How does the effect of external financing on profitability differ across tiers? Evidence from the automotive supply chain

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Abstract: *Due to the importance of automotive industry for the Czech Republic (in a broader sense for European countries) and due to the unprecedented development of both national and European economies caused by the COVID-19 outbreak, also having implications on the financial sector, we aim to explore the main determinants of operating performance within the automotive supply chain. This study is based on the data sample composed of complete individual financial statements (audited if available) of firms conducting their business in the Czech Republic from 2011 to 2018 and belonging to the automotive supply chain. This supply chain is defined as (sub) deliveries of the Czech automotive industry represented mainly by companies classified under NACE 22, 27, 25, 24. The hypothesis claiming that the investment and leverage-based variables are the important drivers of operating profitability was only partly confirmed (valid predominantly for Tier 3), which shows that the supply chain organization also plays a crucial role as well as (valid for Tier 1). Also, we have shown (illustrated) that the assumption of different capital structures among tiers is valid. The average overall indebtedness of Tier 3 is higher by approximately 50% (altogether, the short- and long-term leverage are higher by 40% and 62% respectively) than Tier 1 firms. The need for relatively high capital expenditures (applicable to Tier 1) and working capital investments (applicable to Tier 3) is partly facilitated by external funds reflected in the indebtedness, which is associated with the costs reducing overall low profits from these investments. The leverage-profitability relationship seems to be nonlinear for long-term debts contrary to short-term debts where the linear relationship prevails.*

Introduction

The core function of business management is the management of business performance, while connecting individual sections of business activities and interfering in all of them. There are different views on the term "performance," but it is most often associated with increasing the market value of a business and the appreciation

of funds invested by investors. To manage the overall performance of a company, it is necessary to know not only the value representing a particular area but also the factors affecting its formation; therefore, this paper aims to examine the main determinants of operating profitability as the indicators of operating performance.

Many scholars have paid their attention to profitability and its determinants, but they mostly focused on a selected country, industry, or a segment. A company cannot be considered to be an isolated entity, as its success is also influenced by the environment in which it operates. Therefore, the market and industry situation must also be considered when assessing the financial results achieved. For this reason, the paper will focus on the supply chain of the automotive industry, which is developing very turbulently and is one of the most important industries in the Czech Republic (in terms of production volume, the number of employees, and export share). The authors believe that this paper can bring some important findings and deepen our understanding of profit generation which can be then used by the local management.

The current automotive industry has several specifics that distinguish it from other industries and predetermine its needs. Its typical features are a stable vertical supplier-customer chain, the classification of suppliers into individual levels (Tier 1 – those directly supplying to original equipment manufacturers, subcontractors to Tier 2 – suppliers of subassemblies and individual assembly parts, Tier 3 – those supplying raw materials and individual components, such as fasteners), just-in-time inventory management, the cyclical nature of the industry, or the high expenditure on R&D and innovations.

This paper is innovative mainly thanks to two facts: i) most previous studies differ in their scope (country/industry/segment), they do not focus on a selected supply chain in a particular CEE country (the Czech Republic); and ii) the majority of papers predominantly focus on listed companies only (because of the data accessibility) compared to our data set comprising unlisted firms, thus it brings several factors from different profitability influence categories together and further evaluates them with respect to the supply chain levels. Therefore, this research provides relevant, or, more precisely, beneficial contributive findings to the academic literature in the area that has not been fully processed yet.

The paper consists of 5 sections – the introduction is followed by the overview summarizing the relevant literature sources, including empirical findings concerning the determinants of operating profitability. The data set including its adjustments and the descriptive analysis of the sample are explained in section 3. In section 4, the effects of leverage and investment-based variables on operating profitability are empirically examined. The conclusion remarks and the areas of further research are given in section 5.

1. Theoretical background

According to Grant (2010), by measuring the performance of organizations, or, more precisely, by understanding the factors that affect the profit creation, organizations gain opportunities to plan their activities implemented within the strategic management more effectively, and thus to achieve their visions or to fulfill their mission. However, it should be borne in mind that decisions that increase profitability tend to increase risks, and, conversely, decisions that are aimed at reducing risks will tend to reduce potential profitability (Singh & Kumar, 2017). Therefore, analyses revealing factors influencing profitability have become an extremely helpful tool providing guidelines for managers in their short-term as well as strategic decision-making process (Lesakova et al., 2019).

The influence of the company's age factor on the growth of the company's valuation was demonstrated, for example, by Widagdo and Satiti (2018). Also, the research by Mendes et al. (2014) on small and medium-sized enterprises shows that the investment determinants have a different impact on young and old enterprises. A possible reason for the positive effect of the age factor may be the company's reputation and experience, which will then also make access to finance easier, as confirmed by Pervan et al. (2019). On the contrary, less flexibility of older companies, or, more precisely, bureaucracy which may impede the introduction of innovative approaches, as evidenced by the research of Hirsch et al. (2014), may be negative.

Another specific determinant at the enterprise level resulted from the research by Stefko et al. (2021) or Öcal et al. (2007), and that is working capital ratio. Working capital is the key indicator of liquidity, solvency, efficiency, and the overall performance of a company. This indicator is causally related to profitability as well

as the value of the company (Gumus et al., 2017; Smith, 1980). Other authors (e.g., Deepa et al., 2016; Doruk & Ergun, 2019) argue that the widely used metric for measuring the effectiveness of business management and the internal need for external financing is cash conversion cycle (CCC), which refers to the time span between spending cash on purchases and receiving cash from sales. Using the global empirical analysis and samples of companies from different countries, Chang (2018) demonstrated the relationship between the cash conversion cycle and the business performance. He has traced the negative relationship between the cash conversion cycle and profitability and the value of the company, which supports the fact that the aggressive working capital policy can improve the business performance. However, this effect is reduced or reversed if firms exist at the lower level of the cash conversion cycle. The research by Eljelly (2004) examined the relationship between liquidity and profitability in terms of the current ratio and cash conversion cycle by using correlation and regression analyses on companies in Saudi Arabia. This research found a negative relationship and emphasized that the cash conversion cycle is a more important measure for liquidity than the current ratio. Lazaridis and Tryfonidis (2006) conducted their study on 131 listed companies on the Stock Exchange in Athens and they found a significant relationship between profitability and working capital management. These authors' observation has shown that lower gross operating profit is related to the increase in the number of days for accounts payable. This research has also indicated that accounts receivable, accounts payable, and inventory should be kept at an optimum level in order to generate higher profits. On the contrary, Sharma and Kumar (2011) examined the positive relationship between working capital and profitability using data of 263 non-financial firms obtained from the Stock Exchange in Bombay for the period from 2000 to 2008 by means of multiple OLS regression. The results of these authors have indicated a negative relationship between the number of days for inventory, accounts payable, and profitability, but a positive relationship between accounts receivable and the cash conversion cycle.

The determinant of capital intensity, i.e., the level of capital costs (CAPEX) results, for example, from the studies by Hovakimian

(2011) or Deloof (2003). Hovakimian (2009) has found that investment-cash flow sensitivity is non-monotonic with respect to internal funds and to virtually all considered firm characteristics ex ante associated with the relative costs of external financing. This author proposes a new rationale for the negative relationship between investments and cash flows based on the presumption that growth opportunities change over a firm's lifetime, triggering changes in firms' investment rates and cash flows – periods of high growth opportunities are periods of low cash flows and high capital expenditures and vice versa.

