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Capital structure and its determinants in companies originating from two opposite sides of the European Union: Poland and Portugal[1]

***Leszek Czerwonka*[2], *Jacek Jaworski*[3]**

Abstract: The aim of the paper is to identify differences in enterprises' capital structure and its determinants in Poland and Portugal. The research applies statistical methods to the financial data of 22,775 Polish enterprises and 36,625 Portuguese enterprises for the years 2010–2017. The research results show that: (i) despite several years of ongoing economic integration in the EU differences in enterprises' capital structure in old and new countries of the community still exist, (ii) in Portugal representing the old EU enterprises are more likely to use debt than in Poland being an emerging EU economy, (iii) in Polish enterprises, tangibility, profitability, liquidity and non-debt tax shield exert a negative impact on debt; while growth and size have a positive impact; in Portugal tangibility and a non-debt tax shield show the opposite, (iv) in both countries industry growth decreases indebtedness of enterprises while financial risk results in higher debt; in addition, in Portugal the capital intensity of industry increases the share of debt in capital structure.

Keywords: capital structure, financial decisions of enterprises, Poland, Portugal.

JEL codes: M20, G32, G20.

Introduction

Searching for and applying appropriate sources of financing is one of the key areas of financial decisions for each enterprise. As a result of these decisions a specific capital structure is shaped by the relationship between equity and debt. This relationship provides two important categories that affect the success or

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failure of an enterprise. On the one hand it affects the cost of capital, i.e. the required rate of return on assets. On the other it shapes the financial risk associated with debt participation in sources of financing (Brealey, Myers, & Allen, 2016; Miglo, 2016; Ross, Westerfield, & Jordan, 2013).

Studies on capital structure already have a rich history and a wide range. They have been conducted for over half a century and include searching for determinants and a theoretical description of the decisions taken, determining the optimal structure of capital, examining the dynamics of its changes and many other aspects related to it (Graham & Leary, 2011; Hasan, 2017; Kumar, 2011). The single market of the European Union (EU) countries is the third largest economy in the world. Economic integration, which has been going on for many years, has eliminated many differences between the members of the community. But does it refer to all of them? One of the most important areas of integration concerns the conditions for the functioning of enterprises. Therefore determining common features and differences in the conditions for shaping the capital structure seems to be an important issue from the point of view of science and economic practice.

Until now extensive cross-sectional studies covering more than one economy have been conducted by Rajan and Zingales (1995), de Jong, Kabir, and Nguyen (2008), Gungoraydinoglu and Öztekin (2011), Chen and Wang (2012), Jõeveer (2013), Mateev, Poutziouris, and Ivanov (2013), Öztekin (2015), Koralun-Bereźnicka (2018). These studies mainly concerned the identification of capital structure determinants at the enterprise, industry and country levels. According to these studies, country-specific determinants explain the 4–10% of variability of enterprises' indebtedness. They include two kinds of factors: institutional and macroeconomic. Prior research indicates that the first is more significant than the second.

The main goal of the paper is to characterise the capital structure of enterprises in two economies: Poland and Portugal, by comparing the statistical distribution of indebtedness of enterprises from both countries and identifying significant determinants of their capital structure at company and industry level. The following features have been used as the premises of the choice of countries for comparison:

- Portugal has been a member of the European Communities since 1986 and boasts a developed economy, Poland became a member of the European Union in 2004 and is still perceived as an emerging market.
- Portugal is a member of the Eurozone and is subject to the common monetary policy while Poland still relies on its own currency.
- Portugal is a relatively small market in terms of the number of enterprises and consumer population and Poland is one of the largest EU economies in this respect.

This characteristic causes the institutional differences in environment of enterprise sector which may influence their capital structure. Apart from the

above-mentioned differences which may affect the financial behaviour of companies in both countries there are also similarities which in turn make these economies comparable:

- Portugal in 1974 (the carnation revolution) chose a democratic direction of development based on an open market after 41 years of dictatorship. Poland made similar decisions fifteen years later after 45 years of communism.
- In 2019 both economies recorded a similar volume of GDP purchasing power parity per capita: $ 33,800 for Poland and $ 33,600 for Portugal (International Monetary Fund, 2020).

Another premise of the research undertaken is the fact that studies on the capital structure of enterprises in both economies has not gone beyond the initial phase of exploration. The most interesting studies of Portuguese enterprises include: Antao and Bonfim (2009), Vergas, Cerqueira, and Brandão (2015), Serrasqueiro, Matias and Salsa (2016), dos Santos Morão Lourenço and Oliveira (2017), Matias and Serrasqueiro (2017). The capital structure (and more generally financing) of Polish enterprises was examined by Campbell and Jerzemowska (2001), Klapper, Sarria-Allende, and Zaidi (2006), Mazur (2007), Kaźmierska-Jóźwiak, Marszałek, and Sekuła (2015), Cwynar, Cwynar, Oratowski, and Stachowicz (2016), Czerwonka and Jaworski (2019), Duliniec and Świda (2021). All these studies were conducted on differently constructed research samples. The examinations were carried out at different times and applied different methods. The narrow scope of the results of these studies as well as the inability to compare them reliably reveals the research gap the filling of which is a challenge for this study.

The paper is based on an attempt to answer the following research questions: (i) What is the statistical distribution of the basic measures of capital structure in both countries? (ii) Which of the fundamental internal determinants of capital structure significantly affect its formation in Poland and Portugal? (iii) What are the differences and common features in the industry-specific capital structure determinants for Polish and Portuguese enterprises?

The detailed research outcomes show that: (i) despite several years of ongoing economic integration in the EU differences in enterprises' capital structure in old and new countries of the community still exist, (ii) in Portugal representing the old EU enterprises are more likely to use debt than in Poland being an emerging EU economy—it concerns especially long-term liabilities, (iii) all classic firm-specific factors exert a statistically significant impact on the indebtedness of enterprises in both economies, (iv) the debt of enterprises in both countries increases with the median of indebtedness of industry but decreases in rapidly growing industries, (vi) the median assets tangibility of industry significantly affects the capital structure only in Portuguese companies. Most of all through identifying similarities and differences of enterprises' capital structure in selected economies the results of this study create a reason for investigation. The capital structure factors identified in Poland are shown

to be consistent with the pecking order theory and in Portugal to correspond more to the trade-off theory which creates a basis for further research related to the testing of the capital structure in both countries.

