is used, which should show the extent to which the method is able to provide almost the same results in a given model, even if we change the parameters slightly. If its final value is higher than 0.05, the model is robust and has its informative value.

The equation for this research looks like this:

$$DER_{it} = \alpha_0 + \beta_1 * DER_{it-1} + \beta_2 * ROA_{it} + \beta_3 * SA_{it} + \beta_4 * GDP_{it} + \beta_5 * IR_{it} + \varepsilon_{it}; \quad (1)$$

where the endogenous variable, as mentioned above, is expressed by using the debt-equity ratio (DER_{it}), which in this case is for the i-th number of firms in the given economy in the given sector during the period t (2009–2018). It was also mentioned that this variable has three forms for three forms of debt – total, long-term and short-term. In the equation, we can see the individual determinants – ROA, SA, GDP, IR, which were described above. Furthermore, in the equation, there are symbols α and ε, which denote the constant and the so-called random component of the model, in which all other determinants of the financial structure are hidden. The last variable included in the equation is the lagged value of the endogenous variable (DERit-1), which is automatically generated by the model itself. This variable allows the modelling of the partial adaptation mechanism in a dynamic model. All-time series are presented on annual frequencies and also, the endogenous variable will be lagged by one year.

Economic development in individual economies

This section briefly describes the development of eight selected economies during the period 2009 to 2018. During this ten-year period, the world or the European economies were affected by several events. At the beginning of the considered period, there was a financial crisis, which began a year earlier and had its origins in the United States, from where it spread throughout the world. In Europe, this crisis was smoothly followed by the European debt crisis, which was mainly linked to the southern countries and Ireland. In 2013, economies around the world slowed their growth and in 2018, world demand fell. Each of the eight countries being examined in this research responded differently to these events, and in addition to all, the economies had other internal problems they had to deal with. However, despite some economic difficulties, good GDP growth rates can be observed in Table 3 for most of the period analyzed. The following paragraphs will very briefly summarize the key facts from the economic development of selected countries.

More detailed comments will be provided on the coefficients themselves, provided that macroeconomic variables (GDP, interest rate) are statistically significant.

Table 3. The development of the GDP growth rate in individual economies (in %)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
CZ	-4.80	2.27	1.78	-0.80	-0.48	2.72	5.31	2.45	4.35	2.96
SK	-5.46	5.72	2.86	1.90	0.67	2.75	4.82	2.12	3.04	4.03
PL	2.82	3.61	5.02	1.61	1.39	3.32	3.84	3.06	4.94	5.15
HU	-6.70	0.66	1.82	-1.47	1.96	4.20	3.85	2.20	4.32	5.09
AT	-3.76	1.84	2.92	0.68	0.03	0.66	1.01	2.08	2.48	2.42
SI	-7.55	1.34	0.86	-2.64	-1.03	2.77	2.21	3.12	4.83	4.12
BG	-3.59	1.32	1.91	0.03	0.49	1.84	3.47	3.94	3.81	3.08
RO	-5.52	-3.90	2.01	2.08	3.51	3.41	3.87	4.80	7.11	3.95

Source: World Bank Database.

The countries of the extended Visegrád Group can be divided into two groups according to the degree of severity of the economic problems during the analyzed period. The first group of countries are those economies that were either not affected by the above events (Poland) or showed small and insignificant economic fluctuations (Bulgaria, the Czech Republic, Slovakia and Austria). The Polish economy, as one of the few economies in the world, did not experience an economic downturn and showed a good growth rate, see Table 4. The Bulgarian and Slovak economies were affected by the financial crisis, but insignificantly, growing on average by around 2.5 % per year. The Czech Republic recorded a decline in 2012/2013, which was caused by a decline in household consumption and investment. In Austria, the development of certain economic indicators (debt, unemployment) was not favourable, but apart from the introduction of a deposit guarantee, the economy was no longer constrained.

The second group of countries consists of Hungary, Romania, and Slovenia. Hungary and Romania were hit hard by the global financial crisis and their governments even had to apply for an international loan. In Romania, this loan served to kick-start the credit market and strengthen foreign exchange reserves. The Hungarian economy struggled with poor government management and the orientation of loans that citizens had in foreign currencies (euro, franc), which increased compared to the forint ones during the crisis. The Slovenian economy has been hit by the real estate and mortgage crises, as well as by the banking crisis caused by the state ownership of most banks in the country. However, the local government was able to solve these problems on its own through reforms and no international assistance was needed.

