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# CAPITAL STRUCTURE DETERMINANTS OF WOOD-PROCESSING ENTERPRISES IN SLOVAKIA

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## ABSTRACT

Capital structure has been widely discussed, but there is still a lack of industry-oriented empirical studies of Slovak enterprises focusing on this topic. The aim of the paper is to identify significant capital structure determinants of wood-processing enterprises in Slovakia, and their comparison with the determinants in other industries worldwide. Applying panel regression, in the years 2016-2019, we found evidence for the negative relation between leverage and profitability, growth opportunities, cash, respectively. But most of these relations were disturbed during the crisis in 2020. Some evidence of a negative relation between leverage and size occurred only in the crisis period. There is only a partial confirmation of several capital structure theories. Pecking-order theory corresponds to the debt-equity choice of Slovak wood-processing enterprises best. When comparing empirical capital structure determinants with other industries and countries, the most similar to our sample seems to be the food and beverages industry in Indonesia. Our paper is the first one, which reveals relations between leverage and its determinants of Slovak wood-processing enterprises that support a need for next studies focusing on similar topics.

**Key words:** capital structure, leverage, wood-processing enterprises, Slovakia, panel regression

## INTRODUCTION

Capital structure theories and their empirical verification on different datasets have belonged to widely discussed topics among economists since MODIGLIANI and MILLER (1958) presented their irrelevance theory of capital structure (original MM model). An inexhaustibility of the topic lies in various theories and in the fact that studies of different countries and industries can have both similar and different results.

Adding only one variable – corporate taxes – to the original MM model, capital structure is relevant thanks to interest tax shield (MODIGLIANI and MILLER 1963). Optimal capital structure would be represented by zero equity. On the other hand, the use of other techniques for tax optimization, like non-interest tax shield (depreciation & amortization), can lower a motivation for higher leverage, as non-interest and interest tax shields are substitutes (TREZEVANT 1992). It is clear that enterprises with minus EBIT are not motivated to use interest tax shield, and enterprises with minus EBITDA do not need any tax shield, while enterprises with relatively high EBITDA do not necessarily consider the shields as substitutes; but as complements.

Trade-off theory (KRAUS and LITZENBERGER 1973, MYERS 1984) adds the next variable – financial distress costs. As benefits of interest tax shield must be compared to these expenses, optimal capital structure will not have a corner solution (maximal leverage, zero equity), but the interior one. We can say that business risk is the determinant of possible financial distress that can be amplified by high leverage. Therefore, lower leverage is suitable for enterprises with higher business risk and with higher bankruptcy costs, including the indirect ones such as investment restrictions, a loss of customers, business partners, growth opportunities and key employees (KRIŠTOFÍK 2010), reputational damage of owners and managers that is more severe in specific markets with limited number of potential business partners etc.

Agency costs theory (FAMA and MILLER 1972, JENSEN and MECKLING 1976) focuses on relations between mangers, owners, and creditors. To minimize agency costs of debt, a collateral can be used, owners - especially of micro and small enterprises - can offer personal guarantees, an enterprise as whole or selectively a debt issue should be rated, any information asymmetry between insiders and outsiders should be minimized etc. Minimizing agency costs of equity includes control mechanisms, incentive schemes, and debt issues, especially if cash is so high and investment opportunities low that it motivates managers to an ineffective consumption. Actually, the high value of cash to total assets ratio is the typical feature of many Slovak wood-processing enterprises. Agency costs of both equity and debt can also be minimized thanks to ESG disclosures, ratings, and rankings, with a focus on G-governance ones.

Pecking-order theory (MYERS and MAJLUF 1984) supposes that an enterprise follows certain order when financing: internal funds, debt issue, equity issue. Enterprise issues new debt or equity only if internal funds are insufficient for investment opportunities. So, the need for external financing relates on investment opportunities and on internal funds items, flows, respectively: profitability (retained earnings), dividend policy, amount of cash, depreciation and amortization. If we omit the least probable equity issue, the determinants of external financing become the determinants of debt issue and leverage. If we do not omit equity issue, debt-equity choice is not clear, as equity is both the first and the last financing option.