The paper is structured as follows: The first part is a brief description of the Polish and Portuguese economies that explains the context of the operating conditions of enterprises. The second is a literature review with the theoretical background and characteristics of previous empirical research. Next the methods of the empirical study are described. The fourth part of the paper presents the research outcomes. The paper closes with a discussion on these and conclusions.

1. Polish and Portuguese economies in several numbers

Table 1 presents characteristics of both economies studied using fundamental economic indicators for 2018.

Table 1. Economic characteristics of Poland and Portugal in 2018

Indicator	UM	Poland	Portugal
Population	person	37 977 000	10 279 000
GDP current prices	USD (thous.)	585 816 000	240 901 000
GDP *per capita*, current prices; purchasing power parity	USD	32 005	32 412
GDP growth	%	5.1	2.4
General government revenue	% GDP	41.17	43.01
General government total expenditure	% GDP	41.55	43.47
General government gross debt	% GDP	48.89	120.12
Inflation, average consumer prices	%	1.6	1.17
Unemployment rate	%	3.85	6.99
Total investment	% GDP	20.66	18.13
Gross national savings	% GDP	20.10	17.24
Domestic credit to private sector	% GDP	52.7	97.6

Source: (International Monetary Fund, 2020; World Bank, 2020).

Considering the population the Polish market is almost four times larger than the Portuguese. This ratio is different when comparing GDP. Here the difference decreases to the GDP of Poland being only twice as big as that of Portugal. A fairly large disparity can also be observed in government debt. In

Portugal, it is almost three times bigger in relation to GDP. The share of loans in the private sector is also higher in Portugal. This may mean easier access for enterprises to this type of source of financing. The rest of the indicators are very similar.

Table 2 presents the structures of enterprises in Poland and Portugal. The distribution in the number of enterprises by size is almost the same. In terms of employment and value added large enterprises play a slightly larger role in Poland. However, this difference is not significant.

Table 2. Structure of enterprises in Poland and Portugal in 2017

Characteristics		Poland			Portugal		
		No (unit/%)	**Employment (%)**	**Value added (% GDP)**	**No (unit/%)**	**Employment (%)**	**Value added (%)**
Enterprises in total		1 695 991	100.00	100.00	869 469	100.00	100.00
Micro		95.7	37.8	16.5	95.2	40.9	24.2
Small		3.2	12.9	13.7	4.0	20.6	17.8
Medium		0.9	17.4	21.2	0.6	16.5	18.3
Large		0.2	31.9	48.6	0.1	22.00	43.2
Data for listed firms	UM	Poland			Portugal		
Number of firms	Unit	823			40		
Capitalization	USD (thous.)	160 482			61 933		
Capitalization	% GDP	27.4			25.7		

Source: (European Commission, 2018a, 2018b; World Bank, 2020).

There is a noticeably larger difference in the number of public companies. There are over twenty times more of them in Poland than in Portugal. However, their capitalization as a percentage of GDP is similar. This means that listed companies in Portugal are larger than in Poland.

The last feature of the economy, important from the enterprises' point of view is the ease of doing business. In this respect, Poland and Portugal also have similar achievements. In the current World Bank ranking Poland ranks 40th with 76.4 points, and Portugal 39th with a score 0.1 higher (Doing Business, 2020). The review of economic parameters leads to the conclusion that the operating conditions of enterprises in Poland and Portugal are similar. This means that their parameters such as capital structure can be compared.

2. Literature review

The discussion about capital structure theory was begun by Modigliani and Miller (1958). In the first version of proposed model the authors stated that the cost of capital is independent of the structure of capital under perfect market conditions. This supposition has been later modified by introducing into the model corporate tax, shareholder income taxes, etc. (Modigliani & Miller, 1959, 1963). Criticism of these models based on market distortions arising from the agency theory (Jensen & Meckling, 1976) and the theory of information asymmetry (Leland & Pyle, 1977) created room for development of the most prevalent capital structure theories: the trade-off theory (TOT) and the pecking-order theory (POT).[4]

The pecking-order theory is based on the empirically observed relatively low debt of highly profitable enterprises. Analysis of this phenomenon carried out by Myers and Majluf (1984) led to the conclusion that enterprises prefer a specific selection order of financing sources. This choice is based on adverse selection. As the best informed stakeholders of the enterprise managers are most willing to invest the enterprise's profit in self-financing. For external investors who have less knowledge about the enterprise a loan is a less risky form of investment than taking up new shares. Therefore the adopted order of using financing sources is as follows: self-financing, debt and finally the issue of new shares. Capital structure is a function of aggregated policies related to building profitability, dividend payments and investment opportunities (Bharath, Pasquariello, & Wu, 2009; Klein, O'Brien, & Peters, 2002).

The static trade-off theory was presented by Kraus and Litzenberger (1973). According to this theory the capital structure results from comparing tax benefits with debt costs. On the one hand debt creates a tax shield (benefits) and on the other increases the risk of bankruptcy (costs). It follows that the company must balance the benefits against costs by setting a target debt value. Then it gradually moves towards the set goal resulting from this optimization (Huang & Ritter, 2009; Kayhan & Titman, 2007; Leary & Roberts, 2005; Lemmon, Roberts, & Zender, 2008).

Harris and Raviv (1991) conducted a broad analysis of the above mentioned theories of capital structure isolating a number of features of the enterprise and its activities that could affect the share of debt in financing sources. Rajan and Zingales (1995) and Frank and Goyal (2009) continued this analysis. Table 3 shows the firm-specific capital structure determinants identified as a result of mentioned analyses along with the direction of their impact on the indebt-

[4] There are some other capital structure theories in the literature eg. market timing theory (Baker & Wurgler, 2002) or signalling theory (Leland & Pyle, 1977; Ross, 1977). However, these theories are related mainly to listed companies and they are less embedded in European market conditions.

edness of the enterprise according to the capital structure theories. The table also presents measures (definitions) of these factors most often used in empirical studies (Hang, Geyer-Klingeberg, Rathgeber, & Stöckl, 2018; Jaworski & Czerwonka, 2019).