In Table 4 we see the reference interest rates. We see that most economies have achieved low or even zero values of these rates. The reference rates were chosen because they are always reflected in the interest rates of commercial banks, albeit with some delay, as the reference rates determine the interest rates on commercial loans to citizens and companies.

Table 4. The development of reference interest rates in individual economies (in %)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
CZ	1.00	0.75	0.75	0.05	0.05	0.05	0.05	0.05	0.50	1.75
SK	1.00	1.00	1.00	0.75	0.25	0.05	0.05	0.00	0.00	0.00
PL	3.50	3.50	4.50	4.25	2.50	2.00	1.50	1.50	1.50	1.50
HU	6.25	5.75	7.00	5.75	3.00	2.10	1.35	0.90	0.90	0.90
AT	1.00	1.00	1.00	0.75	0.25	0.05	0.05	0.00	0.00	0.00
SI	1.00	1.00	1.00	0.75	0.25	0.05	0.05	0.00	0.00	0.00
BG	0.55	0.18	0.22	0.03	0.02	0.02	0.01	0.00	0.00	0.00
RO	8.00	6.25	6.00	5.25	4.00	2.75	1.75	1.75	1.75	2.50

Source: Czech National Bank, European Central Bank, Narodowy Bank Polski, Magyar Nemzeti Bank, Българска народна банка and Banca Naţională a României.

Results and discussions

Table 5 shows the medians of the individual variables for each economy and company size. The median was chosen with respect to outliers that distort the average. We see that only Polish, Bulgarian and Romanian companies have the debt-equity ratio for total indebtedness below 100 %, which indicates a risk threshold where the amount of equity equals the amount of total liabilities. Austrian and Slovak large companies even exceed the value of 200 %, which means that the amount of the liability is twice as high as the amount of equity. These values do not necessarily mean existential problems for companies, they can only be an aggressive financial policy.

As indicated in the "Literature overview", construction companies should be characterized by more inventories which cannot normally be used as collateral for long-term debt financing. It is clear from Table 5 that companies do not have a huge amount of tangible fixed assets that are used as collateral. The average median for the ratio of the mentioned and total assets for all companies is 17.13 %, for medium-sized companies 15.94 % and for large companies 18.32 %. It is clear from this that companies may have a larger amount of inventories or intangible assets. The relatively low share of tangible fixed assets should indicate a predominance of short-term debt. This assumption is met in most countries, where high debt-equity ratios for short-term debt can be observed in the table below, indicating the predominance of short-term liabilities. Only Austrian companies are clearly dominated by long-term liabilities.

Table 5. Descriptive statistics – medians of individual variables

	DER	DER_L	DER_S	ROA	SA	GDP	IR
CZ medium-sized companies	121.19%	8.52%	90.13%	4.74%	20.87%	1.84%	0.02%
CZ large and very large companies	105.62%	6.96%	83.49%	4.80%	17.41%	1.78%	0.05%
SK medium-sized companies	178.71%	3.19%	145.55%	3.66%	16.66%	2.75%	0.25%
SK large and very large companies	201.42%	13.13%	164.13%	3.65%	10.75%	2.75%	0.25%
PL medium-sized companies	91.80%	0.07%	68.17%	4.64%	8.79%	3.32%	2.50%
PL large and very large companies	122.59%	13.54%	84.24%	4.43%	9.26%	3.32%	2.50%
HU medium-sized companies	100.06%	0.19%	85.20%	6.83%	18.49%	1.96%	3.00%
HU large and very large companies	173.70%	8.49%	128.14%	4.20%	13.62%	1.96%	3.00%
AT medium-sized companies	159.15%	157.42%	0.00%	0.00%	14.78%	1.01%	0.25%
AT large and very large companies	257.53%	247.52%	0.00%	0.79%	20.66%	1.01%	0.25%
SI medium-sized companies	163.95%	11.95%	118.00%	3.66%	21.60%	1.34%	0.25%
SI large and very large companies	183.76%	23.48%	136.62%	2.84%	20.40%	0.86%	0.25%
BG medium-sized companies	76.46%	0.00%	54.30%	5.48%	16.12%	1.91%	0.02%
BG large and very large companies	121.19%	8.52%	90.13%	4.74%	20.87%	1.84%	0.02%
RO medium-sized companies	97.50%	1.98%	67.23%	3.87%	10.18%	3.41%	4.00%
RO large and very large companies	109.85%	15.96%	64.05%	3.31%	33.62%	3.41%	4.00%

Source: Author's calculations based on data from database Orbis.