According to life cycle theory (WESTON and BRIGHAM 1981, CHITTENDEN *et al.* 1996), smaller and younger enterprises can have some constraints with obtaining new external funds. However, those problems can be minimized by a collateral, and other techniques for achieving investors' trust described in the agency costs theory. The next financing options for start-ups include venture capital, business angels, and internal funds when the enterprises become profitable.

Every rational subject should buy cheaply and sell expensively. Applying this simple idea to capital markets, an enterprise should issue new shares when stock price is relatively higher and make buybacks when it is lower. According to market timing theory (BAKER and WURGLER 2002), this effect can be long-lasting. Therefore, current capital structure is the result of past market timing activities. Applying the theory on debt, there should be a negative relation between interest rates and debt issues.

Empirical studies of capital structure are very often country-oriented, less often industry-oriented. ALMAZAN and MOLINA (2001) studied 61 industries using the Compustat database. They show different leverage variability in different industries. Higher within-industry variability of leverage is confirmed for industries with a longer history, higher capital expenditures, and greater leas indebtedness. Regarding corporate governance variables, board structure and incentives play a role.

CAPOBIANCO and FERNANDES (2004) studied the enterprises of airline industry over the world applying DEA models. They identified that more effective enterprises have lower

values of fixed to total assets ratio, and equity ratio minimally 40%. The enterprises with rising revenues reduce their leverage.

VIVIANI (2008) confirmed that pecking-order theory is more applicable to French wine enterprises than trade-off theory. Applying both single-year linear regression and panel regression on 5-year dataset, he studied profitability, cash, asset turnover, tangibility, non-interest tax shield, age, and growth in sales as leverage determinants. Statistical significance of the selected determinants was confirmed especially when applying single-year approach. Regarding the methodology, several variant measures were defined for both leverage and its determinants. The specific view on the industry was supplemented by the industry sub-sectors analysis.

ISLAM and KHANDAKER (2014) confirmed profitability and asset tangibility as significant determinants of the Australian enterprises in the mining industry, while the same determinants are insignificant for other (non-mining) enterprises. Such results support a need for industry-oriented research.

That is confirmed by the next study of Australian listed companies, as well. LI and ISLAM (2019) – analysing 20 industries – found that firm-specific determinants of capital structure vary across industries. In addition, they show the significant industry-specific determinants.

ZHANG, CAO, and ZOU (2016) confirmed an overinvestment in the renewable industry in China, especially for the wind and biomass subsectors. The effect of leverage on profitability is confirmed especially for downstream enterprises. That creates a basis for policy makers to minimize the constraints that enterprises have when acquiring new debt.

SALIM and SUSILOWATI (2019) focused on Indonesian listed food and beverages companies. They found that liquidity and enterprise growth are significant capital structure determinants, with the negative impact on leverage, while profitability and enterprise size are insignificant. The effect of leverage on enterprise value is positive but insignificant.

JAWORSKI and CZERWONKA (2021) joined single-industry with multiple countries research, as they studied capital structure of the energy industry in 25 EU countries. While tangibility and enterprise size correlate with leverage positively, profitability and liquidity have a negative impact. Macroeconomic determinants with strong or moderate effect on leverage are GDP growth, protection of stakeholders' rights, inflation, taxation, degree of capital markets and financial institutions development.

The complex summary of capital structure theories, selected empirical studies, and the methodology of variables – all focusing on leverage determinants – is presented in Tab. 1. That summary will enable us to develop hypotheses and methodology. We would like to stress that all mentioned determinants have their empirical confirmations in plenty of studies – especially industry non-oriented – but not all of them are part of our industry-oriented review.

Wood-processing industry - which consists of wood, furniture, pulp and paper subindustries - has an important potential in the Slovak economy, which is also given by the forest coverage of the country that is 41% (MINISTRY OF A&RD 2021). Focusing more closely on the first subindustry, its total year revenues (in billions of EUR) in 2020 achieved 1.36, expenses 1.32, respectively (STATISTICAL OFFICE 2022). It has the most important status according to the number of employees, over 12 thousand, followed by the furniture subindustry (NATIONAL FORESTRY CENTRE 2022). However, which determinants have a significant impact on capital structure choice of Slovak wood-processing enterprises, has not been studied yet. The variability of capital structure theories and the existence of industry-oriented empiric studies in different countries support a need for this study.