Table 3. Influence of selected factors on the share of debt in financing sources

Factor/share of debt	Abbreviation	Definition	Pecking order theory	Trade-off theory
Tangibility	TANG	$\frac{\text{Fixed assets}}{\text{Total assets}}$	–	+
Size of enterprise	SIZE	ln(Total assets)	–/+	+
Growth opportunities	GROW	$\frac{\Delta\text{Total assets}}{\text{Total assets}}$	+	–
Profitability	PROF	$\frac{\text{EBIT}}{\text{Total assets}}$	–	+
Liquidity	LIQ	$\frac{\text{Current assets}}{\text{Current liabilities}}$	–	+
Non-debt tax shield	NDTS	$\frac{\text{Depreciation}}{\text{Total assets}}$	–	–/+

+ positive dependence
– negative dependence
–/+ unspecified dependence

Source: Own elaboration.

The higher the share of fixed assets in total assets, the better the collateral for liabilities and the lower costs of issuing debt. This increases the incentives to use the interest tax shield. Thus in accordance with the trade-off theory the relationship between TANG and debt is positive. The opposite dependence is shown by the pecking order theory in line with which a higher TANG lowers the asymmetry of information and causes a reduction in the cost of equity.

Larger enterprises with more diversified operations are less exposed to the risk of bankruptcy. This means that in accordance with the trade-off theory the larger the company, the higher its debt. From the perspective of the pecking order theory the size of the enterprise reduces the cost of issuing equity. On the other hand more diversified assets in the case of large firms cause a greater risk of adverse selection. Thus for this theory the relationship between SIZE and indebtedness may have an effect in both directions.

In accordance with the trade-off theory, the costs of bankruptcy increase with the increasing dynamics of the company's growth. Thus the relationship between GROW and debt is negative. In the case of the pecking order theory fast-growing enterprises generate a higher demand for capital, which causes an increase in debt (positive correlation).

Under the pecking order theory enterprises with high profitability and financial liquidity have a greater ability to self-finance and this reduces debt issuance (negative impact of PROF and LIQ on debt). Higher profits and a higher level of financial liquidity result in lower costs of bankruptcy and encourage the use of the interest tax shield. Therefore in line with the trade-off theory PROF and LIQ cause an increase in the company's debt.

Higher depreciation means a greater financial surplus and increasing self-financing capacity. This means in accordance with the pecking order theory that enterprises are less prone to issue debt (negative relationship between NDTS and debt). NDTS is a substitute for the interest tax shield and reduces indebtedness incentives also according to the trade-off theory. However, increasing depreciation means a higher free cash flow at the disposal of managers (higher agency costs). The natural way to reduce its irrational use by managers is to increase debt. Hence in accordance with the agency cost / tax shield trade-off model, the NDTS may increase debt (Megginson, 1997).

Identification of the impact of particular internal factors on the indebtedness of enterprises is the most frequently explored research area concerning capital structure (Graham & Leary, 2011; Kumar, Sureka, & Colombage, 2020). In their meta-analysis Hang and others (2018) found 591 papers devoted to this problem. Finally they examined the results of one hundred of these papers. The research proves that the most significant firm-specific factors of the capital structure in the range of collected studies are as follows: tangibility (positive sign) and growth and profitability (negative sign). The most recent meta-analysis was conducted by Jaworski and Czerwonka (2019). The authors mentioned 38 studies on this subject from 35 economies all over the world. The profitability and liquidity were identified with a negative sign as the most significant factors of the enterprises indebtedness. The impact of two other factors, the size and growth of the enterprise, turned out to be important to a lesser extent (with positive sign). These two meta-analyses point out the compliance of the direction of the impact of four out of six internal determinants on corporate debt with the pecking order theory.

The capital structure of enterprises is also shaped by external factors related to the environment of the enterprises. They are classified at two levels: industry and country-specific. The relationship between capital structure and industry was studied, among others by: Bradley, Jarrell and Kim (1984), Wessels and Titman (1988), Harris and Raviv (1991), de Jong and others (2008). The common conclusion resulting from these studies is the fact that industry influences the capital structure primarily through the sensitivity of the companies it includes to changes in the economic situation (general and industrial). The higher this sensitivity the greater the reluctance to issue debt.

The economic situation of industry translates into a systematic risk in which enterprises operate. The impact of the business component of this risk on the capital structure of enterprises was studied by Kale, Noe and Ramirez (1991).

The model developed by them and the conducted empirical research proved that for low levels of business risk the debt of the enterprises grow. However after exceeding a certain level (the optimal capital structure) the relationship becomes negative. Kim and Barrett (2002) proved that in the case of increasing financial risk, enterprises try to reduce their debt. This means that the average level of corporate debt follows the level of systematic financial risk. Schwert and Strebulaev (2014) developed a single model linking systematic business and financial risk with corporate debt confirming previous observations. Hovakimian, Opler and Titman (2001) and subsequently Frank and Goyal (2009) assumed that the median of debt in the industry and the median of growth in the industry assets can be seen as measures of financial and business systematic industry risk. The industry concerned is also a determinant of asset structure. This asset structure is, on the one hand, the result of an enterprise's reaction to industry business risk (higher business risk can hinder the access to debt financing) and on the other the greater the share of fixed assets in the company's assets means more collateral for loans, i.e. the possibility of reducing financial risk and thus increasing debt (Baum, Caglayan, & Rashid, 2017; Ross et al., 2013).

At the country level the determinants of capital structure can be divided into two groups. The first group refers to factors resulting from the macroeconomic situation of a particular economy (e.g. tax revenue, size and rate of GDP growth, unemployment or interest rate, etc.). The second group of country-specific factors is related to the institutional environment of enterprises (economic law and freedoms, information asymmetry, etc.) (de Jong et al., 2008; Jaworski & Czerwonka, 2019; Psillaki & Dasaklakis, 2009).

Research on the capital structure of enterprises in Poland and Portugal has been conducted for over a dozen years. However compared to other economies it has not been at a very advanced level and above all it has not been widely disseminated. In Poland the research consists of sectoral studies containing small research samples and mostly written in Polish. Cwynar, Cwynar, and Dankiewicz (2015) counted about 30 such studies in their review article. The research was started by Campbell and Jerzemowska (2001). Among those continuing these studies, Klapper and others (2006), Mazur (2007), Kaźmierska-Jóźwiak and others (2015), Cwynar and others (2016), Czerwonka and Jaworski (2019) are worth mentioning.