The influence of external financing on profitability was dealt with, for example, by Ruckova (2016). Her research is based on the idea that if the use of debt financing should have a positive impact on the running of the company, this funding should be obtained under the best conditions. In view of the fact that debt financing in the V4 countries is obtained from the banking sector, it is assumed that companies that will be granted a loan will increase their profitability. Brusco and Panunzi (2020) argue that management can make efforts to either increase short-term profitability, thereby creating greater immediate cash flows, or to improve long-term prospects. If both types of efforts are observed, low-productivity firms ultimately use internal funds, while high-productivity firms use external sources of funding. Seth et al. (2020) identified the direct effect of external financing costs on the efficiency of working capital management on a sample of 212 Indian manufacturing companies in the period from 2008 to 2019, but they failed to prove their effect on business performance. As for the automotive industry, Mohammed et al. (2016) elaborated a study proving that the leverage in the automotive industry generally has an adverse effect on the profitability of component manufacturers, with the short-term debt having more adverse effect than the long-term one. However, the finding concerning vehicle manufacturers shows a positive relationship between indebtedness and profitability. In this case, the result is significantly affected by the long-term debt. The meta-study by Jaworski and Czerwonka (2019) clearly showed the negative impact of company's indebtedness on liquidity and profitability. The authors also argue that the structure of company's capital is influenced by internal factors, but macroeconomic specifics shape the strength and direction of these dependences.

The key macroeconomic factor is the country's economic potential, which is related to the quantitative increase (growth) in potential gross domestic product. It can therefore be deduced that a change in the performance of national economy will also affect the performance of individual subjects of the national economy, which is confirmed by a number of studies. For instance, Alsaleh and Abdul-Rahim (2018) or Killins (2020) show on the panel models that GDP can be regarded as a significant factor of profitability. Thus, studies (e.g., Kilinc & Berberoglu, 2019; Pereira et al., 2019) show that in times of economic growth the demand for business performance predominates, which has a positive effect on profitability. The general price level of goods and services in the economy (inflation) can also be considered another macroeconomic indicator. Soukhakian and Khodakarami (2019) evidence that inflation is significantly related to economic value added. Li (2012) also proves that rising prices of goods and services increase input costs for companies, and interest rates and taxes are rising. Companies with fixed incomes (contracted orders) can reduce their purchasing power, or, more precisely, demand. This will reduce the performance of the economy. PRIBOR 3M (Prague Inter-Bank Offered Rate) as a reference value of interest rates on the interbank deposit market (fixed for the Czech National Bank and the Czech Forest Club from quotations of reference banks for sale) can also be classified as a macroeconomic indicator. PRIBOR 3M is considered a crucial interest rate, e.g., in the studies by Kocisova (2015).

Within the levels of the automotive supply chain called Tier 1, 2, and 3, the authors aim to test the following hypotheses:

H1: Investment and leverage-based variables are important profitability drivers across the whole automotive supply chain as well as individual sub-segments.

H2: Capital structure tends to be different for individual Tiers.

H3: Financial leverage has a positive effect on profitability.

2. Research methodology

Our data set is composed of complete individual financial statements (audited if available) of firms conducting their business in the Czech Republic over the period of 2011–2018

and belonging to the automotive supply chain. This supply chain is defined as (sub)deliveries of Czech automotive industry represented mainly by following NACE 22 (Nomenclature statistique des Activités économiques dans la Communauté Européenne) – Manufacturing of rubber and plastic products, 27 – Manufacture of electric equipment, 25 – Manufacture of fabricated metal product, 24 – Manufacture of basic metals, etc.

Raw data were adjusted as follows. Companies that did not exist or their financial data were not available throughout the entire observed period (from 2011 to 2018), were removed to avoid the potential composition effect similarly, as in Xu (2012). Furthermore, according to Faulkender and Petersen (2006) or Vithessonthi and Tongurai (2015), the companies with leverage (defined as the amount of bank debt on the balance sheet divided by total assets) above one were excluded from the sample. Unlike Lind et al. (2012), no cut-off points with respect to companies' size in terms of turnover and total assets were applied. On the other hand, to be in line with Bena and Ondko (2012), the companies with extremely high or low profitability were removed. Therefore, the final balanced data set contains 112 firms with the complete annual financial data from 2011 to 2018, thus consisting of 896 yearly observations of the firms. This sample accounts for approximately 5.9% to 15.0% of firms and it accounts for approximately 6.1% to 9.0% of the achieved turnover in 2018 fiscal year across the individual tiers.

The distribution of firms in the predefined supply chain tiers is derived from the CzechInvest (2021) classification (a national business and investment development agency functioning as a state-funded organization subordinated to the Ministry of Industry and Trade of the Czech Republic) which allows classifying a company in multiple supply chain tiers. For our purposes, we assigned each company to a single tier only based on prevailing production.

Several variables (including the industry and firm specific ones) were employed to capture potential characteristics and amounts of profit differentiation within the financial value chain. For the comprehensive overview, see Tab. 1.

EBTDA margin (alt. EBITDA margin) is used as an indicator of company's profitability showing different levels of external indebtedness and it is related to the total amount of net costs

Tab. 1: Overview of variables

Variables	Abbreviation	Unit	Definition
Profitability	EBTDA margin	% p. a.	EBTDA/TO
	EBITDA margin	% p. a.	EBITDA/TO
Firm specific			
Age of the firm	AGE	Years	Number of years in the business
Working capital ratio	WC_TA	n. a.	Working investment (inventory + accounts receivable − accounts payable)/ total assets
CAPEX ratio	CAPEX_TA	n. a.	Capital expenditure/total assets
Working capital financing ratio	STBL_TA	n. a.	Short-term bank financing/total assets
Long-term financing ratio	LTBL_TA	n. a.	Long-term bank financing/total assets
Turnover	TO	CZK mil.	Sales
Industry specific			
Production increase	PROD_CZ	No units	Annual production growth in the Czech Republic
Macroeconomic			
GDP growth	GDP	% p. a.	Annual GDP growth rate
Inflation	CPI	% p. a.	Customer price index
3M PRIBOR	3MPRIBOR	% p. a.	Annual 3M PRIBOR average

Source: own

(mainly interest expenses) reflecting the risk profile of a particular company.

Existing studies have demonstrated that investments both in fixed assets (Hovakimian, 2009) and current assets (Deloof, 2003) can strongly influence the overall performance of companies. Capital expenditures scaled to total assets shall capture effects of investment policy on firm's profitability. Working capital management also constitutes an important determinant of firm's performance represented by conventional working capital investments scaled to total assets and can lead to a competitive advantage, e.g., operating performance can be improved by reducing accounts payable (Deloof, 2003) or inventory levels (Enqvist et al., 2014). Alternatively, we also employ dynamic measures reflecting firm's continuing liquidity represented by the cash conversion cycle as by Nobanee et al. (2011).

Turnover is used as the indicator of the potential effect of growth and size on firm's performance (e.g., Coad et al., 2011).

Leverage is typically measured as the ratio of the book value of total liabilities to the book value of total assets (e.g., Ahn et al., 2006; Faulkender & Petersen, 2006) or, alternatively, as the ratio of the book value of long-term debt to the book value of total assets (e.g., Alsaleh & Abdul-Rahim, 2018; Hall, 2012) in the mainstream literature. Since we have the detailed financial data at our disposal, for our purposes, the leverage is defined as the senior bank interest bearing debt (these are typically bank loans, since the Czech economy is predominately bank-driven economy). From the time perspective, we further specify the short-term leverage with 12-month repayment period maximum, whereas the long-term one has the repayment period longer than 12 months. Other forms of senior debt (such as corporate bonds) are not considered because of the underdeveloped local capital market. Potential intragroup financing is typically subordinated to the senior bank debt (any repayment including interest is subject to prior lender's consent) and it is not

Tab. 2: Descriptive analysis of data set

	Mean	Std. dev.	Min	Median	Max	Skewness	Kurtosis
EBTDA margin	0.090	0.092	−1.081	0.088	0.615	−4.290	55.630
CPI	0.016	0.010	0.003	0.017	0.033	0.220	−1.160
GDP	0.023	0.020	−0.008	0.026	0.053	−0.210	−1.010
3MPRIBOR	0.007	0.006	0.003	0.004	0.020	1.400	0.660
AGE	18.400	6.300	0.000	19.500	46.000	−0.040	1.130
CAPEX_TA	−0.080	0.091	−0.950	−0.058	0.368	−2.420	15.880
LTBL_TA	0.106	0.117	0.000	0.070	0.765	1.550	3.090
STBL_TA	0.100	0.100	0.000	0.075	0.513	0.980	0.440
TO	784	1,361	6	326	9,557	3.600	14.570
WC_TA	0.154	0.141	−0.328	0.152	0.736	0.310	2.020

Source: own

Note: N (valid) = 896; Pct (valid) = 99.1.

so important in the Czech context (both bonds and intragroup loans account for approximately 0.37% of financing in 2018).