Tables 6 and 7 show the results of the GMM method for companies of both sizes. Since there are eight selected economies, it is clear that the tables do not include results for all economies for all forms of debt. Unfortunately, the missing models did not meet the robustness condition, and thus they are not reliable and therefore were not included. The values of the Sargan test are shown in Table 6. We can see that all values are smaller than our required value 0.05. First, the results for medium-sized companies will be analyzed, followed by the results for large companies.

The first result we can see in Table 7 is the relationship between the current and past debt. At first sight, it is clear that the values reach tenths or hundredths and at the same time, this relationship is statistically significant in almost all cases. Unfortunately, due to the level of coefficients, these results cannot be considered relevant. There is one exception, for Slovak companies within the short-term debt, where the value of the coefficient reaches a whole number. The relationship is negative, which means that if companies used debt financing in the past, they would try to reduce it in the future. Overall, coefficients with positive values prevail, which means the exact opposite – the use of debt financing in the past will continue in the future.

Table 6. Results of the Sargan test

Medium-sized companies		Large companies	
Total debt		Total debt	
SK	0.0000	CZ	0.0192
PL	0.0001	SK	0.0214
AT	0.0345	BG	0.0000
Long-term debt		Long-term debt	
CZ	0.0081	PL	0.0000
SK	0.0000	AT	0.0147
HU	0.0387	RO	0.0000
SI	0.0000	Short-term debt	
Short-term debt		SK	0.0000
PL	0.0343	SI	0.0000
BG	0.0000	HU	0.0312
RO	0.0000	AT	0.0087

Source: Author's calculations based on data from database Orbis.

Table 7. GMM results for medium-sized companies

Medium-sized companies					
Total debt					
	DER(-1)	ROA	SA	GDP	IR
CZ	0.01[a]			15.56[a]	16.95[c]
HU	0.02[a]		-18.97[b]	119.69[a]	
SI	-0.12[a]	-8.42[a]			453.17[a]
BG	0.06[a]	1.38[a]	-4.87[a]	22.21[a]	
RO		-7.01[c]		-47.06[b]	-655.65[b]
Long-term debt					
PL		-4.20[c]	-4.94[b]	-12.99[a]	
AT	0.13[a]		11.33[a]		301.71[a]
BG	0.13[a]	1,96[a]		7.43[a]	182.04[b]
RO	-0.05[b]		7.42[a]	-5.21[a]	
Short-term debt					
CZ		-2.08[b]	-2.69[a]		
SK	-2.10[a]		3.08[a]	452.39[b]	389.59[a]
HU	0.02[a]	2.36[c]			-80.10[c]
AT		-12.81[a]		-335.13[a]	
SI	-0.03[a]		-23.78[a]	-57.49[a]	

Source: Author's calculations based on data from database Orbis.
Symbols: [a], [b] and [c] indicate significance at 1 %, 5 %, and 10 %.

For profitability, all forms of indebtedness were expected to have a negative impact, such as in Hernádi and Ormos (2010, 2012) and Růčková (2015b, 2017). This assumption was fulfilled by the Czech, Polish, Slovenian, Romanian, and Austrian companies. The negative impact means that these companies will reduce their debt in case the profits increase by using e.g. retained earnings, which can certainly also grow. In addition, for Polish, Romanian and Austrian companies, this claim is reinforced by coefficients for the impact of GDP, which are also negative, which means that if the economy thrives, the debt level will decline. The negative effects of GDP follow the results of the study by Bokpin (2009). Usually, this link is explained by growing profits, which serve as own source of funding. In the Polish economy, this result could be expected, as the economy was doing very well and there was certainly a lot of room for profit growth. Unfortunately, the remaining economies were hit by certain economic problems, but virtually all of them were able to falter and had solid economic growth in at least last five years of the period under review, which could cause a negative link. In the case of Slovenian companies, the negative impact could occur because the Slovenian economy was hit by several successive crises and companies preferred using their own resources, e.g., their profits. There is a slight discrepancy in the Czech companies – a negative impact of profitability, but at the same time, a positive impact of GDP on the amount of debt.