Campbell and Jerzemowska (2001) examined 65 listed companies in the years 1991–1995. They found that the long-term debt of these companies was increasing along with the non-debt tax shield. This debt decreased with the increase in the size of the enterprise, profitability and the tangibility. The authors concluded that for enterprises which were just at the beginning of their activity (1989 was the year of socio-economic changes in Poland), it was difficult to clearly link their research results with those concerning developed economies. Klapper and others (2006) examined panel data of 14,795 small and medium enterprises and

520 large companies functioning in Poland in the years 1998–2002. The study showed that the non-debt tax shield and profitability were positively linked with the indebtedness of enterprises. The relationship between tangibility and debt was positive. The authors, similarly to Campbell and Jerzemowska (2001), did not indicate any theory adequate to explain the financing behaviour of the studied firms. Mazur (2007) included financial data from 238 companies listed on the Warsaw Stock Exchange in the years 2000–2004. The results showed a negative relationship between profitability and liquidity and indebtedness. This evidence supported the predictions based on the pecking-order theory. The same direction of the diagnosed relationships between tangibility and size of the enterprise and debt was explained by the author by lower asymmetric information problems in larger companies with greater fixed assets. A very similar study was conducted by Kaźmierska-Jóźwiak and others (2015). It covered 111 companies listed on the Warsaw Stock Exchange in the years 2002–2012. The authors found a statistically significant negative relationship between the indebtedness of enterprises studied and their size, profitability and tangibility. On this basis the authors suggested the pecking-order theory as the most adequate for the financial behaviour of Polish enterprises.

Cwynar and others (2016) conducted research on the capital structure of 3,784 enterprises operating during the 2007–2011 crisis. They stated that the indebtedness of the companies studied did not increase significantly during the crisis. The authors found a positive relationship only between the debt and the size of the enterprise. Growth opportunities and the non-debt tax shield turned out to be insignificant. For profitability and tangibility the link with debt turned out to be negative. These results did not contradict the results of earlier studies of other authors (published in Polish) and partly supported the pecking-order theory as the best to explain decisions of Polish enterprises. Examining 355 listed companies in the years 1998–2012, Czerwonka and Jaworski (2019) obtained slightly different results. Just as in the research by Cwynar and others (2016) they did not find a significant relationship between debt of the companies and their growth but they found negative dependence related to profitability and tangibility. In addition a negative dependence of the size of the enterprise and financial liquidity on the indebtedness of enterprises was detected. Only the non-debt tax shield exerted a positive impact on debt. These results also correspond to the pecking-order theory.

Among classical determinants the capital structure factors of Portuguese enterprises were sought by Antao and Bonfim (2009), Vergas and others (2015), Serrasqueiro and others (2016), dos Santos Morão Lourenço and Oliveira (2017), to name but a few. Using the Banco de Portugal Central Balance Sheet database covering the period from 1990 to 2007, the first authors found that there was a statistically significant negative relationship between the debt of enterprises and their growth rate. Financial liquidity also proved to be negatively connected with debt. Tangibility, the non-debt tax shield and size exerted a positive influence on

share of debt in the sources of funding of the enterprises. Such a distribution of relationships did not allow the authors to clearly indicate the capital structure theory that these relationships stem from. Dos Santos Morão Lourenço and Oliveira (2017) analyzed a panel of 6,184 enterprises for the years 2008–2012. Their results did not confirm the previous findings. The indebtedness of enterprises turned out to be negatively connected with the enterprise's growth and size. A positive relationship was found for the assets' structure, profitability and the size of the enterprises. Such results were also not consistent with any capital structure. This was similar to the outcomes of the research by Vergas and others (2015). Examining the capital structure of 41 listed companies for the period 2005–2011. These authors found a positive relationship between debt and tangibility, non-debt tax shield and growth opportunities. Profitability and size exerted a negative impact on debt. The compliance of four out of six factors with the pecking-order theory was established by Serrasqueiro and others (2016). The panel of analysed enterprises included data concerning 2,329 small firms for the years 2007–2011. The size of the enterprises and their non-debt tax shield exerted a positive impact on their debt while tangibility, growth, liquidity and profitability was linked with debt negatively.

Polish and Portuguese enterprises were also the subject of research on industry and country-specific factors. Both countries were included in the research as the components of the research samples by Jõeveer (2006), de Jong and others (2008), Fan, Titman, and Twite (2012), Öztekin (2015), to mention a few. Therefore, it can be assumed that the external determinants of capital structure being the results of these studies (described above) also apply to Poland and Portugal. However, comparative research in this area has not yet been carried out.

3. Research data and method

The source of data for empirical research was the Amadeus database.[5] Data from this database for two samples created in parallel: for Poland and Portugal was downloaded. In both cases, data was collected for all enterprises active in the period 2010–2017, for which the database has collected all financial data in the last two years.

In the next step low credibility data has been removed from each sample. Only positive values of debt, assets and equity have been taken into account.

[5] Amadeus is the database conducted by Bureau Van Dijk A Moody's Analitics Company. Amadeus contains comprehensive information on around twenty one million companies across Europe. This information can be used to research individual companies, search for companies with specific profiles and for analysis (https://www.bvdinfo.com/en-gb/our-products/data/international/amadeus).

The sample also included only the data for which the values of debt ratios and the share of fixed assets in total assets have been in the range of 0 to 1. In order to eliminate outliers the first and last percentiles of data on enterprise growth, size, profitability, liquidity and the non-debt tax shield have been excluded. As a result two research samples have been obtained with the following parameters: Poland: 22,775 enterprises (80,763 observations) and Portugal: 36,625 enterprises (148,143 observations).

Following Welch (2011) and Miglo (2016) the total debt ratio (*DR = Total debt/Total assets*) as a measure of the capital structure was adopted. In addition the analysis have been extended by long-term debt ratio (*LDR = Long-term debt/Total assets*) and short-term debt ratio (*SDR = Short-term debt/Total assets*) with separate comments provided.