The descriptive statistics of variables selected for the regression analysis of the Czech automotive supply chain is provided in Tab. 2.

If the company age (AGE) equals zero, it corresponds to the first year of business operation. The negative value of working investment share on the balance sheet (WC_TA) is driven by the negative value of working investment, which reflects relatively aggressive external financing in the form of trade credits (the value of account payables is higher than the sum of inventories and accounts receivable). By contrast, the positive value of WC_TA represents a rather conservative working capital investment strategy, which has to be financed from own equity or short-term bank loans. Both zero values of LTBL_TA and/or STBL_TA represent companies with zero senior bank and/or short-term debts, the so-called zero debt companies. The positive value of CAPEX_TA stands for companies, where the fixed assets value dropped beyond the annual depreciation, e.g., because of significant divestment, assets revaluation, corporate changes, etc. The negative sign of CCC represents firms with external financing (provided by their suppliers in the form of trade credit), thereby demonstrating their market power. On the contrary, the positive sign means that the particular firm is the

provider of external financing to its customers (the sign of a weaker market position).

As depicted in Fig. 1, it is obvious that the average working capital investment amounts to significantly higher volumes (across all Tiers) than the average capital expenditures (almost two-fold). Also, the average working capital ratios are positive for all Tiers, indicating that all sub-segments of the Czech automotive supply chain tie up the significant amount of working capital. Over the observed period, the average capital expenditure share (CAPEX_TA) is highest for Tier 2 (8.8% in Tier 2 versus 7.3% in Tier 3). In contrast, the average working capital investment share (WC_TA) is highest for Tier 3 (17.6% in Tier 3 versus 15.6% in Tier 1). Especially in case of the working capital investment, Tier 3 significantly outcompetes other Tiers almost every single year (with the exception of the first two years for Tier 1), which is also accompanied by the growing trend of 15.8% (2011) and 18.1% (2018), unlike Tier 1 experiencing the reduction in the working capital investment share from 17.5% (2011) to 13.9% (2018). The evidence remains robust in the case of median values for both metrics as well. For the further robustness check, we have also alternatively calculated investment-related variables scaled to turnover, i.e., WC_TO and CAPEX_TO confirming previous observations.

The differences in the capital structure across Tiers can also be observed in Fig. 2.
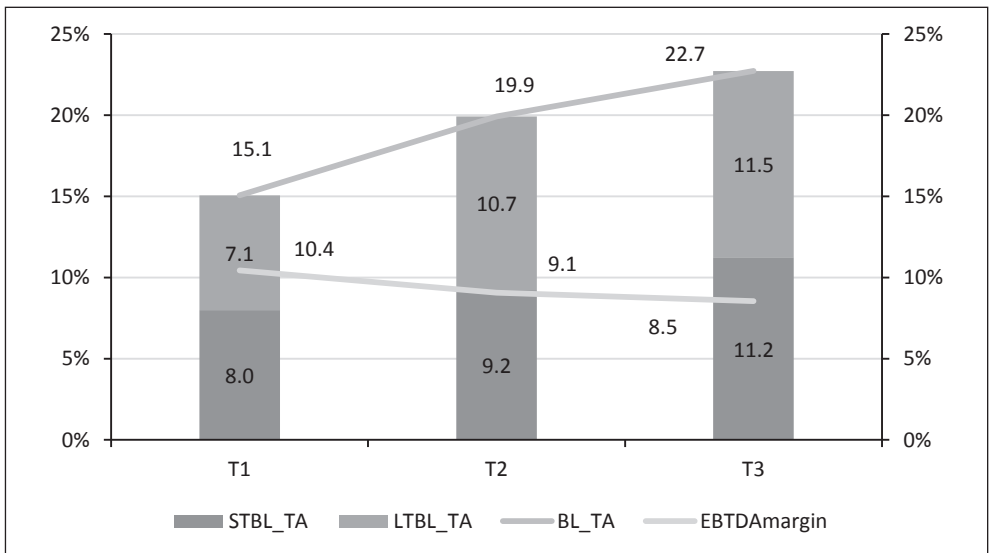
Fig. 1: **Investment-related variables (average values)**
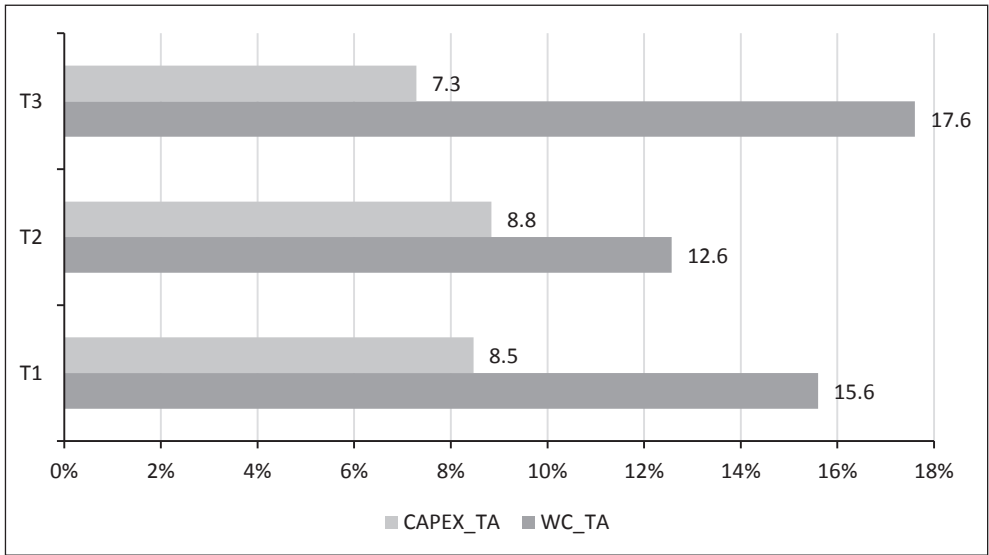
Note: T1 – Tier 1, T2 – Tier 2, T3 – Tier 3.

Fig. 2: **Leverage-related variables and EBTDA margin (average values)**

Note: T1 – Tier 1, T2 – Tier 2, T3 – Tier 3.

The average leverage, both long-term (LTBL_TA) and short-term (STBL_TA), is higher for Tier 3 companies amounting to 11.5% and 11.2%, respectively, as compared to 7.1% and 8.0% respectively observed for Tier 1. From the time perspective, both leverages in Tier 3 oscillate around average values, whereas in Tier 1, where we observe the strong trend of deleveraging, i.e., there is almost 49% decline in the total leverage from 17.5% in 2011 to 9.9% in 2018.

