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Does Capital Structure Drive Profitability in the Energy Sector?

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Abstract: This paper investigates the factors that determine the profitability of non-listed energy firms from four central European countries: Hungary, Poland, Slovakia, and the Czech Republic. We apply the regression analysis, on a large panel of firm-year observations for the 2015–2019 timespan, to verify the hypothesis on the inversed relationship between leverage and profitability of the companies performing in the energy sector. Our results support the inversed relationship for debt in total and long-term debt, which are consistent with the assumptions of the pecking order theory. However, for short-term debt, we have found a direct relationship, which confirms the assumptions of the trade-off theory of capital structure. Our work contributes to the existing debate on the interplay between financial leverage and profitability, by providing evidence for a large panel of non-listed firms, from a single sector (energy)-oriented perspective.

Keywords: capital structure; financial leverage; profitability; energy sector

1. Introduction

The question about the key determinants of a firm's profitability still has a high priority both for academics and practitioners, including managers, shareholders, debt holders, policymakers, and other stakeholders. The profitability of a firm is understood as the ability to generate profit from the employment of the available resources. As a decision-making parameter, profitability is regarded as the crucial aspect of a firm's financial condition and the key objective of financial management, regardless of a firm's business model, type of industry or market, size, or age. Profitability is also regarded as a critical determinant of a firm's ability to survive, grow, and create value, as well as an influential factor of a firm's technological change, employment stabilization, and innovation. Managers, shareholders, investors, creditors, competitors, and business partners, as well as other stakeholders, constantly monitor profitability indicators to assess the firm's performance and prospects for further development. In the internal dimension, firms commonly use a variety of profitability-based measures in decisive contexts, particularly in the selection of investment projects, access to sources of funds, remuneration schemes for top management and other employees, dividend policy, CSR activity, tax planning, and growth strategy.

Theoretical models and empirical studies suggest various factors may determine the level of a firm's profitability. Some models link profitability to the external market conditions and industry structure, while others focus on the firm-specific characteristics to determine the factors that may improve the financial performance of a firm [1–5]. In this stream of the literature, the most important conceptual models are linked to the capital structure theories—the trade-off theory [6,7] or the pecking order theory [8–10]. The assumptions of these models have been verified in numerous empirical studies, with ambiguous results [11–15].

Our work is guided by the capital structure considerations, as a key determinant of profitability in light of the trade-off and pecking order theories. In this regard, the prime

aim of this study is to examine whether the capital structure and the related financing strategy exert an impact on the profitability of firms that operate in the energy sector.

The contribution of our study to the existing literature on the profitability and leverage interplay is twofold. First of all, the majority of the existing empirical works revises the publicly listed companies [12,15,16], while the analysis of non-listed companies remains relatively scarce [17]. In this respect, our work contributes by displaying evidence on the profitability–leverage trade-off for a large panel of data for non-listed firms. The listed firms remain under the pressure of the investors (and capital markets) and it influences their capital structure decisions. The scarcity of studies on non-listed firms, e.g., [18–20], results in our limited understanding of whether similar forces drive their capital structure decisions, either in light of trade-off theory or pecking order theory. Additionally, non-listed companies represent the dominant part of the business sector in most modern economies, both with respect to value added and employment [21,22]. Thus, the in-depth analyses focused on the financial management decisions in private companies are crucial for a better understanding of the factors influencing the profitability of non-listed companies. The scarcity of the studies on non-listed firms could result from the limited availability of the data, and thus a limited number of factors could be considered. Nevertheless, the panel of data employed in this work enabled a revision of a wide range of the control variables that correspond to the variables controlled for listed firms in the prior empirical investigations.

A second important contribution of this work is a focus on a single-sector sample, operating in a defined country-setting. Our work provides empirical evidence for firms that operate in the energy sector and controls the results for its two subsectors: energy production (PROD) and energy trade and distribution (DT). Our interest in the energy sector is also attracted by the importance of this sector for the entire economy, its growth and social welfare in particular [23,24]. Moreover, the continuously increasing demand for energy as well as the discussion about the direction and methods of the energy transition underpin the importance of researching the profitability drivers in this sector. Although the existing evidence on the relationship between capital structure and a firm's profitability is considerable [11–15,25,26], there is a visible scarcity of works that address the specifics of the energy sector. More importantly, the existing evidence on the energy sector offers ambiguous results or is limited to a single-country-oriented perspective, e.g., Apan and İslamoğlu [27] analyzed the profitability of the energy firms in Turkey, Fareed et al. [28] in Pakistan, Taliab [29] in the USA, and Sabău-Popa et al. [30] in Romania. The larger scope of research was presented in the work by Lameira et al. [31], which analyzed the profitability of energy firms located in the Euro-zone. Several studies are devoted to the European energy sector (e.g., Jaworski and Czerwonka [32] or Škuláňová [33]). However, these works used different perspectives from ours, as they focused on the capital structure determinants in the energy industry in the European Union.