The aim of our paper is to identify significant capital structure determinants and to verify the validity of capital structure theories with a focus on wood-processing enterprises

in Slovakia, along with a worldwide comparison of the determinants across industries. The object of the study are wood-processing enterprises except the furniture, pulp and paper ones.

**Tab. 1 Capital structure determinants – theoretical and empirical views.**

| Determinant of capital structure | Theoretical effect on leverage | | Definition | Empirical confirmation (industry, country, relation to leverage) |
|---|---|---|---|---|
| | + | - | | |
| Corporate income taxes (interest tax shield) | MM with tax effect, Trade-off | | Effective tax rate, Nominal tax rate, MILLER's (1977) tax index | |
| Depreciation and amortization (non-interest tax shield) | | MM with tax effect, Trade-off, Pecking-order | D&A / Total assets, D&A / Sales, Other non-interest tax shields and tax optimization | Wine – France (- or + depending on leverage measure) |
| Profitability | MM with tax effect, Trade-off | Pecking-order | ROA (EBIT/Total assets), ROI, Margin | Wine – France (-), Mining – Australia (-), Energy – EU (-) |
| Risk and bankruptcy costs (especially indirect) | | Trade-off | Risk: Standard deviation of operating CF / Total Assets, Inverse value of rating, Altman's model; Bankruptcy costs: Uniqueness of products or industry, High specialization of employees | |
| Tangibility (collateral), rating, less information asymmetry from creditors' view | Agency-costs theory (focus on agency costs of debt), Life cycle | | Fixed assets/Total assets, PPE/Total Assets Collateral(any)/Total assets, (Total assets - Intangible assets)/Total Assets, Existence and value of: Overall credit rating, Issue credit rating, ESG score | Wine – France (+), Mining – Australia (+), Energy – EU (+) |
| Cash | Agency-costs theory (focus on agency costs of equity) | Pecking-order | Cash/Total assets, Liquidity ratios, Free cash flow/Total Assets | Wine – France (-), Food & beverages – Indonesia (-), Energy – EU (-) |
| Growth opportunities | Pecking-order | Agency-costs, Trade-off | Total assets growth, Sales growth, Market-to-book ratio, Capital expenditures/Total assets | Airline – World (-), Wine – France (+), Food & beverages – Indonesia (-) |
| Dividends | Pecking-order | | Dummy variable (yes/no), Dividend payout ratio | |
| Size and age | Life cycle | | Size: Total assets, Sales, Market capitalization; Age: Number of years | Energy – EU (+) |
| Stock price | | Market-timing | Market-to-book ratio, Current price/Average historical prices | |
| Interest rate | | Market-timing | Effective interest rate, Weighted average costs of debt | |

## MATERIAL, METHODS, AND HYPOTHESES DEVELOPMENT

Based on theories and empiric studies – summarized in Tab. 1 – we set the hypotheses and methodology of variables, as follows.

*H1: There is a positive linear correlation between leverage and tangibility.*

The hypothesis confirmation is in favour of agency costs and life cycle theory. Opposite correlation than expected does not have direct support in any capital structure theory. However, as equity is long-term capital, and we include both long- and short-term debt to leverage computation, it can be explained as a possible partial application of the golden financing rule - saying that fixed assets should be financed by long-term capital. In that case, future research focusing on long-term leverage is needed to support or reject such interpretation.

Tangibility can be defined as the ratio of fixed assets to total assets, the ratio of property, plant, and equipment (PPE) to total assets, as collateral value, or literally as tangibility i.e., excluding intangible assets from calculation. PPE has naturally the key role in the wood-processing industry, the ratio of PPE to total assets is relatively high in many wood-processing enterprises and PPE, especially real estate, serves as a collateral. In the case of smaller or younger enterprises, real estate can even be the only suitable collateral together with personal guarantees of owners, when acquiring new debt. Therefore, we define tangibility as PPE to total assets ratio.