The average profitability measured by EBTDA margin shows that Tier 1 with the average value of 10.4% is outperforming other Tiers – especially Tier 3 with the average value of 8.5%, i.e., approximately 19% gap in margin. This is valid throughout all the years (except for the first two years in the case of Tier 1) with the increasing gap magnitude. In terms of the robustness check, the observations are not largely distorted by outliers as the median value follows the similar pattern.

Average annual values, the extreme value of Tier 2 in 2011 is caused by one company with high financial cost related to refinancing. If omitted, then the average annual value would be 0.9%. Altogether for Fig. 1–3, the following abbreviations are used: T1 – Tier 1, T2 – Tier 2, T3 – Tier 3.

Fig. 3 depicts the development of the difference between the EBITDA margin and the EBTDA margin across the Tiers over the entire observed period as the indicator of financial cost predominantly associated with interest expenses caused by the external indebtedness. The reduction in profitability (EBTDA margin) also confirms the above-mentioned observation about the capital structure, i.e., Tier 3 constantly faces higher indebtedness resulting in the higher financial cost and ultimately leading to the EBTDA margin higher reduction with the exception of 2011. Over the observed period, the financial burden is decreasing rapidly in the case of Tier 1 (−50%) in contrast to Tier 3, experiencing only 15% reduction mainly caused by the high competition on the Czech banking market and the resulting pressure on offered margins.

During the period from 2011 to 2014, the total European personal car production increased from 15.7 mil. produced units to 18.1 mil. produced units. Tier 1 suppliers, who are almost

Fig. 3: Financial cost across the tiers
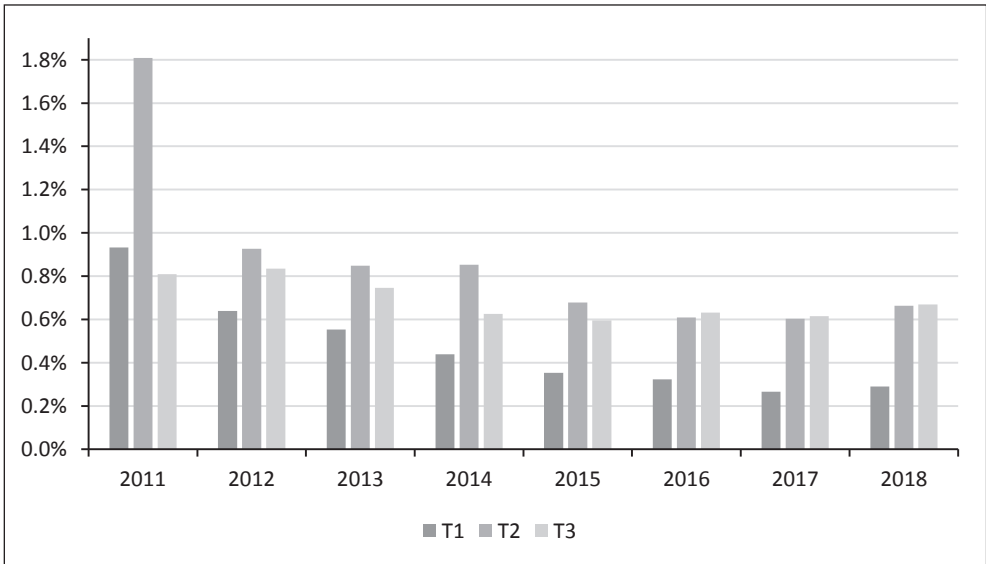
Source: own

Note: T1 – Tier 1, T2 – Tier 2, T3 – Tier 3.

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exclusively dependent on the automotive sector (the high level of specialization resulting in the full firm's production within the automotive value chain), were able to improve fixed costs coverage during this period to realize economies of scale more than their suppliers from the Tier 2 and Tier 3 sub-sectors (probably due to their lower level of specialization, i.e., only partial participation in the automotive supply chain from the firm's profitability perspective), and keep it for the remaining period of time.

To investigate the determinants of profitability within the automotive supply chain, we estimate the following model, including the company-specific, industry-specific, and economy-specific variables (Model 1):

$$EBTDAmargin_{it} = Age_{it} + LTBL\_TA_{it} +$$
$$+ STBL\_TA_{it} + CAPEX\_TA_{it} + WC\_TA_{it} + \text{(1)}$$
$$+ TO_{it} + PROD\_CZ_t + GDP_t + CPI_t +$$
$$+ 3MPRIBOR_t + \upsilon_i + \varepsilon_{it}$$

where: EBTDA – earnings before taxes and depreciation and amortization; EBTDA margin – profitability calculated as EBTDA over sales; Age – number of years in business; LTBL_TA – long-term leverage; STBL_TA – short-term leverage; CAPEX_TA – capital expenditures over total assets; WC_TA – working capital investment share on balance sheet; TO – annual sales; PROD_CZ – annual car production in the Czech Republic; GDP – annual GDP growth; CPI – annual consumer price index; 3MPRIBOR – average annual 3M PRIBOR.

The level of leverage is captured by the two variables allowing for distinguishing between short-term and long-term financing, while controlling the usual uses of these – working capital and capital expenditures scaled to total assets, respectively. The company-specific variables include Age as the indicator of its market experience and lifecycle, whereas TO variable shows the size of the company. Macroeconomic variables employed in the model include the GDP growth and the 3MPRIBOR benchmark interest rate to include the economic environment in the particular year. In order to capture also the condition of the Czech automotive industry, the number of cars produced in the particular year is also indicated. The error term consists of υ and ε, which represent the company-specific and disturbance term, respectively.

In order to select the appropriate panel data estimation method, the usual procedure was performed. First, the *F*-test provides significant evidence for rejecting the zero hypothesis of no individual effects (*p*-value < 0.001). After that, using the Hausman test, we reject the zero hypothesis of both fixed effects and random effects model to be consistent (*p*-value < 0.001). We apply the model of individual fixed effects, and use the robust covariance matrix estimator by Beck and Katz (1995) to get panel corrected standard errors to control for serial correlation and heteroscedasticity.

The presence of multicollinearity is tested using the Variance Inflation Factor (VIF) test on the pooled model with none of the VIF values exceeding 2.5. As a rule of thumb, the VIF value of 3 is perceived to be a conservative threshold for potential multicollinearity issue.

3. Research results

The estimation results of Model 1 for the entire sample as well as for the individual Tiers are presented in Tab. 3.

In the case of the Tier 1 subsample, we have found a significantly negative effect of the long-term leverage whereas the leverage related to working capital facilities as well as to other firm-specific and control variables remain insignificant (with the only exception of marginally significant positive effect of the age of the company).

On the other hand, Tier 2 does not exhibit any effect of the leverage on profitability. However, we have found a strong positive effect of capital expenditures to total assets on EBTDA margin, which corresponds to 100 bps increase in CAPEX_TA, translating into 37 bps increase in the EBTDA margin. Still strong but a bit weaker effect has been found also in the case of working capital investment related to total assets. Furthermore, we have also found the evidence of positive effect of company size measured by turnover to its profitability, though the effect is rather small (CZK 1 bn of turnover contributing to EBTDA margin by 12 bps).

Interestingly, investment-related, and leverage-related variables have been detected as the significant determinants of profitability for Tier 3 companies unlike Tier 1 where the stronger effect has been found for the long-term leverage. Also, the CAPEX intensity has had a significantly negative effect, whereas the ratio of working capital investment to total assets has demonstrated a positive effect on profitability.