However, expectations were not fulfilled for Bulgarian and Hungarian companies as the positive impact of profitability on the indebtedness level can be observed such as in Pinková (2012) and Aulová and Hlavsa (2013). Also, in this case, these results are supported by the positive effects of GDP on debt. The positive impact of GDP can be found in the studies of Salehi and Manesh (2012) and Mursalim and Kusuma (2017). The Bulgarian economy had a favorable economic development during the period under review, so the positive link is not a surprise. Despite significant problems at the beginning of the period under review, the Hungarian economy has been achieving very good economic growth since 2013. On the other hand, the positive links with these variables may be caused by the increase in debt after the financial crisis in 2009, when firms often borrowed foreign currencies, which weakened significantly after the crisis, thus increasing the debt.

As for the effects of GDP, the impact on Slovak companies remains to be explained. The positive impact on total debt and the negative impact on short-term debt meet our assumptions. Slovakia is also one of the economies that, in addition to 2009 and 2012/2013, achieved a high rate of the GDP growth. As a result, corporate profits could grow, making companies look more creditworthy to creditors.

Another relationship examined was the relationship between the composition of assets and the indebtedness level. For all forms of debt, a negative link was expected with regard to the selected sector. We can see the negative influence in studies of Črnigoj and Mramor (2009) and De Haas and Peeters (2006). Construction companies are expected to have more inventories which usually cannot be used as collateral when applying for debt financing. When analyzing the composition of assets, it was found that all countries except Romania had 20 % to 30 % of tangible fixed assets, which were used as collateral. This ratio is not large enough to leave room for a larger increase in debt. In the case of Romanian companies, this ratio is 50 %, which brings with it a considerable possibility of using collateral for debt financing, as evidenced by the found positive link. The positive impact can be found in studies of Hernádi and Ormos (2010, 2012) and Hanousek and Shamshur (2011). The ratio of inventories to total assets, which is only 13 %, speaks also in favor

of this. As for the remaining companies, the Czech, Slovak and Hungarian companies also had this ratio of 12 % or 13 %. Slovenian and Bulgarian companies had 20 % and 24 %. Austrian and Polish exceeded 30 %, more precisely 32 % and 35 %. These numbers do not confirm the theoretical assumption, which counted on a larger number of inventories at construction companies, thus the resulting links are quite surprising in this respect. On the contrary, these results are in line with the composition of total indebtedness, in which short-term indebtedness predominates.

The last determinant influencing the indebtedness level are the reference interest rates of the selected economies. In terms of results, in the Czech Republic, Slovenia, Austria, Bulgaria and Slovakia, a positive impact of the interest rate on the debt level was found. The reference interest rates fluctuated between 0 and 1 % (with the exception of 1.75 % in 2018 in the Czech Republic). Such low costs of debt financing encourage its increase. On the contrary, the negative impact was revealed in the case of Romanian and Hungarian companies. These two economies are among the ones with the highest interest rates. In Romania, the interest rate was around 4 % with a maximum of 8 %; in Hungary, interest rates were around 3.4 %, with a maximum of 7 %.

As with medium-sized companies, in the case of large companies, the first relationship to be examined is the relationship between the current and past indebtedness. This relationship is statistically significant in almost all cases and the values of the coefficients are very low again, so even here we cannot talk about a significant impact of the variable. It can only be said that a negative relationship prevails, which means that if companies used debt financing in the past, they would try to reduce it in the future.

Regarding the impact of profitability on the indebtedness level, negative expectations were met by Austrian, Romanian and Czech companies such as in Črnigoj and Mramor (2009) and Mokhova and Zinecker (2013). As with medium-sized companies, the results of Romanian and Czech companies are supported by negative coefficients for the impact of GDP. The negative effects of GDP follow the results of studies by Bastos et al. (2009) and Jõeveer (2013). The results of the companies of these two economies are the same as those for the medium-sized companies, so the explanation is the same.