In the country-oriented context, our study considers the firms that actively perform in the energy sector in four central European countries: Poland, Slovakia, Hungary, and the Czech Republic. These countries are regarded as comparable if we consider their economic development, on their route to transition from a command to a free-market economy [34]. In this respect, our study adds to the existing literature by providing the profitability-oriented evidence stemming from the analysis of a large panel of data, for non-listed and non-US firms. As noted by Hernadi and Ormos [35], the importance of such studies is underlined by the fact that most of the financial theories have been formulated primarily for developed markets and thus our knowledge of their validity for emerging European countries is limited.

The remainder of this paper is organised as follows. Section 2 reviews the existing literature on the subject. Section 3 explains the research design and method, by specifying the sample, data, and justifying the selection of the main and control variables. The estimation for the regression model and the related discussion are presented in Section 4. The last section summarizes the findings and concludes.

2. Literature Review

This work is guided primarily by the considerations of the two prevalent capital structure theories, namely the trade-off theory (TOT) and the pecking order theory (POT). These theories revise the capital structure as the key internal determinant of a firms' profitability and critical drivers of its successful performance and value creation. The capital structure is defined as the mix of debt and equity used to finance a firm's operations and, in this regard, capital structure decisions are the key aspects of corporate financial strategy.

The possibility to increase the profitability of a firm and its value by using the rational level of debt capital is suggested by the trade-off theory of capital structure (TOT) based on the research by Modigliani and Miller [36] and is linked to the tax shield and positive effect of financial leverage. Due to the fact that interest is a tax-deductible expense, Modigliani and Miller [36] proposed that when the bankruptcy risk is ignored, the firm should use as much debt capital as possible to maximize its value. However, as a level of debt increases, the bankruptcy costs [37,38] and agency cost of debt [6] increase as well. Thus, according to the trade-off theory, the value of the firm may be maximized by balancing positive and negative consequences of debt, minimizing the cost of capital, maximizing the profitability, and consequently finding the optimal capital structure. The TOT assumes that every company has its own optimal capital structure and additional capital (in this debt) is acquired to keep this optimal capital structure stable, to minimize the cost of capital, to increase the profitability, to maintain the competitive advantage, and to maximize value [6,39]. Thus, following the TOT, we may expect the positive effect of financial leverage and the improvement of the firm's profitability by using a reasonable level of debt.

On the other hand, the pecking order theory (POT) originally formulated by Myers and Majluf [9,10] and developed by Lucas and McDonald [8] suggests that highly profitable firms have lower external capital needs (including debt capital), as they use the generated profit first to finance their investment projects and growth. With regard to external financing, the pecking order theory places debt as the preferred source, while the issue of new equity is regarded as the last resort, which is used when firms are no longer able to use additional debt. Thus, the capital structure choices are determined by the reserve borrowing capacity of a firm. According to POT, profitable firms borrow less because they do not have high external capital needs. On the other side, by incurring debt, the firm may become less profitable due to additional financial costs. In this context, the profitability of a firm may be inversely related to the level of debt. This assumption was confirmed by Abel [11], who found out that the increase in current or future profitability may reduce the optimal leverage ratio. Thus, the pecking order theory assumes the negative relationship between leverage and profitability. It suggests that the theoretical debate on the importance of capital structure for a firm's profitability is still open for discussion. As Baker stated, "the profitability may affect leverage, and leverage may affect profitability" [40], (p. 503).

The problem of the interplay between capital structure and profitability has been revised in numerous works. However, the existing works provide mixed evidence on the relationship between leverage (capital structure) and profitability. Strong evidence on the inverse relationship between profitability and the level of debt was confirmed by Titman and Wessels [37], who observed that profitable firms tend to have lower levels of debt in capital structure. Similar findings were reported by Ahmed and Bhuyan [25]; Goddard et al. [41]; Jaworski and Czerwonka [32]; Rajan and Zingales [26]. This evidence supports the POT theory and suggests that profitable firms prefer to use their earnings first, rather than borrowing funds on the financial market. Numerous works have confirmed this evidence, for various settings and with the inclusion of various control variables to describe the internal and external factors [1,13,14,42–44]. However, there are also studies in which no relationship was found between profitability and capital structure (e.g., for AMEX firms in the study by Fosberg and Ghosh [16]). On the other side, Abor [12] studied listed firms in Ghana and found that there is a negative relationship between profitability and long-term debt and a positive relationship between profitability and short-term debt.

Several works that have addressed the relationship between capital structure and profitability for a sample of firms that perform in the energy sector. Taliab [29] analyzed the effect of capital structure on the profitability of American energy firms. A sample of 30 energy firms was investigated for a period of nine years from 2005–2013. It was found that debt has a significant negative impact on *ROE* and *ROA*. Fareed et al. [28] analyzed the key determinants of profitability of the power and energy sector in Pakistan, but the sample covers only 16 firms. They found that financial leverage negatively influences firms' profitability. Apan and İslamoğlu [27] examined the effect of financial ratios (liquidity, productivity, and financial structure) on the return on assets of 10 energy firms listed on the Istanbul Borsa. They found that leverage has a negative impact on *ROA*. The negative relationship between corporate debt and profitability was also found in the study by Jaworski and Czerwonka [32] based on the data for 6122 companies from 25 EU countries operating between 2011 and 2018. Several studies tended to investigate issues other than capital structure-related determinants of profitability in the energy sector: e.g., Zieliński and Jonek-Kowalska [45] analyzed the importance of CSR activities, Wattanatorn and Kanchanapoom [46] the impact of the crude oil prices, Apergis and Sorros [47] investigated the role of the research and development expenses and Lameira et al. [31] verified the importance of location and sector of activity of the energy firms.