Tab. 3: Model 1 – estimation results

	All	Tier 1	Tier 2	Tier 3
Age	0.001	0.006°	0.000	−0.002
	(0.002)	(0.004)	(0.004)	(0.001)
LTBL_TA	−0.042	−0.215*	0.130	−0.088***
	(0.037)	(0.100)	(0.119)	(0.022)
STBL_TA	−0.199***	−0.114	−0.167	−0.240***
	(0.053)	(0.123)	(0.133)	(0.036)
CAPEX_TA	0.115***	0.023	0.367***	−0.072**
	(0.033)	(0.089)	(0.075)	(0.024)
WC_TA	0.101*	0.072	0.212*	0.080**
	(0.039)	(0.071)	(0.107)	(0.026)
TO	0.000*	0.000	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
PROD_CZ	−0.059	0.030	−0.174	−0.001
	(0.050)	(0.036)	(0.117)	(0.036)
GDP	0.081	0.045	−0.041	0.170
	(0.181)	(0.186)	(0.429)	(0.131)
CPI	−0.690°	−0.684	−0.961	−0.423
	(0.401)	(0.407)	(0.940)	(0.293)
3MPRIBOR	−0.652	−1.150	−1.209	−0.026
	(0.638)	(0.850)	(1.491)	(0.464)
Number of observations	896	128	336	432
Adjusted R^2 (%)	34.6	59.3	33.7	54.4

Source: own

***$P < 0.001$; **$p < 0.01$; *$p < 0.05$; °$p < 0.1$.

Based on the standard diagnostics procedure, we report heteroscedasticity-robust standard errors for the results from the Tier 1 subsample. The residuals for the entire sample as well as for the remaining subsamples passed the serial correlation (p-values of Breusch-Godfrey/Wooldridge test for the serial correlation in the panel models are: 0.0004441 for Tier 1; 1.314e-06 for Tier 2; 5.303e-08 for Tier 3, and 3.183e-13 for the entire sample) and heteroscedasticity tests (p-values of the Breusch-Pagan test are: 0.1856 for Tier 1 – corrected by heteroscedasticity robust standard errors; 0.0005323 for Tier 2; 0.08989 for Tier 3, and 1.121e-07 for the entire sample) at 10% level at least.

In contrast to Hutchinson et al. (2007) or Nobanee et al. (2011), who found the inverse relationship between working capital management and profitability, our results imply a positive relationship applicable to Tier 2 and Tier 3 similarly to those of Gill et al. (2010) and Sharma and Kumar (2011). We also used an alternative model where the conventional working capital investment variable (WC_TA) was substituted by Cash Conversion Cycle (Cash Conversion Cycle is defined as the number of days of inventory outstanding plus the number of days of accounts receivable outstanding minus the number of days of payable outstanding) which emphasizes rather the liquidity aspects of working capital management. However,

the alternative model (Model 3) has provided inconclusive results (the coefficients were insignificant and very small in its magnitude), which indicates that liquidity is not the primary profitability driver within the Czech automotive supply chain (the results are available upon request).

With respect to the leverage-based variables, the obtained results are rather mixed across the individual Tiers. If the leverage-based variable is found significant, the effect is negative. As for the long-term leverage, this is the case of Tier 1 and Tier 3; however, Tier 3 shows a significantly stronger effect. We have observed the short-term leverage to be the key determinant of profitability for the Tier 3 companies, since 100 bps increase in the short-term leverage translates into 24 bps decrease in the EBTDA margin, whereas it would drop by 9 bps in case of the equal increase in the long-term leverage, i.e., the effect is approximately 2.6 times smaller. As for Tier 3, we assume that it is caused by the combination of higher working capital investment needs (WC_TA is higher by approximately 13% compared to Tier 1) and the related higher short-term leverage (STBL_TA is higher by approximately 40% compared to Tier 1), which altogether leads to the decreasing marginal returns. We presume that Tier 3 is highly dependent on Tier 1. Tier 3 is thus forced to keep a higher amount of inventories prepared to be delivered to the Tier 2 and Tier 1 companies. Also, the day-on-hand accounts receivable are higher in Tier 3. Tier 3 is forced to keep and therefore finance a higher working capital and the inability to manage own working capital has a negative impact on the profitability of Tier 3. The Tier 3 companies can also be easily replaced by other producers, as Tier 3 produces mainly smaller and non-structural parts. Therefore, Tier 1 is in a better negotiating position. Tier 1 produces larger units, which are structurally important for the car manufacturers, they cannot be replaced so easily and therefore the overall business conditions concluded between Tier 1 and the car manufacturers are set to be sustainable for a long term for both. Based on the above assumptions, Tier 1 benefits from its strength and can manage its working capital and leverage more effectively, while Tier 3 if forced to keep a higher working capital and related leverage, which deteriorates its profitability.

CAPEX expenditures (CAPEX_TA) seem to be significant only for Tier 3 and Tier 2

with negative and positive signs respectively and a relatively low magnitude. The inverse relationship to profitability may be driven by: i) the associated long-term leverage that is needed to finance these capital expenditures (Tier 3 has a higher share of long-term leverage – LTBL_TA, compared to Tier 1, namely by 61% on average over the observed period of time), which implicates higher interest cost; and ii) lower profitability (the average EBTDA margin for Tier 3 is lower by 19% than for Tier 1) resulting in the constrained generation of company internal resources that could alternatively be used for financing these investments.

Regarding the control sector-specific and macroeconomic variables, all models provide consistent estimates in terms of sign, magnitude, and statistical significance, to be more precise, none of them is statistically significant except for CPI variable for the entire data set.

Furthermore, to verify the non-monotonic effects of leverage on a company's performance, we have included the squared variables capturing the leverage (both long and short) and estimate the following model (Model 2):

$$
\begin{aligned}
EBTDAmargin_{it} = &\ Age_{it} + LTBL\_TA_{it} + \\
&+ LTBL\_TA_{it}^2 + STBL\_TA_{it} + STBL\_TA_{it}^2 + \\
&+ CAPEX\_TA_{it} + WC\_TA_{it} + TO_{it} + \\
&+ PROD\_CZ_t + GDP_t + CPI_t + \\
&+ 3MPRIBOR_t + v_i + \varepsilon_{it}
\end{aligned} \tag{2}
$$

Tab. 4 clearly shows that a significantly negative effect of the squared long-term leverage and a positive sign of the level effect of the leverage have been found for the entire sample, which suggests that the relationship between the long-term leverage and performance is inverted-U-shaped. Interestingly, this relationship is found (strongly) significant only in the case of Tier 2. The break-even point for Tier 2 is when the ratio of long-term bank loans to total assets is approximately at 22%, i.e., when any additional leverage beyond this point has a marginal deteriorating effect on the performance. This confirms the fact that in case of leverage-performance relationship it is necessary to assess the individual tiers separately. On the other hand, we can confirm the monotonic relationship between performance and short-term leverage (if there is any). We have found a significantly negative effect of the short-term leverage for Tier 1 and Tier 3 (with the effect being nearly double in size for

Tab. 4: Model 2 – Estimation results

	All	Tier 1	Tier 2	Tier 3
Age	0.002	0.007*	−0.001	−0.002
	(0.002)	(0.003)	(0.004)	(0.001)
LTBL_TA	0.169*	−0.299	0.659**	−0.049
	(0.082)	(0.215)	(0.239)	(0.054)
LTBL_TA_SQ	−0.462**	0.649	−1.509**	−0.077
	(0.156)	(0.816)	(0.577)	(0.096)
STBL_TA	−0.094	−0.408*	−0.059	−0.219**
	(0.109)	(0.195)	(0.241)	(0.084)
STBL_TA_SQ	−0.329	1.076	−0.447	−0.054
	(0.317)	(0.637)	(0.693)	(0.238)
CAPEX_TA	0.112***	0.016	0.300***	−0.071**
	(0.033)	(0.073)	(0.078)	(0.024)
WC_TA	0.114**	0.062	0.256*	0.082**
	(0.039)	(0.075)	(0.107)	(0.026)
TO	0.000*	0.000	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
PROD_CZ	−0.051	0.026	−0.160	0.001
	(0.050)	(0.071)	(0.116)	(0.036)
GDP	0.082	0.051	0.103	0.164
	(0.180)	(0.261)	(0.427)	(0.132)
CPI	−0.639	−0.616	−0.940	−0.419
	(0.400)	(0.569)	(0.930)	(0.294)
3MPRIBOR	−0.677	−1.204	−1.181	−0.040
	(0.635)	(0.899)	(1.477)	(0.466)
Number of observations	896	128	336	432
Adjusted R^2 (%)	35.3	60.0	35.2	54.2

Source: own

Note: ***$P < 0.001$; **$p < 0.01$; *$p < 0.05$; °$p < 0.1$

the Tier 1 companies). In the case of other variables, the coefficients and significance do not change conclusions drawn from Model 1.