*H2: There is a positive linear correlation between leverage and size.*

The hypothesis confirmation is in favour of life cycle theory. The opposite correlation than expected would suggest, for example, a lack of internal funds, or a lack of capital deposits by owners in smaller enterprises. But it does not have any support in any theory.

Enterprise size is most often defined as total assets (its book value) or sales. For listed companies, it can be calculated as market capitalization, or as total assets using market value i.e., as the sum of market value of equity and book value of debt (market value of debt is not usually used, or even calculated). As our dataset does not consist of listed companies, this is not our case. We define size as sales.

*H3: There is a positive linear correlation between leverage and growth opportunities.*

The hypothesis confirmation is in favour of pecking-order theory. On the other hand, if the opposite correlation is confirmed, it will be in favour of agency costs and trade-off theory.

Growth opportunities are usually defined as sales growth, total assets growth, market-to-book ratio (for listed companies), and capital expenditures scaled by total assets. We define them as total assets growth, as sales are used for size calculation, and possible collinearity of independent variables should be avoided.

*H4: There is a negative linear correlation between leverage and non-interest tax shield.*

The hypothesis confirmation is in favour of MM model with taxes, trade-off, and pecking-order theory. The opposite result would suggest that both interest and non-interest tax shield can be used together. In other words, their positive correlation would also mean that enterprises which use one tax shield, use also the next tax shield, while other companies apply no one. The first group of mentioned enterprises represent ‘maximal tax optimizers’. Another explanation is that fixed assets are financed with debt, when both depreciation & amortization and leverage rise.

Depreciation and amortization scaled by total assets or by sales are often used for the calculation. We apply D&A scaled by sales to minimize collinearity with variable tangibility that would be caused if the D&A to total assets ratio were used.

*H5: There is a negative linear correlation between leverage and profitability.*

The hypothesis confirmation is in favour of pecking-order theory, while the opposite correlation is in favour of MM model with taxes, and trade-off theory.

Profitability can be calculated as ROA, ROI, profit margin, respectively. We define it as ROA – EBIT to total assets – which is the most common measure. It is obvious that EBIT application is suitable for capital structure research due to the fact that both interests that relate to leverage directly and taxes – affected by interest tax shield – are not included.

*H6: There is a negative linear correlation between leverage and cash.*

The hypothesis confirmation is in favour of pecking-order theory. The positive correlation would be in favour of agency costs theory.

Variable cash can be defined as cash and cash equivalents scaled by total assets, liquidity ratio (current, quick, cash), or as free cash flow scaled, for example, by total assets. We apply the first one, because a part of studied enterprises has surprisingly very high level of cash and equivalents to total assets ratio; so, it is the important item of assets. Moreover, this ratio has clear and simple interpretation.

To sum up, the independent variables are tangibility (TAN), size, growth opportunities (GROWTH), non-interest tax shield (DA), profitability (ROA), and cash. The dependent variable is leverage (LEV). Several definitions are used for that, such as total liabilities to total assets, long-term debt to equity, long-term debt to total assets, short-term debt to total assets, and other variations. We define leverage as the total liabilities to total assets ratio that most complexly includes all non-equity items. It represents debt-equity choice from the broadest view.

Mathematical notation of the model is, as follows. Standard symbols for regression are used.

$$LEV = \alpha + \beta_1 TAN + \beta_2 SIZE + \beta_3 GROWTH + \beta_4 DA + \beta_5 ROA + \beta_6 CASH + \varepsilon \quad (1)$$

As we can see, several capital structure determinants from Tab. 1 are disregarded from our further analysis. Corporate income tax is suitable for multi-country studies, dividends and stock price for studies of listed companies. The rest of determinants are selected for the analysis depending on their application in other industry-oriented studies. Summary of methodology for interpretation of the results is showed in Tab. 2.