The positive impact of profitability was confirmed by Hungarian, Slovenian and Polish companies. This impact is the same as the impact of GDP on these economies. The positive impact of profitability can be found, for example, in the studies of Klapper et al. (2002), and the positive impact of GDP can be found in the study of Yinusa et al. (2017). The result for Hungarian companies agrees with the results for medium-sized companies. The behaviour of Polish large companies is different as they increase the amount of their debt in the face of growing profits, which usually grow in times of economic prosperity. Medium-sized companies, on the other hand, reduced their debt. The positive impact is also justifiable, as the Polish economy prospered very well throughout the period under review. The positive impact of both profitability and GDP in the Slovenian economy also has its explanation. Slovenia went through a real estate crisis at the beginning of the period under review, followed by a banking crisis. It is obvious that the real estate crisis or the bubble is very much related to the construction industry, which is also a cyclical sector.

Also, in the case of large companies, several coefficients for GDP remain to be explained. The positive impact on Slovak and Bulgarian companies in terms of long-term debt met our expectations, however, the positive impact on Bulgarian companies for short-term

debt did not meet our expectations. The fulfilment of our assumptions is in line with the development of the Slovak and Bulgarian economies. Both economies did not have major economic problems, and thus companies prospered and were able to increase their indebtedness.

Regarding the impact of the asset structure on the indebtedness level, Polish, Hungarian, Slovak, Slovenian and Bulgarian companies met our expectations regarding the negative impact. Again, this effect was expected with respect to the industry. An analysis of assets was also carried out for large companies and we found out that the ratio of tangible fixed assets to total assets was in the range of 20–30 % for Polish, Bulgarian, Slovenian and Hungarian companies, as well as for the medium-sized companies. Romanian companies also deviate in this respect and have as much as 56 %. Austrian (43 %) companies are also close to half. On the other hand, Slovak (13 %) and Czech (19 %) companies have the least of such assets that can be used as collateral. This analysis helps us to explain the resulting negative links for all countries. The negative impact can be found in studies by Bauer (2004), Weill (2004) and Růčková (2015a). At the same time, the analysis of assets showed that a positive impact can be expected for Austrian and Romanian companies, which was confirmed by our models. We can see the positive influence in the studies of Delcoure (2007) and Pinková (2012). The only unexpected effect is the positive effect on Czech companies that do not have a large amount of tangible fixed assets. As with medium-sized companies, large companies were analyzed for assets in terms of inventories. With a few exceptions, large companies have a smaller share of inventories in the asset structure, ranging from 11 to 20 %. Slovak and Austrian companies even reach values of only 7 % and 9 %, while Hungarian companies reach 53 %. These three exceptions are consistent with our results in the model.

The last change examined was the reference interest rate of the economy. All the coefficients are in line with a logical expectation, moreover, they are in the same direction as for the medium-sized companies. Therefore, the explanations are the same as in the case of medium-sized companies. The positive impacts in the Czech Republic, Slovakia, Slovenia, Bulgaria and Austria can be caused by the level of rates in these economies, which, with one exception (the Czech Republic – 1.75 % in 2018) did not exceed 1 % and were rather close to zero. These values brought the advantage of cheap debt financing, which companies probably used, given the positive impact. On the other hand, economies with a negative impact – Hungary, Romania and Poland, are among the economies with rather higher interest rates during the period under review. In Poland, the interest rate was on average 2.6 % with a maximum of 4.5 %; in Romania, the interest rate was around 4 % with a maximum of 8 %; in Hungary, interest rates were around 3.4 % with a maximum of 7 %. Although interest rates in these economies gradually declined over the period under review, the impact of higher rates in the first half of the period probably outweighed them and caused a negative impact.