4. Discussion

Unlike the most frequently used definitions of profitability (typically ROA, ROE, etc.), we have focused on more "cash flow" driven measurers, namely EBTDA and EBITDA margin (Model 2). They demonstrate different levels of external indebtedness more precisely by capturing the total amount of net expenses reflecting company's risk profile. The obtained results remain the same in its characteristics and slightly smaller in its magnitudes, by which they confirm the general observed patterns across

the entire data set (the costs associated with bank financing reduce margins; the results are available upon request).

The results valid for the entire sample are not consistent across the individual Tiers, where we find significant discrepancies mainly in the effects of leverage as well as in the investment intensity-related variables on profitability measures by EBTDA/EBITDA margin.

From the entire supply chain perspective, only capital expenditures (CAPEX_TA) and short-term leverage (STBL_TA) appear to be the most significant variables, since the automotive industry is highly innovative (a pressure on lower emissions/fuel consumption, a higher level of automation and digitization, etc.) and has a relatively high share of current assets that needs to be financed by external resources (from outside the automotive supply chain), respectively.

The obtained results are in line with the findings of other scholars. The positive sign for investment-intensity variables indicates the existence of efficient capital allocation (Palazzi et al., 2020) achieved by, e.g., the standardization of production operations, which is typical for the automotive industry (Arora et al., 2020). On the other hand, Dickinson and Sommers (2012), and Lee (2010) claim that excess capacity investment could lead to a negative relationship (the capital expenditures for Tier 3 in our sample).

From the leverage point of view, our evidence demonstrates the inverse relationship to profitability, thus indicating that the pecking order theory is relevant to our sample as in the case of Mazur (2007) or Mateev et al. (2013). Mohammed et al. (2016) elaborated a study proving that debt in the automotive industry generally has an adverse effect on the profitability, with the short-term debt having more adverse effect than the long-term one (in our case applicable to Tier 3). Pan and Liu (2018) documented that leverage for short-term financing plays a more important role than for long-term financing from the operating performance perspective. The comparison of the calculated coefficients for the long and short-term leverage (−0.09 versus −0.24 for Tier 3) indicates the application of non-standard pricing (loans with shorter maturity have higher interest rates), which can probably be explained by the applied higher risk premium charged by banks (the results from the descriptive analysis indicate

a significantly higher leverage both for long and short term for Tier 3 compared to the others), thus modifying the pecking order theory (Delcoure, 2007), namely by adopting the selected aspects of trade-off theory in business practise (Prášilová, 2012). Another explanation might also be the lack of effective management of the capital structure.

Based on the comparison of Tiers, there is no clear and the same pattern between the investment intensity and profitability generation (the profitability of Tier 3 is more dependent on the working capital/investment intensity than in the case of the others, e.g., it is not significant in the case of Tier 1 at all). Similar patterns are also valid for the leverage-based variables, i.e., the profitability of Tier 3 is determined by both the short and long-term leverage(there are significant independent variables), and in the case of other Tiers the robustness decreases. Based on the above-mentioned facts, *H1* can be confirmed only partly (particularly for Tier 3).

Obviously, there are other factors than the conventional ones affecting a firm's profitability, especially firms in Tiers within the supply chain. As Losbichler et al. (2008) noted, the organization of the supply chain shall be dealt with. One can believe that the profitability in Tier 1 is predominantly driven by the special relationship with OEM (Original Equipment Manufacturer), which is based on their mutual interdependence and ensures their long-term sustainable cooperation (reasonable contractual conditions, etc.). On the contrary, Tier 3 production can be viewed as a "commodity" that can be easily replaced by another producer, which creates an extremely competitive environment (pressures on margins, less favourable payment conditions, etc.) demanding higher capital expenditures, longer cash conversion cycles, and thus ultimately leads to higher indebtedness due to the smaller capacity of internal resources generation. This can be understood as evidence of diminishing downstream value-added decomposition, which was observed also by others, e.g., by Pirttila et al. (2010) and Losbichler et al. (2008).

The above-mentioned findings also translate into the capital structure formation in individual firms across the predefined Tiers. Our results also confirm capital variations across industries/segments as was already noted by Hall et al. (2000), Vithessonthi and Tongurai (2015), Talberg et al. (2008). Presuming that

small and medium-sized firms operate predominantly in Tier 2 and particularly in Tier 3, the results indicate a noticeably stronger relationship between external resources (financial leverage) and profitability (the indicator of operating performance) in these segments as was mentioned by Huang et al. (2020).

Specifically, Tier 3 has its average overall indebtedness higher by approximately 50% (altogether the short- and long-term leverages are higher by 40% and 62%, respectively) than the firms belonging to Tier 1. Therefore, *H2* is confirmed. The automotive industry is relatively capital (both short and long-term) and investment-intensive (ongoing pressures on quality and effectiveness due to various measures, such as emission reduction, green policy, etc.). The need for relatively high capital expenditures (applicable to Tier 1) and working capital investments (applicable to Tier 3) is partly facilitated by external resources transformed into indebtedness, which is associated with costs reducing the overall low profitability of these investments. Altogether for all Tiers, all significant leverage coefficients (both short and long-term) have a negative sign, and therefore *H3* is rejected. Apart from the above-mentioned suggested explanation using the modified pecking order theory (the preference of internal resources use), other arguments can also be given. For example, Zeitun and Tian (2007) claim that firms in emerging markets tend to overleverage themselves to solve the agency problem, which ultimately leads to a decline in profitability. On the assumption of overleverage, the relationship between leverage and profitability shall be non-linear by nature, i.e., to a certain level of indebtedness (leverage ratio) its benefits exceed its costs; however, costs of debt subsequently surpass benefits. The obtained results indicate different patterns for the relationship between long-term leverage and profitability, where the non-linear assumption is confirmed (particularly for the entire data set and Tier 2). On the contrary, the relationship between short-term leverage and profitability seems to be linear by nature (particularly for Tier 1 and Tier 3). The potential areas of future research may include: i) a broader understanding of supply chain organization (cooperative versus self-serving) that translates into profit distribution among supply chain members; ii) further comprehension and analysis of sensitivity to interest rate rise (since the

leverage plays an important role in generating profitability); and iii) potential implications on changes in the working capital structure (inventory pre-stocking, etc.) – these have been caused by the disruption in the traditional supply chain due to the COVID-19 outbreak and it could be elaborated.

Conclusions

We have demonstrated the existence of inconsistency in the profitability drivers (investment and leverage-based variables) among the individual sub-segments (Tiers) of the Czech automotive supply chain, which implies difficulties when comparing the firms belonging to Tiers. Typically, Tier 1 firms are entities with a long-term history, sizeable performance (a higher turnover, a significant number of employees, etc.), a high level of specialization/automation and mostly hardly substitutable relationship with EOM that is reflected in their dominant market position within the supply chain. By contrast, Tier 3 firms are either: i) rather smaller entities (typically SMEs) fully dedicated to automotive industry supplies easily replaceable due to the "commodity" character/nature of their production; or ii) bigger firms with a primary focus on the alternative production outside the automotive industry, where activities related to the automotive supply chain are only complementary (the utilization of excess production capacity, etc.).