However, the comprehensive analyses of the factors determining the profitability of energy sector non-listed firms are relatively rare. To cover this gap, we designed the empirical research aiming at identifying the most important drivers of profitability for the energy sector firms operating in four European countries of a comparable level of economic development and history behind [34]. In light of the prevalent prior empirical evidence on the associations between the capital structure and profitability, including the results for the energy sector, we hypothesize that in the non-listed energy firms, there is an inverse relationship between financial leverage and profitability of a firm.

3. Research Design and Method

3.1. Data and Sample Composition

From the EMIS database, we requested for accounting-based figures (constituents of the balance sheet and income statement) for the non-listed companies operating in Poland, Czech Republic, Hungary, and Slovakia, in the 2015–2019 time span. The time horizon of our analysis is limited by the data availability. The EMIS database offers an insight into four consecutive years of a firm's performance. We have obtained data for our analysis twice: first at the end of 2019, when the completed records for 2015–2018 were obtainable, and then at the end of 2020, to supplement the dataset for 2019. We controlled for the sector, by selecting energy (NAICS code 2211), and the sub-sectors, by distinguishing between the firms that produce energy (PROD) and those that are involved in energy distribution or/and trade (DT).

Under the initial request terms, we have obtained data for 1977 companies (all records available for our sector-oriented r7uest): in this are 133 for Slovakia, 241 for Hungary, 600 for the Czech Republic, and 1000 for Poland. However, before running the analysis, we filtered our sample in order to remove any biased or missing entries. In particular, we controlled for the correctness of the balance sheet entries, by revising the structure of assets (fixed and current assets against the total assets), capital structure (long-term debt, short-term debt, and equity, against total capital), as well as the balance between total assets and total equity and liabilities. We have also filtered out the firms that did not provide information on sales revenues, to obtain a sample of firms that actively performed in the whole period of our interest. As the number of missing records was considerable (for Poland in particular), we have finally obtained a panel of 2776 firm-year observations. The structure of our sample, in cross-country, time, and sub-sector dimensions, is presented in Table 1.

Table 1. The structure of the research sample.

Data	2015	2016	2017	2018	2019	In Total	(%)
Country							
CZ	94	133	262	222	122	833	30
HU	77	128	131	117	112	565	20
SLO	34	74	76	80	73	337	12
PL	229	67	147	299	299	1041	38
in total	434	402	616	718	606	2776	100
Sub-sector							
PROD	293	257	423	532	435	1940	70
DT	141	145	193	186	171	836	30
in total	434	402	616	718	606	2776	100

Notes: CZ—Czech Republic, HU—Hungary, SLO—Slovakia, PL—Poland; sub-sectors: PROD—production of energy, DT—energy distribution and trade.

According to data provided by Eurostat for 2018 (the latest available record), in sectors related to energy (NACE D), there were 11723 enterprises in the Czech Republic, 898 in Hungary, 3619 in Poland, and 585 in Slovakia [48]. Given the number of firms in our sample, our dataset represents the following percentage of this potential firms' population: c.a. 2% for the Czech Republic, 13% for Hungary, 8% for Poland, and 14% for Slovakia. However, in our data request in EMIS, we have selected the data only for the two specific energy sub-sectors following the NAICS codes (developed on the basis of a production-oriented framework), and the Eurostat follows the NACE code (based on activities). NAICS and NACE classifications schemes are regarded as substantially different; thus, this comparison on the fraction of examined population should be treated as providing some general insight into the energy sector size in each country.

3.2. Variables and Model

3.2.1. Dependent Variable

The accounting profit-based measures are prevalent, due to their informativeness stemming from the clear accounting standards. Since seminal work by Rajan and Zingales [26], the accounting-based measures of profitability are commonly associated with a firm's *ROA* (return on assets) or/and *ROE* (return on equity) [8,49,50]. In our work, as a dependent variable, we employ *ROA* (return on assets), defined as net profit (earnings after taxes) to total assets of the company.

For the energy sector, the determinants of profitability proxied by *ROA* were addressed by the study by Farred et al. [28]. However, *ROA* is a common measure of profitability and it is often subject of empirical analysis in this context for various sectors and a firm's size (e.g., [17] or [27]). In *ROA*, the effect of profitability is scaled by a firm's total assets, regardless of its existing capital structure and the related financing mix. In other words, *ROA* per se does not reflect the direct effect of capital structure decisions on a firm's profitability.

3.2.2. Independent Variables

As a main independent variable, we employed financial leverage, proxied by *D/A* (total debt to total assets). The *D/A* ratio was employed as a proxy of financial leverage by Tailab [29], who revised the effects of capital structure on profitability in the energy American firms. However, the *D/A* ratio is commonly used as a measure for controlling the effects of a financing mix, and in this, the related financial constraints; thus, it is considered as a universal measure employable in various settings (e.g., [16,17,27,28,51–53]).