The order of research tasks undertaken was determined by the research questions. The research procedure was divided into three stages. According to research question (i), in the first step of the research the focus was on the statistical description of indicators characterizing the capital structure of enterprises in both countries and the variables that can shape it. In order to check the significance of differences between the values of variables for Polish and Portuguese enterprises the test *t* of two independent samples was applied. It allows the identification of any difference between the mean values in two different groups is statistically significant. The Mann-Whitney U test is a second way to compare the central tendency of two independent samples (to compare medians by checking the differences between distributions) (Cleff, 2019).

The second stage of research was the identification of fundamental firm- and industry-specific determinants of capital structure (research questions (ii) and (iii)). To achieve this goal statistical modelling was used based on the estimation of the parameters of panel models. These models include variables consistent with internal determinants of the capital structure:
1) pooled regression model (Ordinary Least Squares Method):

$$DR|LDR|SDR_{it} = \beta_0 + \beta_1 TANG_{it} + \beta_2 SIZE_{it} + \beta_3 GROW_{it} + \beta_4 PROF_{it} + \\ + \beta_5 LIQ_{it} + \beta_6 NDTS_{it} + \varepsilon_{it} \quad (1)$$

2) model with fixed effects:

$$DR|LDR|SDR_{it} = \beta_i + \beta_1 TANG_{it} + \beta_2 SIZE_{it} + \beta_3 GROW_{it} + \beta_4 PROF_{it} + \\ + \beta_5 LIQ_{it} + \beta_6 NDTS_{it} + \mu_{it} \quad (2)$$

3) model with random effects:

$$DR|LDR|SDR_{it} = \beta_0 + \beta_1 TANG_{it} + \beta_2 SIZE_{it} + \beta_3 GROW_{it} + \beta_4 PROF_{it} + \\ + \beta_5 LIQ_{it} + \beta_6 NDTS_{it} + u_i + \mu_{it} \quad (3)$$

The pooled model is used for homogeneous samples. For finding individual effects the Breusch-Pagan test was applied. The Hausman test was applied in order to identify fixed or random characteristics of individual effects (Greene, 2003). Due to the identification of heteroscedasticity and autocorrelation in the models which could lead to an incorrect assessment of the significance of specific variables, heteroscedasticity- and autocorrelation-consistent (HAC) standard errors were applied. Autocorrelation occurs in the model when the value of the Durbin-Watson statistic is substantially distant from the value of 2 (Gujarati & Porter, 2009).

The last stage of the study is the introduction of additional variables associated with industry-specific factors to the above models. These variables include the median of debt of enterprises belonging to particular industry (MED_DR_IND), the median of growth of these enterprises (MED__GROW_IND) and the median of the share of fixed assets in total assets (MED_TANG_IND).

The occurrence of multicollinearity which may be a problem in panel model estimation has been examined using a correlation matrix (Pearson coefficients) between independent variables and also variance-inflating factors (VIF) presented respectively: for Poland in Table 4 and for Portugal in Table 5.

Table 4. Correlation matrix of independent variables for Poland

TANG	SIZE	GROW	PROF	LIQ	NDTS	Ind_ Med_ DR	Ind_ Med_ TANG	Ind_ Med_ GROW	Variables	VIF
1.0000	0.2922	–0.1758	–0.2638	–0.1932	0.1478	–0.4651	0.5925	–0.2387	TANG	1.82
	1.0000	–0.0037	–0.1660	–0.1272	–0.0932	–0.1964	0.1927	–0.0552	SIZE	1.14
		1.0000	0.1968	–0.0240	–0.1048	0.1113	–0.1192	0.2612	GROW	1.15
			1.0000	0.1431	0.0550	0.1436	–0.1911	0.0988	PROF.	1.14
				1.0000	–0.0839	–0.1045	–0.0105	–0.0034	LIQ	1.12
					1.0000	0.0478	0.0292	0.0754	NDTS	1.10
						1.0000	–0.7655	0.3220	Ind_Med_ DR	2.55
							1.0000	–0.3884	Ind_Med_ TANG	3.08
								1.0000	Ind_Med_ GROW	1.27

Source: Own elaboration.

The values of all correlation coefficients do not show strong relationships between the variables for both countries. Also the VIFs which show how the variance of the estimator is inflated by the presence of multicollinearity are well below the critical value of 10 (Gujarati & Porter, 2009). This means that

Table 5. Correlation matrix of independent variables for Portugal

TANG	SIZE	GROW	PROF	LIQ	NDTS	Ind_ Med_DR	Ind_ Med_ TANG	Ind_ Med_ GROW	Variables	VIF
1.0000	0.1701	–0.0547	–0.1122	–0.1149	0.2846	–0.1278	0.4351	–0.1074	TANG	1.433
	1.0000	–0.0785	–0.0856	–0.1434	–0.2206	0.1662	0.0549	–0.0561	SIZE	1.170
		1.0000	0.2609	–0.0315	–0.0137	–0.0236	–0.0051	0.1295	GROW	1.094
			1.0000	0.0071	0.0688	–0.1321	0.0078	0.1395	PROF	1.126
				1.0000	–0.0409	–0.1784	0.0939	0.0044	LIQ	1.091
					1.0000	–0.1987	0.1822	0.0072	NDTS	1.220
						1.0000	–0.2471	–0.1634	Ind_ Med_ DR	1.225
							1.0000	–0.2500	Ind_ Med_ TANG	1.433
								1.0000	Ind_ Med_ GROW	1.161

Source: Own elaboration.

the problem of multicollinearity does not exist and all assumed variables can be used in panel model estimation.

4. Research results

Table 6 presents statistics of main indicators of the capital structure and its internal determinants. Table 7 includes the outcomes of examining whether the mean values (*t* test) and medians (the Mann-Whitney U Test) of the selected indicators, shown in Table 6, in the two countries are equal (the difference between them is 0) or different. The outcomes of tests *t* and Mann-Whitney U substantiate the fact that the means and medians of all variables (dependent and independent) differ in a statistically significant way. It means that measures of capital structure and their assumed determinants are different for Polish and Portuguese enterprises.