We have found that especially the capital-intensity variables (both working capital and CAPEX) play an important positive role (except for Tier 3) in profitability formation. Interestingly, the cash conversion cycle (CCC) variable (an alternative to working capital ratio) as the indicator of liquidity implies that liquidity is not a primary profitability driver within the supply chain. Other profitability determinants employed, such as turnover (TO), and industry-specific and macroeconomic variables seem to play no significant role in generating profitability.

The capital structure, in other words, the source of financing seems to play different role across Tiers in terms of profitability. It has been illustrated that the employment of external financial resources for capital expenditures reimbursement is translated into an increase in profitability (applicable to the entire data set and Tier 2). However, it is limited by nature due to the non-linear character of the relationship between leverage and profitability. Short-term

financing used to facilitate working capital needs appears to be linear and inverse to profitability, i.e., the use of any short-term debt leads to a decrease in profitability margins.

References

Ahn, S., Denis, D. J., & Denis, D. K. (2006). Leverage and investment in diversified firms. *Journal of Financial Economics*, *79*(2), 317–337. https://doi.org/10.1016/j.jfineco.2005.03.002

Alsaleh, M., & Abdul-Rahim, A. S. (2018). Determinants of cost efficiency of bioenergy industry: Evidence from EU28 countries. *Renewable Energy*, *127*, 746–762. https://doi.org/10.1016/j.renene.2018.04.085

Arora, A., Li, J., Zantye, M. S., & Hasan, M. M. F. (2020). Design standardization of unit operations for reducing the capital intensity and cost of small-scale chemical processes. *Aiche Journal*, *66*(2). https://doi.org/10.1002/aic.16802

Beck, N., & Katz, J. N. (1995). What to do (and not to do) with time-series cross-section data. *American Political Science Review*, *89*(3), 634–647. https://doi.org/10.2307/2082979

Bena, J., & Ondko, P. (2012). Financial development and the allocation of external finance. *Journal of Empirical Finance*, *19*(1), 1–25. https://doi.org/10.1016/j.jempfin.2011.11.002

Brusco, S., & Panunzi, F. (2020). Internal financing, managerial compensation and multiple tasks. *Annals of Finance*, *16*(4), 501–527. https://doi.org/10.1007/s10436-020-00375-z

Chang, C.-C. (2018). Cash conversion cycle and corporate performance: Global evidence. *International Review of Economics & Finance*, *56*, 568–581. https://doi.org/10.1016/j.iref.2017.12.014

Coad, A., Rao, R., & Tamagni, F. (2011). Growth processes of Italian manufacturing firms. *Structural Change and Economic Dynamics*, *22*(1), 54–70. https://doi.org/10.1016/j.strueco.2010.09.001

CzechInvest. (2021). *Supplier database: Classification*. https://www.czechinvest.org/cz/Sluzby-pro-investory/Databaze-dodavatelu

Deepa, N., Sivakumar, S. D., Deshmukh, S. S., & Malarkodi, M. (2016). Influence of cash conversion cycle on financial performance of coconut oil mills in Western Tamil Nadu. *Indian Journal of Economics and Development*, *12*(1), 143–150. https://doi.org/10.5958/2322-0430.2016.00016.0

Delcoure, N. (2007). The determinants of capital structure in transitional economies. *International Review of Economics & Finance*, *16*(3), 400–415. https://doi.org/10.1016/j.iref.2005.03.005

Deloof, M. (2003). Does working capital management affect profitability of Belgian firms? *Journal of Business Finance & Accounting*, *30*(3–4), 573–588. https://doi.org/10.1111/1468-5957.00008

Dickinson, V., & Sommers, G. A. (2012). Which competitive efforts lead to future abnormal economic rents? Using accounting ratios to assess competitive advantage. *Journal of Business Finance & Accounting*, *39*(3–4), 360–398. https://doi.org/10.1111/j.1468-5957.2012.02283.x

Doruk, O. T., & Ergun, B. (2019). The role of macroeconomic constraints on cash conversion cycle: Evidence from the Turkish manufacturing sector. *Asia-Pacific Journal of Accounting & Economics*, *29*(4), 1063–1074. https://doi.org/10.1080/16081625.2019.1636665

Eljelly, A. M. A. (2004). Liquidity – Profitability tradeoff: An empirical investigation in an emerging market. *International Journal of Commerce and Management*, *14*(2), 48–61. https://doi.org/10.1108/10569210480000179

Enqvist, J., Graham, M., & Nikkinen, J. (2014). The impact of working capital management on firm profitability in different business cycles: Evidence from Finland. *Research in International Business and Finance*, *32*, 36–49. https://doi.org/10.1016/j.ribaf.2014.03.005

Faulkender, M., & Petersen, M. A. (2006). Does the source of capital affect capital structure? *Review of Financial Studies*, *19*(1), 45–79. https://doi.org/10.1093/rfs/hhj003

Gill, A., Biger, N., & Mathur, N. (2010). The relationship between working capital management and profitability. Evidence from the United States. *Business and Economics Journal*, *10*(1), 1–9.

Grant, R. M. (2010). *Contemporary strategy analysis* (7th ed.). John Wiley & Sons.

Gumus, Y., Aslanertik, E., & Gumus, G. K. (2017). Liquidity position and working capital adequacy of companies in Turkey: Outlook from industry financial statements. In *Contributions to management science* (pp. 399–415).

Springer International Publishing. https://doi.org/10.1007/978-3-319-44591-5_27

Hall, G., Hutchinson, P., & Michaelas, N. (2000). Industry effects on the determinants of unquoted SMEs' capital structure. *International Journal of the Economics of Business*, *7*(3), 297-312. https://doi.org/10.1080/13571510050197203

Hall, T. W. (2012). The collateral channel: Evidence on leverage and asset tangibility. *Journal of Corporate Finance*, *18*(3), 570–583. https://doi.org/10.1016/j.jcorpfin.2011.12.003

Hirsch, S., Schiefer, J., Gschwandtner, A., & Hartmann, M. (2014). The determinants of firm profitability differences in EU food processing. *Journal of Agricultural Economics*, *65*(3), 703–721. https://doi.org/10.1111/1477-9552.12061

Hovakimian, G. (2009). Determinants of investment cash flow sensitivity. *Financial Management*, *38*(1), 161–183. https://doi.org/10.1111/j.1755-053x.2009.01032.x

Hovakimian, G. (2011). Financial constraints and investment efficiency: Internal capital allocation across the business cycle. *Journal of Financial Intermediation*, *20*(2), 264–283. https://doi.org/10.1016/j.jfi.2010.07.001

Huang, G.-Y., Huang, H. H., & Lee, C. I. (2020). Taming the dark side of asset liquidity: The role of short-term debt. *International Review of Economics & Finance*, *69*, 539–562. https://doi.org/10.1016/j.iref.2020.06.007

Hutchinson P. D., Farris, M. T., & Anders, S. B. (2007). Cash to cash analysis and management. *The CPA Journal*, *77*(8), 42–47.

Jaworski, J., & Czerwonka, L. (2019). Meta-study on relationship between macroeconomic and institutional environment and internal determinants of enterprises' capital structure. *Economic Research-Ekonomska Istrazivanja*, *32*(1), 2614–2637. https://doi.org/10.1080/1331677x.2019.1650653

Kilinc, E. C., & Berberoglu, C. N. (2019). The relationship between saving, profit rates and business cycles. *Sosyoekonomi*, *27*(40), 131–150. https://doi.org/10.17233/sosyoekonomi.2019.02.08

Killins, R. N. (2020). Firm-specific, industry-specific and macroeconomic factors of life insurers' profitability: Evidence from Canada. *The North American Journal of Economics and Finance*, *51*, 101068. https://doi.org/10.1016/j.najef.2019.101068

Kocisova, K. (2015). Analysis of the loan to deposit ratio in the Visegrad Group countries. *Ekonomicky Casopis*, *63*(10), 1053–1075.