Guided by the prior empirical evidence on the relationships between profitability and capital structure, we additionally employed the modified independent variable, by considering the maturity of debt commitments (such an analysis of debt components is suggested by Koralnun-Bereźnicka [54] or Bevan and Danbolt [55]). More specifically, in

Model 2, we employed the long-term debt to assets (*LtD/A*), and in Model 3, we employed the short-term debt to assets (*StD/A*). In Table 2, we provide the expected sign for these variables, guided by our main hypothesis stating that profitability may be inversely related to the overall level of debt and long-term debt (consistent with POT). However, prior evidence has confirmed a positive relationship for short-term debt and profitability in the energy sector [12], as well as for European firms [54]. In light of this mixed evidence, for short-term debt (*StD/A*) in Model 3, we expect either a positive sign (consistent with TOT) or a negative sign (consistent with POT).

Table 2. Independent variables and their expected causal relationships.

Variables	Definition/Proxies	Expected Sign
Dependent		
ROA	Net profit to total assets	n.a.
Independent		
Model 1: *D/A*	Total liabilities to total assets	−
Model 2: *LtD/A*	Long-term liabilities to total assets	−
Model 3: *StD/A*	Short-term liabilities to total assets	$+/-$

3.2.3. Control Variables

The range of control variables employed in our model is motivated by Eriksen and Knudsen [4], who confirmed that the firm-level factors co-determine the level of profitability. Accordingly, in our study, we employed a range of control variables, that have been addressed in prior empirical works that revised the determinants of a firm's profitability, as accompanying the capital structure considerations. These variables are explained in Table 3 and we provide their expected sign in the regression model, explained in light of prior empirical evidence.

Table 3. Control variables and their expected causal relationships.

Control Variables		Definition/Proxies	Expected Sign
Size	Firm size	Proxied by natural logarithm of a firm's assets	$+/-$
Age	Firm age	The number of years since firm inception	$+/-$
Sector	Sector	As a dummy variable, 0 for production, 1 for trade and distribution	
Tang.	Asset structure (tangibility)	Fixed tangible assets (PPE—plant, property, and equipment) to total assets	$+/-$
CR	Financiall iquidity	Current ratio, measured as current assets to current liabilities	$+/-$
Slack	Financial slack	Available financial slack, measured as cash to assets (cash ratio)	$+/-$
PA	Assets productivity	Sales revenues to total assets (total assets turnover)	$+$
OPM	Operating profit margin	EBIT (earnings before interests and taxes) to sales revenues	$+$

Size and Age

Nunes et al. [43] confirmed that larger companies are distinguished by a greater level of profitability and the profitability is persistent over time. Similar findings were presented by Fareed [28] and Asimakopoulos et al. [1], who analyzed Greek listed companies and demonstrated that firm profitability was positively affected by size. Martinez-Sola et al. [56] have confirmed that younger firms have better growth prospects and tend to be more

cost-efficient, and as a result, they are more profitable. On the other side, Yazdanfar [5] analyzed a large sample of Swedish firms and concluded that while a firm's size positively influences profitability, a firm's age negatively influences it. Additionally, Fareed et al. [28] found that a firm's age and productivity negatively influence firm profitability. In light of this evidence, in our study, we controlled for a firm's size and age. A firm's size is proxied by the natural logarithm of the firm's assets and the firm's age is proxied by the number of years since the firm's inception [57].

Sector-Related Variables

As there is evidence that firms substantially differ with profitability across the industries [31,57], we also controlled for the sub-sectors by distinguishing between energy production (PROD) and energy distribution and trade (DT). One explanation of industry specifics is related to the differences in the firm's asset's structure; thus in our study, we additionally controlled for the firm's tangibility of assets, proxied by the level of plant, property, and equipment in total assets of a firm. The tangibility of assets explains the operating leverage effect and the related impact of fixed operating costs on a firm's profitability [58,59]. Prior studies suggest that greater operating leverage (and the related effect of fixed costs) negatively impacts a firm's profitability [60]. For the energy sector, tangibility was confirmed as having a negative impact on *ROA* by Apan and İslamoğlu [27], although their sample covered only 10 energy firms listed on the Istanbul Borsa. The importance of tangibility stems from the fact that this variable is typically found to be a significant determinant of a firm's capital structure as it is linked to the firm's ability to use collateralized debt [57].

Liquidity

The second set of control variables employed in this study refers to financial ratios that specify a firm's financial liquidity and efficiency of operating performance. The financial liquidity is proxied in our study with two variables: the current ratio of financial liquidity (*CR*) and the available financial slack (also referred to as cash ratio) (*Slack*). These proxies verify the buffer of liquid assets (*CR*) or cash for immediate use (*Slack*) held by a company. Goddard at el. [41] proved that firms with higher liquidity tend to be more profitable. For the energy sector, liquidity was considered by Apan and İslamoğlu [1], with a positive impact on profitability. However, from the risk-return trade-off point of view, firms that manage their assets in a conservative manner and are more risk-averse, are also less profitable. On the other hand, only the firms that are profitable are able to earmark cash reserves and hold idle cash resources. In this respect, we do not predict the sign of the interplay between profitability and a firm's liquidity. Given that financial liquidity (*CR*) is dependent on the burden of a firm's short debt, the association between profitability and liquidity could differ if we consider long- or short-term debt in the firm's capital structure.