The distribution of the total debt ratio (DR) indicates that enterprises in Portugal are more indebted than those in Poland. Half the Polish enterprises indebted their assets by no more than 56.76% while in Portugal this level is 62.34%. However, the structure of this debt is different. In Poland short-term debt is clearly higher than in Portugal (average SDR: 34.82% > 32.31). In the case of long-term debt, the situation is reversed (average LDR: 20.53% < 26.60%).

Table 6. Statistics of data samples

Variable/ Data	Mean	Median	Standard deviation	Min.	Max
Poland					
DR	0.5535	0.5676	0.2293	0.002562	1.000
SDR	0.3482	0.3275	0.2191	0.000474	0.9918
LDR	0.2053	0.1485	0.1849	0.000008	0.9892
TANG	0.5408	0.5519	0.2753	0.0001578	0.9995
SIZE	14.73	14.69	1.404	11.000	18.5
GROW	0.0943	0.03941	0.2295	–0.3993	1.18
PROF	0.07687	0.05655	0.08959	–0.1796	0.4994
LIQ	1.89	1.297	2.116	0.08004	19.98
NDTS	0.04084	0.03266	0.03383	0.0002207	0.2
Portugal					
DR	0.5891	0.6234	0.2487	0.002133	1.000
SDR	0.3231	0.2851	0.2278	0.000230	0.9973
LDR	0.2660	0.2092	0.2249	0.0000	0.9960
TANG	0.3313	0.2649	0.2730	0.0000	0.9985
SIZE	12.93	12.64	1.716	9.560	18.72
GROW	0.1218	0.03012	0.3683	–0.4499	3.350
PROF	0.06174	0.04241	0.1071	–0.3440	0.5437
LIQ	5.034	2.172	9.219	0.1502	97.00
NDTS	0.04518	0.03185	0.04300	0.0004505	0.2531

Source: Own elaboration.

Table 7. Differences between means

Variable	Means-difference	test t	*p*-value	Medians-difference	Mann--Whitney U test Z	*p*-value
DR	–0.036	–34.4	< 0.001	–0.056	–39.1	< 0.001
SDR	0.025	25.8	< 0.001	0.042	30.4	< 0.001
LDR	–0.061	–69.3	< 0.001	–0.061	–54.9	< 0.001
TANG	0.209	174.4	< 0.001	0.287	165.4	< 0.001
SIZE	1.802	270.8	< 0.001	2.050	238.8	< 0.001
GROW	–0.027	–21.9	< 0.001	0.009	8.6	< 0.001
PROF	0.015	36.0	< 0.001	0.014	42.1	< 0.001
LIQ	–3.144	–125.3	< 0.001	–0.875	–153.1	< 0.001
NDTS	–0.004	–26.6	< 0.001	0.001	–3.1	0.002

Source: Own elaboration.

In Polish enterprises the book value of assets is much higher than in Portugal (SIZE). The share of fixed assets in total assets (TANG) is also clearly higher in Poland. However, higher NDTS values for Portuguese enterprises indicate that their fixed assets are depreciated faster or that these assets are older than in Polish enterprises.

The average growth of enterprises calculated as an increase in assets (GROW) is comparable in both countries. However, the higher standard deviation of this variable in Portugal indicates that the enterprises in this country are more diverse in this respect. Polish enterprises are more profitable than Portuguese (PROF) but they are characterized by much lower financial liquidity (LIQ). High values of the LIQ variable in Portugal may indicate widespread excess liquidity in this economy. Despite similar values the differences between the means of all variables in both countries are statistically significant. The same conclusion can be drawn for medians (Table 7).

Table 8 presents the estimated parameters of panel models for the indebtedness of enterprises and its components relative to the classical internal determinants of the capital structure. All internal capital structure determinants in all models concerning both countries and debt ratios turn out to be statistically significant.

In the case of Polish enterprises, the relationship between DR and the variables TANG, PROF, LIQ and NDTS is negative and for GROW and SIZE positive. The detected directions and significance of the impact of these determinants on the capital structure are thoroughly consistent with the pecking-order theory. In comparison to Polish companies, TANG and NDTS show the opposite direction of impact on DR for Portuguese companies. This is contrary to the pecking-order theory. However, it also does not indicate any alternative theory but only shows that tax incentives could be more important in Portugal than in Poland.

In the case of impact on the long-term debt ratio (LDR), the differences between Poland and Portugal are smaller and apply only to NDTS. In Poland the higher the NDTS the smaller the long-term debt. In Portugal this relationship is reversed. In both countries a positive relationship has been detected between LDR and TANG, SIZE, GROW and LIQ. Negative dependence is detected only for PROF. The indicated directions of dependence are not clearly consistent with any capital structure theory. However, the greatest similarity is indicated in the pecking-order theory than the static trade-off theory (Four out of six consistent determinants).

The significance and direction of influence of internal determinants on short-term indebtedness (SDR) of enterprises in both countries are consistent with the pecking-order theory. In both cases, there is a correspondence of five out of six factors shaping SDR. In Poland SIZE, GROW and NDTS exert a positive impact on SDR. In Portugal it concerns GROW and NDTS. Other determinants exert a negative impact on SDR in both economies. The results

Table 8. Results of panel model estimations for internal determinants of capital structure