Lazaridis, I., & Tryfonidis, D. (2006). Relationship between working capital management and profitability of listed companies in the Athens stock exchange. *Journal of Financial Management and Analysis*, *19*(1), 26–25.

Lee, S. (2010). Effects of capital intensity on firm performance: The U.S. restaurant industry. *The Journal of Hospitality Financial Management*, *18*(1), 1–13. https://doi.org/10.1080/10913211.2010.10653882

Lesakova, L., Ondrusova, A., & Vinczeova, M. (2019). Factors determining profitability of small and medium enterprises in selected industry of mechanical engineering in the Slovak Republic – The empirical study. *E&M Economics and Management*, *22*(2), 144–160. https://doi.org/10.15240/tul/001/2019-2-010

Li, B. M. (2012). The study on the impact of inflation on profitability of property insurance companies in China insurance. In Proceedings of *China International Conference on Insurance and Risk Management* (pp. 561–566). Tsinghua University Haidianqu.

Lind, L., Pirttilä, M., Viskari, S., Schupp, F., & Kärri, T. (2012). Working capital management in the automotive industry: Financial value chain analysis. *Journal of Purchasing and Supply Management*, *18*(2), 92–100. https://doi.org/10.1016/j.pursup.2012.04.003

Losbichler, H., Mahmoodi, F., & Rothboeck, M. (2008). Greating greater shareholder value form supply chain initiatives. *Supply Chain Forum: An International Journal*, *9*(1), 82–91. https://doi.org/10.1080/16258312.2008.11517192

Mateev, M., Poutziouris, P., & Ivanov, K. (2013). On the determinants of SME capital structure in Central and Eastern Europe: A dynamic panel analysis. *Research in International Business and Finance*, *27*(1), 28–51. https://doi.org/10.1016/j.ribaf.2012.05.002

Mazur, K. (2007). The determinants of capital structure choice: Evidence from Polish companies. *International Advances in Economic Research*, *13*(4), 495–514. https://doi.org/10.1007/s11294-007-9114-y

Mendes, S., Serrasqueiro, Z., & Nunes, P. M. (2014). Investment determinants of young and old Portuguese SMEs: A quantile approach. *BRQ-Business Research Quarterly*, *17*(4), 279–291. https://doi.org/10.1016/j.brq.2013.03.001

Mohammed, H. K., Knapkova, A., & Aliu, F. (2016). Debt financing and profitability of Czech automotive industry. In Proceedings of

3rd International Conference on Finance and Economics (ICFE) (pp. 342–351). Tomas Bata University in Zlin (Czech Republic).

Nobanee, H., Abdullatif, M., & AlHajjar, M. (2011). Cash conversion cycle and firm's performance of Japanese firms. *Asian Review of Accounting*, *19*(2), 147–156. https://doi.org/10.1108/13217341111181078

Öcal, M. E., Oral, E. L., Erdis, E., & Vural, G. (2007). Industry financial ratios – Application of factor analysis in Turkish construction industry. *Building and Environment*, *42*(1), 385–392. https://doi.org/10.1016/j.buildenv.2005.07.023

Palazzi, F., Sgro, F., Ciambotti, M., & Bontis, N. (2020). Technological intensity as a moderating variable for the intellectual capital-performance relationship. *Knowledge and Process Management*, *27*(1), 3–14. https://doi.org/10.1002/kpm.1617

Pan, Z., & Liu, L. (2018). Forecasting stock return volatility: A comparison between the roles of short-term and long-term leverage effects. *Physica A: Statistical Mechanics and Its Applications*, *492*, 168–180. https://doi.org/10.1016/j.physa.2017.09.030

Pereira, A., Hernandes, M., & Pereira, V. S. (2019). Economic cycles and the ratio of working capital to the profitability of internationalized companies. *Revista Contabilidade e Controladoria*, *11*(1), 142–161. https://doi.org/10.5380/rcc.v11i1.64614

Pervan, M., Pervan, I., & Curak, M. (2019). Determinants of firm profitability in the Croatian manufacturing industry: Evidence from dynamic panel analysis. *Economic Research-Ekonomska Istrazivanja*, *32*(1), 968–981. https://doi.org/10.1080/1331677x.2019.1583587

Pirttila, M., Viskari, S., & Karri, T. (2010). Working capital in the value chain: Cycle times of pulp and paper industry. In Proceedings of *19th Annual IPSERA Conference* (pp. 16–19). IPSERA.

Prášilová, P. (2012). Determinanty kapitálové struktury českých podniků [Determinants of the capital structure of Czech enterprises]. *E&M Economics and Management, 15*(1), 89–104.

Ruckova, P. (2016). Effect of liquidity and profitability on use of debt finance sources in manufacturing industry's companies in V4 countries. In Proceedings of *15th International Conference on Finance and Banking* (pp. 333–341). Silesian University in Opava.

Seth, H., Chadha, S., Sharma, S. K., & Ruparel, N. (2020). Exploring predictors of working capital management efficiency and their influence on firm performance: An integrated DEA-SEM approach. *Benchmarking: An International Journal*, *28*(4), 1120–1145. https://doi.org/10.1108/bij-05-2020-0251

Sharma, A. K., & Kumar, S. (2011). Effect of working capital management on firm profitability: Empirical evidence from India. *Global Business Review*, *12*(1), 159–173. https://doi.org/10.1177/097215091001200110

Singh, H. P., Kumar, S., & Colombage, S. (2017). Working capital management and firm profitability: A meta-analysis. *Qualitative Research in Financial Markets*, *9*(1), 34–47. https://doi.org/10.1108/QRFM-06-2016-0018

Smith, K. (1980). Profitability versus liquidity tradeoffs in working capital management. *Readings on the Management of Working Capital*, *42*(1), 549–562.

Soukhakian, I., & Khodakarami, M. (2019). Working capital management, firm performance and macroeconomic factors: Evidence from Iran. *Cogent Business & Management*, *6*(1). https://doi.org/10.1080/23311975.2019.1684227

Stefko, R., Vasanicova, P., Jencova, S., & Pachura, A. (2021). Management and economic sustainability of the Slovak industrial companies with medium energy intensity. *Energies*, *14*(2), 267. https://doi.org/10.3390/en14020267

Talberg, M., Winge, C., Frydenberg, S., & Westgaard, S. (2008). Capital structure across industries. *International Journal of the Economics of Business*, *15*(2), 181–200. https://doi.org/10.1080/13571510802134304

Vithessonthi, C., & Tongurai, J. (2015). The effect of firm size on the leverage-performance relationship during the financial crisis of 2007–2009. *Journal of Multinational Financial Management*, *29*, 1–29. https://doi.org/10.1016/j.mulfin.2014.11.001

Widagdo, B., & Satiti, N. (2018). An effect analysis of company's size, profitability, and age towards islamic social reporting disclosure and company's valuation. In Proceedings of *5th International Conference on Community Development (AMCA)* (pp. 426–428). https://doi.org/10.2991/amca-18.2018.117

Xu, J. (2012). Profitability and capital structure: Evidence from import penetration. *Journal of Financial Economics*, *106*(2), 427–446. https://doi.org/10.1016/j.jfineco.2012.05.015

Zeitun, R., & Tian, G. G. (2007). Capital structure and corporate performance: Evidence from Jordan. *Australasian Accounting Business and Finance Journal, 1*(4), 40–61.