Efficiency

We also controlled for two variables that are regarded as influential on a firm's profitability and described the efficiency of the use of the firm's assets. The first variable is the productivity of assets (*PA*) that is proxied by the level of sales revenues generated by a firm's assets (total assets turnover). The second variable is the operating profit margin (*OPM*) that is proxied by the operating profit (EBIT—earnings before interest and taxes) to a firm's sales. In general, higher levels of PA and *OPM* should exert a positive impact on an overall firm's profitability. For example, Yazdanfar [5] proved that productivity positively influences profitability.

3.2.4. Regression Model and Method

In light of the prior literature, our basic model (Model 1) to test the association between profitability (*ROA*) and capital structure considers the debt to assets (*D/A*) as follows: as the main dependent variable:

$$ROA = \beta_0 + \beta_1 \, D/A + \beta_2 \, Age + \beta_3 \, Size + \beta_4 Sector + \beta_5 Tang + \beta_6 CR + \beta_7 Slack + \beta_8 PA + \beta_9 OPM + \varepsilon \quad (1)$$

where: *Age*—number of years since a firm's inception, *Size*—natural logarithm of a firm's assets, *Sector*—dummy variable 0 for the energy production, 1 for the energy distribution and trade, *Tang.*—tangible assets to total assets, *CR*—current ratio of financial liquidity, *Slack*—cash to total assets, *PA*—sales revenues to total assets, *OPM*—earnings before interests and taxes to sales revenues (see the explanation of variables provided in Table 3).

As we also controlled for the maturity of liabilities, we built two additional models, by replacing *D/A* with *LtD/A* (for long-term debt in Model 2) and *StD/A* (for short-term debt in Model 3):

$$ROA = \beta_0 + \beta_1 \, LtD/A + \beta_2 \, Age + \beta_3 \, Size + \beta_4 Sector + \beta_5 Tang + \beta_6 CR + \beta_7 Slack + \beta_8 PA + \beta_9 OPM + \varepsilon \quad (2)$$

$$ROA = \beta_0 + \beta_1 \, StD/A + \beta_2 \, Age + \beta_3 \, Size + \beta_4 Sector + \beta_5 Tang + \beta_6 CR + \beta_7 Slack + \beta_8 PA + \beta_9 OPM + \varepsilon \quad (3)$$

We employed the WLS (weighted least square) regression to test our models, as it could handle the problem of heteroskedasticity [61], which we have confirmed for our variables with the Breusch–Pagan test. The weights used in the regression were the absolutes of the residuals from the first-path OLS (ordinary least square) regression. We used PS Imago Pro v. 6.0 Predictive Solutions software for the modelling.

4. Results and Discussion

4.1. Descriptive Statistics

In Table 4, we report the means and standard deviation for the modelled variables, except size, which was proxied by the natural logarithm of total assets. We additionally present the descriptive statistics broken by the sub-sectors, by specifying their values for the firms operating in energy production (N = 1940) and for those operating in energy distribution and trade (N = 836), as these differences shed some light on the sector specifics. We supplement the analysis by providing the differences in sector-level means and employ the Wilcoxon Z-test to address the statistical significance of the observed differences. On average, the *ROA* for the energy sector is c.a. 5.99%, and it is slightly higher for energy production in comparison to energy distribution and trade (statistically significant at $p = 0.019$). The *D/A* is on average of 60.44% and it is also slightly higher in the energy production sector, with the difference statistically significant at $p = 0.038$. However, if we consider the capital structure from the debt maturity perspective, we observe interesting and considerable differences in the sub-sector dimension. Although, for the whole sample (N = 2776), the use of long- and short-term debt seems balanced (c.a. 31.3% vs. 29.08%), the energy production sector is distinguished with considerably higher levels of long-term debt in the capital structure as compared to the short-term debt use (40.76% vs. 20.41%), and this difference is statistically significant at $p = 0.000$. In the energy trade and distribution sector, we observe a contrary situation, with long-term debt levels of c.a. 9.34% and short-term debt levels of c.a. 49.21%, with the difference statistically significant at $p = 0.000$. This difference in the structure of debt is driven by the differences in the means of assets' tangibility, which is 62.32% for the whole sample, but with a 36.18% difference in mean values between the energy production and energy distribution and trade (statistically significant at $p = 0.000$). Thus, the higher level of tangibility ratio is linked to the higher level of long-term debt. The data also clearly indicate the considerable differences in sub-sector dimensions for the productivity of assets (*PA*) and operating profit margin ratios, which are statistically significantly higher for the energy trade and distribution sector. We also observe that sub-sectors differ at a statistically significant level in terms of financial liquidity (*CR*), with higher liquidity in the energy production sector. However, the differences between the means of financial slack are not statistically significant.

Table 4. Descriptive statistics and differences in mean values between the sub-sectors.