Country	Poland			Portugal		
Dependent variable	**DR**	**LDR**	**SDR**	**DR**	**LDR**	**SDR**
Model	**fixed effects**	**fixed effects**	**fixed effects**	**fixed effects**	**fixed effects**	**fixed effects**
const	0.26078*** (0.04373)	−0.09076** (0.03820)	0.35154*** (0.03403)	0.46894*** (0.02875)	−0.06176** (0.02951)	0.53071*** (0.02671)
TANG	−0.01889** (0.00811)	0.34120*** (0.00760)	−0.36008*** (0.00703)	0.04328*** (0.00534)	0.21412*** (0.00567)	−0.17084*** (0.00490)
SIZE	0.02474*** (0.00295)	0.00712*** (0.00257)	0.01761*** (0.00230)	0.00940*** (0.00222)	0.01888*** (0.00227)	−0.00948*** (0.00207)
GROW	0.06935*** (0.00219)	0.03610*** (0.00214)	0.03325*** (0.00203)	0.07792*** (0.00139)	0.03594*** (0.00157)	0.04198*** (0.00152)
PROF	−0.36789*** (0.00883)	−0.11800*** (0.00755)	−0.24988*** (0.00737)	−0.39393*** (0.00550)	−0.23104*** (0.00545)	−0.16288*** (0.00512)
LIQ	−0.01843*** (0.00063)	0.01059*** (0.00053)	−0.02904*** (0.00070)	−0.00252*** (0.00008)	0.00333*** (0.00010)	−0.00585*** (0.00011)
NDTS	−0.11563*** (0.11563)	−0.18879*** (0.03485)	0.07317** (0.03090)	0.25966*** (0.02181)	0.12864*** (0.02233)	0.13102*** (0.01910)
Number of observations	80673	80673	80673	148143	148143	148143
Joint test on named regressors	F(6, 57892) = 2147.68 $p < 0.0001$	F(6, 57892) = 1527.76 $p < 0.0001$	F(6, 57892) = 3898.75 $p < 0.0001$	F(6, 111512) = 3330.93 $p < 0.0001$	F(6, 111512) = 1988.76 $p < 0.0001$	F(6, 111512) = 2670.58 $p < 0.0001$
Breusch-Pagan test	LM = 89813 $p < 0.0001$	LM = 80981 $p < 0.0001$	LM = 64937 $p < 0.0001$	LM = 167754 $p < 0.0001$	LM = 128845 $p < 0.0001$	LM = 107610 $p < 0.0001$
Hausmann test	H = 3437 $p < 0.0001$	H = 424 $p < 0.0001$	H = 4411 $p < 0.0001$	H = 3880.88 $p < 0.0001$	H = 1132 $p < 0.0001$	H = 4505 $p < 0.0001$
Durbin-Watson statistic	0.8092	0.9776	1.0963	0.7742	1.0846	1.1367

* dependence is significant at the level of 0.1; ** dependence is significant at the level of 0.05; *** dependence is significant at the level of 0.01 (HAC standard errors in parentheses).

Source: Own elaboration.

Table 9. Results of panel model estimations for industry-specific factors

Country	Poland			Portugal		
Dependent variable	DR	LDR	SDR	DR	LDR	SDR
Model	fixed effects	fixed effects	fixed effects	fixed effects	fixed effects	fixed effects
const	0.10962** (0.04841)	−0.17100*** (0.04313)	0.28062*** (0.03754)	−0.27788*** (0.03342)	−0.49681*** (0.03519)	0.21893*** (0.03136)
TANG	−0.02299*** (0.00808)	0.33578*** (0.00758)	−0.35877*** (0.00707)	0.03897*** (0.00521)	0.21120*** (0.00562)	−0.17222*** (0.00489)
SIZE	0.03309*** (0.00304)	0.01449*** (0.00265)	0.01860*** (0.00237)	0.03191*** (0.00227)	0.03081*** (0.00235)	0.00111 (0.00212)
GROW	0.07974*** (0.00224)	0.04335*** (0.00219)	0.03638*** (0.00209)	0.07008*** (0.00138)	0.03159*** (0.00158)	0.03849*** (0.00153)
PROF	−0.37137*** (0.00879)	−0.12094*** (0.00753)	−0.25042*** (0.00739)	−0.36908*** (0.00529)	−0.21821*** (0.00537)	−0.15087*** (0.00505)
LIQ	−0.01817*** (0.00062)	0.010754*** (0.00053)	−0.02892*** (0.00070)	−0.00234*** (0.00008)	0.00342*** (0.00010)	−0.00576*** (0.00011)
NDTS	−0.05723 (0.03567)	−0.14501*** (0.03468)	0.08777*** (0.03106)	0.14056*** (0.02120)	0.06262*** (0.02216)	0.07794*** (0.01907)
Ind_MED_DR	0.07894*** (0.02152)	−0.05407*** (0.01991)	0.13301*** (0.01678)	0.73028*** (0.02089)	0.41799*** (0.02312)	0.31229*** (0.02023)
Ind_MED_TANG	−0.01668 (0.01806)	0.01425 (0.01828)	−0.03092** (0.01621)	0.08302*** (0.02040)	0.10915*** (0.02271)	−0.02612 (0.02075)
Ind_MED_GROW	−0.18978*** (0.00577)	−0.14015*** (0.00539)	−0.04963*** (0.00533)	−0.39038*** (0.01821)	−0.16258*** (0.01931)	−0.22779*** (0.01834)
Number of observations	80673	80673	80673	148143	148143	148143
Joint test on named regressors	F(9, 57889) = 1580.91 $p < 0.0001$	F(9, 57889) = 1105.49 $p < 0.0001$	F(9, 57889) = 2630.51 $p < 0.0001$	F(9, 111509) = 3193.55 $p < 0.0001$	F(9, 111509) = 1523 $p < 0.0001$	F(9, 111509) = 1938.81 $p < 0.0001$
Breusch-Pagan test	LM = 87940 $p < 0.0001$	LM = 79845 $p < 0.0001$	LM = 63597 $p < 0.0001$	LM = 171276 $p < 0.0001$	LM = 127909 $p < 0.0001$	LM = 108416 $p < 0.0001$
Hausman test	H = 3239 $p < 0.0001$	H = 853 $p < 0.0001$	H = 3554 $p < 0.0001$	H = 4373 $p < 0.0001$	H = 1737 $p < 0.0001$	H = 3565 $p < 0.0001$
Durbin-Watson statistic	0.8094	0.9814	1.0980	0.8065	1.0967	1.1460

* dependence is significant at the level of 0.1; ** dependence is significant at the level of 0.05; *** dependence is significant at the level of 0.01 (HAC standard errors in parentheses).

Source: Own elaboration.

of the estimates for extended models by industry-specific factors are presented in Table 9.

The indebtedness (DR) of Polish enterprises decreases with the increasing growth rate of the industry (Ind_MED_GROW). Higher financial risk in the industry (Ind_MED_DR) results in a higher indebtedness of enterprises. The capital intensity (Ind_MED_TANG) of the industry does not exert a significant impact on the debt of Polish companies.