Table 8. GMM results for very large and large companies

Large and very large companies					
Total debt					
	DER(-1)	ROA	SA	GDP	IR
PL	-0,02[a]		-12,94[a]	93,56[a]	
HU			-16,58[a]		-305,10[a]
AT	-0,36[a]	-6,97[b]	11,83[a]		133,13[a]
SI	0,37[b]	23,28[a]		384,99[a]	147,99[b]
RO	-0,39[a]	-38,58[a]			-625,89[a]
Long-term debt					
CZ	0,02[a]			-258,82[a]	
SK	-0,19[a]		-31,76[a]	201,83[b]	530,66[a]
HU	0,18[a]	4,12[c]		139,33[a]	-80,93[a]
SI		2,31[a]	-3,42[b]		
BG	-0,03[c]			87,61[b]	877,07[a]
Short-term debt					
CZ	0,01[a]	-83,92[b]	27,52[a]		187,44[b]
PL	-0,27[b]	3,61[a]			-39,27[a]
BG	-0,04[a]		-92,59[a]	65,30[a]	
RO	-0,54[a]		20,47[c]	-420,67[a]	

Source: Author's calculations based on data from database Orbis.
Symbols: [a], [b] and [c] indicate significance at 1 %, 5 %, and 10 %.

Conclusion

The financial structure and several selected factors affecting it in companies belonging to the construction industry were the subject of this research. The companies came from eight European economies, which mainly belong to Central and Eastern Europe. Specifically, the Czech Republic, Slovakia, Poland, Hungary, Austria, Bulgaria, Slovenia, and Romania were included in the research. The initial assumptions were tested on a total of 54,637 companies, which were also divided according to the size into medium and (very) large companies. The research period included the years 2009 to 2018. Panel regression and specifically the GMM model were used to determine the impacts of selected factors. The aim of this research was to determine the influence of four selected determinants on the financial structure of construction companies in eight selected economies. Specifically, it is the effect of profitability, asset structure, GDP growth rates and the reference interest rate on the amount of total, long-term and short-term debt of companies.

The main conclusion is that the amount of indebtedness of construction companies of the extended Visegrád Group, within the selected four determinants, is most influenced by the external environment – the development of the economy and the development of the reference interest rate. This conclusion applies regardless of the companies' size. Of course, the observed direction of influence differs from one economy to another, as each

of the economies underwent a different development over the given decade – for example, it was found that in the economies that had higher interest rates for much of the period (Romania, Hungary, Poland), the interest rate had a negative impact on the amount of debt, thus fulfilling the logical assumption: "the higher the cost of debt financing, the lower the interest in this type of financing". The situation is similar for the effect of the GDP growth. With regard to the main conclusion, the results for the effects of GDP growth rates and reference interest rates will be briefly discussed below.

The negative impact of the reference interest rate was found for Polish, Hungarian and Romanian companies. In these economies, interest rates were relatively high during the period under review. The Romanian interest rate averaged 3.6 %, the Hungarian 3.1 % and the Polish 2.5 %. However, the peaks in the first half of the period exceeded 5–6 %. High rates carry high debt costs, which reduced debt as companies preferred to avoid debt financing. In the remaining economies, rates averaged around 0.4 %, indicating very low debt financing costs and explaining the positive effects in these economies.

In terms of macroeconomic development, Czech medium-sized and Hungarian, Bulgarian, Slovak, Slovenian and Polish large companies have shown a positive impact of this variable on debt levels. In addition, this result was supported by the results of the profitability effect for most companies, which also had an unexpected positive impact. These results mean that in times of economic prosperity companies preferred the use of debt financing for their investment activities, as in these times, lenders were very willing to lend to virtually anyone, usually at lower debt financing costs than in times of economic recession. At the same time, if the economy prospers, corporate profits usually increase, which means that the company is profitable and not on the verge of bankruptcy, and thus again becomes attractive to creditors. The countries and companies analyzed performed well during the period under review, so the profit growth and economic prosperity are appropriate. The Hungarian and Slovenian economies have gone through certain economic problems, but for most of the period analyzed, the economy has been growing at a good growth rate of even over 3–5 % year on year. On the other hand, the negative impact of macroeconomic development was revealed in Polish, Austrian and Slovenian medium-sized, Czech large and all Romanian companies. Also, most of these results were in line with the results for profitability. The results indicate that companies, despite the good economic development of their economies, preferred the use of equity (e.g., growing retained earnings) over debt financing. On the one hand, this decision was wise, as a gradual reduction in indebtedness will help companies avoid huge potential problems in future economic recessions or crises. However, using only equity can lead to limited investment activities and lower future profits.

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