Variables	Whole Sample N = 2776		PROD N = 1940		DandT N = 839		Difference in Sector Means	Wilcoxon Z-Test	p-Value
	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev			
ROA	5.99%	0.1123	6.09%	0.1068	5.74%	0.1240	0.35%	−2.355 *	0.019
D/A	60.44%	0.2716	61.23%	0.2686	58.61%	0.2776	2.62%	−2.080 *	0.038
LtD/A	31.30%	0.3055	40.76%	0.3045	9.34%	0.1608	31.42%	−24.863 ***	0.000
StD/A	29.08%	0.2724	20.41%	0.2099	49.21%	0.2936	−28.81%	−24.548 ***	0.000
Age	14.27	9.7925	14.01	9.9764	14.86	9.3306	−0.85	−3.784 ***	0.000
Tang.	62.32%	0.3144	73.21%	0.2387	37.03%	0.3233	36.18%	−25.174 ***	0.000
CR	3.24	6.0402	3.72	6.6923	2.13	3.9346	1.59	−4.931 ***	0.000
Slack	11.12%	0.1317	10.23%	0.1190	13.19%	0.1555	−2.96%	−1.955	0.051
PA	1.29	3.8492	0.56	0.9279	3.00	6.5642	−2.44	−28.373 ***	0.000
OPM	19.15%	0.4590	26.36%	0.4804	2.42%	0.3524	23.94%	−22.975 ***	0.000

Notes: The entry variables have been winsorised at 1%, except from firm's age. Statistically significant at: *** α = 0.001; ** α = 0.01; * α = 0.05.

In Table 5, we present the Pearson's pair-wise correlations between the regressed variables. The main dependent variable (*ROA*) is negatively correlated, at a statistically significant level, with the independent variables employed in Model 1 (*D/A*), Model 2 (*LtD/A*), and Model 3 (*StD/A*). However, the correlation coefficients indicate relatively weak associations. We also observe that the main dependent variable is correlated with the control variables in the regression model, except the firm's age. For the tangibility of assets (*Tang.*), as the sector-oriented control variable, we observe a relatively weak association. The liquidity-related control variables (*CR* and *Slack*) are positively associated with *ROA*, on a comparable level. The efficiency-related control variables are also positively associated with ROA. However, the correlation with the productivity of assets (*PA*) is weak, whereas the correlation with the operating profit margin (*OPM*) is moderate.

Table 5. Correlation matrix (The Pearson's pair-vise correlation).

	ROA	D/A	LtD/A	StD/A	Size	Age	Tang.	CR	Slack	PA	OPM
ROA	1	−0.191 ***	−0.076 ***	−0.098 ***	−0.098 ***	0.018	−0.038 *	0.174 ***	0.178 ***	0.047 *	0.394 ***
D/A		1	0.498 ***	0.309 ***	0.025	−0.221 ***	−0.035	−0.408 ***	−0.220 ***	0.005	0.049 *
LtD/A			1	−0.549 ***	0.018	−0.155 ***	0.489 ***	0.123 ***	−0.195 ***	−0.236 ***	0.159 ***
StD/A				1	−0.006	−0.005	−0.465 ***	−0.665 ***	0.026	0.223 ***	−0.149 ***
Size					1	0.299 ***	0.086 ***	−0.090 ***	−0.315 ***	−0.091 ***	−0.014
Age						1	0.088 ***	0.056 **	−0.041 *	−0.115 ***	−0.018
Tang.							1	−0.120 ***	−0.313 ***	−0.363 ***	0.089 ***
CR								1	0.361 ***	0.009	0.090 ***
Slack									1	0.141 ***	0.044 *
PA										1	−0.048 *
OPM											1

Notes: Statistically significant at: *** α = 0.001; ** α = 0.01; * α = 0.05.

Taking into consideration the correlations between the control variables, we observe that there is a moderate positive and statistically significant correlation between long-term debt (*LtD/A*) and the tangibility of assets (*Tang.*). This is, however, explainable, as the firms that employ more fixed assets require long-term funding for maintaining financial balance. Thus, we also observe that there is a moderate and negative, statistically significant correlation between short-term debt (*StD/A*) and tangibility of assets (*Tang.*). There is also a relatively strong correlation between short-term debt finance (*StD/A*) and the current ratio of liquidity (*CR*). This association results from the measurement of a firm's financial liquidity, as the ability of current assets to cover the short-term debt obligations. As a result, the lower is the short-term debt, the higher is the current ratio of liquidity.

4.2. Regression Results

In Table 6, we present the WLS regression results for three models that differ with the main independent variable. Consistent with our assumptions, the first model (Model 1)

employs the overall debt to assets (*D/A*) as a proxy of capital structure, while the second and third models consider the maturity of liabilities (long-term debt to assets in Model 2, and short-term debt to assets in Model 3).

Table 6. The results of the WLS regression.