For Portuguese enterprises, Ind_MED_TANG exerts a positive influence on all sorts of debt. For the other two industry-specific factors (Ind_MED_DR and Ind_MED_GROW) their impact on corporate debt is the same as in Poland. These relationships between the indebtedness of enterprises and industry-specific factors also concern the other debt ratio—LDR.

In Poland the faster the industry is growing the smaller the short-term debt of enterprises. The same direction of the relationship exists between capital intensity and SDR. The growing industry risk exerts a positive impact on SDR. In Portugal the relationship between SDR and risk and industry growth is the same as in Poland. The capital intensity of the industry does not play a crucial role.

To determine whether the effects of interest have been estimated robustness can be checked by removing or adding variables (Lu & White, 2014). This means that models with industry-specific factors are also robustness checks for internal determinants. The relationship between them and debt and its components have retained the same direction and statistical significance as in models without industry variables. The exception is the loss of the statistical significance of the SIZE variable in the model describing SDR in Portugal.

5. Discussion

Taking into account the total debt Polish enterprises are less indebted than the Portuguese. The capital structure determinants of Polish enterprises are consistent with the pecking-order theory (compliance of all six determinants). These findings correspond to the research of other authors (Cwynar et al., 2016; Czerwonka & Jaworski, 2019; Kaźmierska-Jóźwiak et al., 2015; Mazur, 2007). In the case of Portugal, where enterprises are more indebted the results do not allow for an unambiguous identification of the theory with which the internal capital structure determinants are more consistent. This is also in line with previous findings of other authors (Antao & Bonfim, 2009; Vergas et al., 2015).

Higher indebtedness of Portuguese enterprises with a simultaneously diagnosed positive influence of tangibility on indebtedness may indicate a greater tendency of managers to benefit from the interest tax shield in Portugal than in Poland. The positive relationship between the non-debt tax shield and debt means that debt is also used in Portugal to reduce agency costs. Both observations prove that Portuguese companies are more likely to behave in line with

the trade-off theory. Higher income taxation in Portugal than in Poland with a lower cost of debt in the euro area may be a reason for this observation.

The industry-specific factors have not been studied so far. The research shows that in both economies corporate debt is shaped in a similar way by two out of the three industry-specific factors examined. Debt (and its components) increases with the median of debt in a particular industry. This observation is consistent with the research of Frank and Goyal (2009) and means that enterprises in both economies change their debt according to systematic industry financial risk. At the same time the indebtedness of Polish and Portuguese enterprises decreases in rapidly growing industries. It may mean that similarly to the research of Kale and others (1991), Schwert and Strebulaev (2014) an increase in industry business risk causes a decrease in debt. The third factor the tangibility of the industry significantly affects the capital structure of Portuguese companies. The higher the share of fixed assets in the industry the higher the debt of enterprises (primarily long-term). It confirms the theses of Baum and others (2017), or Ross and others (2013).

Conclusions

The results of the study indicate that despite comparable macroeconomic and institutional conditions for the functioning of enterprises in Poland and Portugal the capital structure of these enterprises is shaped differently. Portuguese enterprises are characterized by higher total debt and a higher share of long-term liabilities in this debt. A larger share of short-term liabilities is observed in Poland. In addition Polish enterprises have a higher book value of assets and relatively lower depreciation. This is accompanied by corporate profitability higher than in Portugal. On the other hand Portuguese enterprises are characterized by higher liquidity.

The impact on the capital structure of enterprises in both countries has been detected for all six classical internal determinants albeit with a different direction and strength of impact on individual debt components. In Poland this impact on total debt is more consistent with the pecking-order theory. For Portuguese enterprises the relationship between the identified factors and capital structure theories is equivocal. It concerns especially tangibility and the non-debt tax shield. The significant and positive impact of these factors on the indebtedness of Portuguese enterprises suggests that in Portugal, debt (especially long-term) is more preferred to obtain benefits from the tax shield, and its extensive use generates lower costs and risk than in Poland. In the case of short-term debt it is determined in Poland and Portugal by the same internal factors in accordance with the pecking-order theory.

At the industry level, very similar dependencies are identified for Polish and Portuguese enterprises. The indebtedness of companies in both countries de-

creases with an increasing industry financial and business risk. In Portugal the increase in the tangibility of the industry causes increase in the share of debt in capital structure especially in the long-term.

From the outcomes of the study some implications arise:

- In an economy with wider market experience (Portugal) enterprises use debt more widely as a source of financing with long-term debt being the significant component of a much larger proportion.
- In Polish enterprises, a relatively lower debt translates into a higher profitability of enterprises and the maintenance of optimal financial liquidity. This relationship is not observed in Portugal. Higher levels of liquidity with a higher level of indebtedness may indicate that Portuguese enterprises store an excess of liquidity which can mean ineffective use of debt financing. However, this hypothesis requires in-depth research.
- A smaller use of the tax shield in Poland results in the higher profitability of enterprises. Polish enterprises utilise their profits in self-financing more willingly than the enterprises in Portugal. These conclusions are strengthened by the diagnosed relationships between the internal determinants of capital structure and the long-term debt of enterprises in both countries.
- The analysis of internal determinants of capital structure shows that taking taxation into account Portuguese companies manage their debt more efficiently than the Polish optimizing the benefits of the tax shield with the costs and risk of maintaining high debt.
- The internal capital structure factors identified in Poland suggest that Polish enterprises behave in accordance with the pecking-order theory. For Portuguese enterprises the indication is ambiguous. The fact that they are more indebted and use the non-debt tax shield to a greater extent may mean that their behaviour corresponds more to the trade-off theory. However, the identification of a theory that best explains decisions of enterprises in both countries requires further research based on models relevant to testing capital structure theories.
- The diagnosed dependence of the capital structure on industry-specific factors allows the extension of the above conclusions and to hypothesize that in the Portuguese economy enterprises use long-term debt to finance fixed assets more willingly and effectively. However, the confirmation of this hypothesis requires additional research.

The limitations of the study are: (i) the taking into account only two EU economies, (ii) the static dimension of the research and disregarding the dynamics of changes taking place in both economies. Nevertheless it is worth emphasizing that the study was performed at the threshold of the predicted global economic crisis caused by the coronavirus pandemic. Replication of the study in the conditions of the crisis and after its end should lead to conclusions significant from the point of view of science and practice.

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