Variables	Model 1: *D/A*		Model 2: *LtD/A*		Model 3: *StD/A*	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
(Intercept)	−1.506 ***	0.000	−1.951 ***	0.000	−2.734 ***	0.000
D/A	−0.321 ***	0.000				
LtD/A			−0.319 ***	0.000		
StD/A					0.092 **	0.005
Age	−0.102 ***	0.000	0.209 ***	0.000	−0.187 ***	0.000
Size	0.070	0.139	0.069 ***	0.000	0.369 ***	0.000
Sector	−0.166 ***	0.000	0.178 ***	0.000	0.042 **	0.003
Tang.	0.000	0.984	−0.086 ***	0.000	−0.354 ***	0.000
CR	−0.138 ***	0.000	0.248 ***	0.000	−0.114 **	0.006
Slack	−0.092 ***	0.000	−0.227 ***	0.000	0.177 ***	0.000
PA	0.124 ***	0.000	0.012	0.600	0.028	0.063
OPM	0.561 ***	0.000	0.547 ***	0.000	0.653 ***	0.000
	R^2 = 449		R^2 = 753		R^2 = 622	
	Adj. R^2 = 447		Adj. R^2 = 752		Adj. R^2 = 621	
	F = 250.722 ***		F = 937.675 ***		F = 505.811 ***	

Notes: Dependent variable *ROA*, the dependent, independent, and control variables in the model in their natural logarithms, except from sector. Statistically significant at: *** $\alpha = 0.001$; ** $\alpha = 0.01$; * $\alpha = 0.05$.

4.2.1. Model 1

The relationship between the profitability (*ROA*) and capital structure (*D/A*) in Model 1 is inversed, which confirms our hypothesis and the expected sign of associations. The standardized beta coefficient of (−0.321) indicates that the increase in D/A negatively impacts a firm's *ROA*, at a statistically significant level ($p = 0.000$). In Model 1, we also observe that *ROA* (profitability) is negatively impacted by the firms' age (−0.102), increase in financial liquidity (−0.138), and increase in slack holdings (−0.092), at a statistically significant level. As expected, the *OPM* and *PA* exert a positive impact on the firm's profitability (with statistically significant beta coefficients of +0.561 and +0.124, respectively). For the sector, as a dummy variable, the negative beta coefficient of (−0.166) informs that lower levels of profitability are observed in firms that operate in the sector of energy trade and distribution. In Model 1, the firm's size and tangibility of assets are statistically insignificant. Overall, we consider the R^2 = 449 in Model 1 as consistent (or better) with the level of model fit in prior studies of similar scope (for different models, the R^2 ranged between 0.083 and 0.377 in D'Amato [62], 0.081 and 0.203 in Gill et al. [63], or adj. R^2 ranging between 0.265 and 0.498 in Abeywardhana [17] or 0.0899 and 0.1947 in Lameira et al. [31]).

4.2.2. Model 2

In the second model (Model 2), the long-term debt in the capital structure (*LdD/A*) is considered as a main independent variable. Similarly, as in Model 1, we observe that the higher level of long-term debt negatively impacts a firm's profitability, which is confirmed by the negative beta coefficient (−0.319), at a statistically significant level ($p = 0.000$). This confirms our hypothesis and the expected sign of associations.

Additionally, in Model 2, we observe that size and age positively impact profitability (beta coefficients of +0.069 and +0.209, respectively, at statistically significant levels). We also observe that assets' tangibility negatively impacts *ROA* (which was statistically insignificant in Model 1). Sector positively impacts *ROA* (beta coefficient +0.178), which signalizes that for long-term debt effects, the higher levels of *ROA* were observed in firms that operate in energy trade and distribution. Further, consistently with Model 1, in Model 2, the operating profit margin has a positive impact on *ROA* (beta coefficient +0.547) and available financial slack holdings have a negative impact on *ROA* (beta coefficient −0.227). However, in comparison to Model 1, in Model 2, productivity of assets is statistically

insignificant, whereas financial liquidity (*CR*) exerts a positive impact on *ROA* (beta coefficient +0.248). The R^2 for Model 2 indicates a better model fit in comparison to Model 1, and given the R^2, Model 2 explains 75.3% of the data. It suggests that the inverse relationship between profitability and capital structure is confirmed only if we consider the overall level of debt and the long-term debt employed by the company.

4.2.3. Model 3

If we compare the results for control variables in Model 3 against Models 1 and 2, we observe that the effect of sector, size, tangibility of assets, and operating profit margin is the same as in Model 2, given the signs of beta coefficients. In addition, this effect is visibly stronger for size (beta coefficient +0.369) and operating profit margin (beta coefficient +0.653). We also observe that in Model 3, the productivity of assets is insignificant, as in Model 2. The effect of firm's size in Model 3 is consistent with Model 1, and indicates that size exerts a relatively weak and negative impact on *ROA* (beta coefficient −0.187). For financial-liquidity-oriented control variables, in Model 3, for *CR*, we obtain results contrary to those observed in Model 2, but consistent with Model 1 (weak negative relationship, beta coefficient −0.114, significant at $p = 0.006$). For financial slack, the results are contrary to both Models 2 and 1, with a positive beta coefficient of +0.177, (significant at $p = 0.000$). Given the R^2 in Model 3, the model explains 62.2% of the data, which should be considered as a good model fit.

4.2.4. Expected Signs versus Findings

First of all, as presented in Table 7, we confirmed the inverse relationship between profitability and capital structure for non-listed energy firms for the overall level of debt (*D/A*) and the long-term debt (*LtD/A*). This supports our main hypothesis and the assumptions of the pecking order theory of capital structure (POT). For the short-term debt (*StD/A*), our results are consistent with prior findings of Abor (2005) and suggest that the greater level of short-term finance exerts a positive impact on profitability (*ROA*). However, this impact is relatively weak, given the beta coefficient of +0.092. For the control variables, given the differences in beta coefficients and their statistical significance among all three models considered, we find that the effects of age, financial liquidity, and available financial slack are inconclusive. If we consider the differences between beta coefficients obtained in Model 1, and beta coefficients obtained in Models 2 and 3, we find that size, sector, assets' tangibility, and productivity of assets are inconclusive as well. In this regard, the maturity of liabilities could be considered as the factor moderating the impact the control variables exert on a firm's profitability.

Table 7. Independent and control variables and their impact on firm's profitability.

	Variables	Expected Sign	Findings
	Independent Variables		
D/A	Capital structure (Financial leverage effect)	−	confirmed
LtD/A		−	confirmed
StD/A		+/−	+
	Control Variables		
Size	Firm size	+/−	inconclusive [b]
Age	Firm age	+/−	inconclusive [a]
Sector	Sector	+/−	inconclusive [b]
Tang.	Asset structure (tangibility)	+/−	inconclusive [b]
CR	Financial liquidity	+/−	inconclusive [a]
Slack	Financial slack	+/−	inconclusive [a]
PA	Assets' productivity	+	inconclusive [b]
OPM	Operating profit margin	+	confirmed

Notes: (a) the beta coefficients differ between Models 1, 2, and 3; (b) the Beta coefficients are similar for Models 2 and 3, but different from Model 1.

5. Concluding Remarks

This empirical work was designed to verify the hypothesis on the inverse relationship between profitability and financial leverage effect for the non-listed firms operating in the energy sector in four central European countries: Czech Republic, Hungary, Slovakia, and Poland. Grounded on the prior empirical evidence, we expected that the financial leverage (and the related increase of debt in the capital structure) reduces the firm's profitability. In our empirical examinations, we have confirmed this for the overall level of debt and the long-term liabilities. These findings are consistent with prior empirical evidence for firms operating in the energy sector and confirm the assumptions of the pecking order theory of capital structure and the related inverse relationship between leverage and a firm's profitability.

Our study also provides some evidence on the weak, but statistically significant positive interplay between the increase of short-term debt in capital structure and a firm's profitability. This is consistent with the assumptions of TOT (trade-off theory) and supports prior evidence for the energy sector provided by Abor [12]. However, as the associations are weak, further inquiries should be placed to confirm the positive effect between short-term finance leverage and profitability in the energy sector.

The remaining variables as the controls considered in our work are inconclusive in their impact on profitability, given the differences in debt maturity in the regression models. However, prior empirical evidence for these variables was also inconclusive. This aspect of research needs further revisions both for the energy sector, as well as for other sectors. In the examined set of control variables, the exception is the operating profit margin that positively impacts a firm's profitability, regardless of the components of financing mix and the related debt maturity.

Our work contributes to the existing body of the literature mainly by revising the large panel of data for non-listed firms that operate in the energy sector. Former evidence was provided predominantly for listed firms, which are under the pressure of the investors' and financial markets' impacts in their capital structure decision-making. Our work has confirmed the statistically significant differences between the sub-sector of energy production and energy distribution and trade. In light of this evidence, further inquiries should be placed to revise the capital structure as a driver of profitability in each sub-sector separately. Our work has also indicated that numerous control variables were inconclusive, given the debt maturity of financial leverage. In this regard, further research avenues should also address more in-depth the drivers of financial leverage as related to the debt maturity considerations and the overall firm's indebtedness. Although our model incorporated the sector (as a dummy variable), the size could be influential on the inconclusive results we have obtained for the remaining firm characteristics (age, size), liquidity (CR and slack), or assets' tangibility and productivity.

The evidence provided in this work is, to some extent, limited by the dataset obtainable for non-listed firms. In the regression models, several control variables that are often tested for listed firms were not included. However, we still controlled for the predominant drivers of profitability confirmed in prior works. Another limitation of our work is that we did not control for country settings, as we treated the group of four central European countries (Poland, Slovakia, Czech Republic, and Hungary) as unified. In this respect, further studies could address the country-specific features and their relevance for the profitability of non-listed firms that operate in the energy sector.

This study revises the financial leverage effect on the profitability of firms that perform in the energy sector in the pre-COVID-19 period. Thus, further inquiries could be placed to verify whether the observed associations will also be valid in the post-COVID-19 periods, starting from 2020 as the year of severe pandemic frictions, and forthcoming years that could bring some stabilization of the energy sector performance. However, in the context of the countries of our interest (Poland in particular), further studies that will capture the energy-transition effect will be of particular importance as well. The green transition and the related deep changes expected in the energy sector will certainly exert an impact on

firms' profitability and may result in the evaporation of the currently observed prevalence of POT in leverage–profitability interplay. In this respect, further studies that will address the drivers of profitability in the energy sector and the moderating role of capital structure within are critical for the countries that are highly exposed to the challenges of green transition policies.

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