Dataset consists of wood-processing enterprises in the Slovak Republic except furniture, pulp and paper ones. Industry is represented by NACE code 16 – Wood-processing and manufacturing of wood products except furniture (NACE 2022). It includes 16.1. Sawmilling and planing of wood, 16.21 Manufacturing (Ma.) of boards and wooden panels, 16.22. Ma. of parquets, 16.23 Carpentry, 16.24 Ma. of wooden containers, 16.29 Ma. of other wooden products. The five-year period (2016-2020) is studied. As pre-crisis and crisis period should be modelled separately, the period is divided into two subperiods: 2016 – 2019, and 2020, due to the pandemic situation. Therefore, we have applied both panel regression for the first subperiod and regression of cross-sectional data for the second subperiod. The database is REGISTRY OF ACCOUNT STATEMENTS (2022). According to the database, the total number of wood-processing enterprises with published account statements for the entire selected period and at least 10 employees is 242. Applying random selection, we have selected one third i.e., 81 enterprises. Their sales represent nearly 32 % market share. We consider such a sample as representative. Micro enterprises (with 9 and fewer employees) are not included, as there are several specifics that make them incomparable with bigger enterprises. Micro enterprises often create account statements only formally, as a necessity required by state – tax office; they include one-person companies that are actually self-employed persons, with only a legal form of a limited company; these

enterprises can acquire loans with different conditions than others like EaSI (EU Program for Employment and Social Innovation) loans with guarantee of European investment fund; they often do not follow hardly any governance rules, etc. STATISTICAL OFFICE (2022) uses a partially similar methodology when creating DataCube - only enterprises with 20 and more employees are there analysed exhaustively.

**Tab. 2 Methodology for results interpretation (dependent variable - leverage).**

| Independent variable | Regression result | Interpretation in favour of … | Regression result | Interpretation in favour of … |
|---|---|---|---|---|
| Tangibility | $\beta > 0$ | Agency costs, Life cycle | $\beta < 0$ | Questionable, possibly golden financing rule with a need for future verification |
| Size | | Life cycle | | Lack of internal funds and owner's capital deposits in small enterprises together with too many investment opportunities, Debt preference in debt-equity choice in smaller enterprises – unsupported by theories |
| Growth opportunities | | Pecking-order | | Agency costs, Trade-off |
| Non-interest tax shield | | Maximal tax optimization, Nonexistence of tax shields exhaustion, Fixed assets financed by debt | | MM with tax effect (if tax shields are considered as supplements to each other), Trade-off, Pecking-order |
| Profitability | | MM with tax effect, Trade-off | | Pecking-order |
| Cash | | Agency costs | | Pecking-order |

## RESULTS AND DISCUSSION

Before the presentation of the final results, let us mention some important results of econometric tests and the reasons for the model adjustments. First, we will look at the panel model. Two high leveraged enterprises were excluded as outliers to achieve an asymptotic normality of the dependent variable and residuals (see Tab. A.1 in Appendix). As our data are burdened with multicollinearity (see Tab. A.2 and A.3), we had to exclude the variable TAN which has the highest pair correlations with other independent variables. According to the Durbin-Watson statistics (value 1.2), autocorrelation also occurs. Therefore, we applied the White method for covariance and standard errors matrix in the final model, which should eliminate both autocorrelation and heteroskedasticity, if any occurs. All variables do not have a unit root (see Tab. A.4) means that their stationarity is not rejected. As many authors prefer scaling the size of an enterprise with logarithm, we applied for SIZE both lin-lin and lin-log models, using natural logarithm. However, the results look very similar (see Tab. 3 and Tab. 4). Random effects are used instead of fixed affects, according to the Hausman test (see Tab. A.5).

When looking at cross-sectional data in 2020, heteroskedasticity occurs according to the White test (see Tab. A.6). Therefore, we applied Huber-White-Hinkley standard error and covariance method consistent with that. Normality of residuals cannot be rejected (see

Tab. A.1). Three outliers have been excluded. Similarly to the panel model, both lin-lin and lin-log models – using natural logarithm – are used for variable SIZE. Ramsey RESET test shows correct model specification for the lin-lin model only at 1% significance level, while the lin-log model seems to be even better specified (see Tab. A.7 and Tab. A.8). On the other hand, the log-lin model would not be correct for both panel and cross-sectional data, as residuals would not have a normal distribution.

As we can see in Tab. 3, profitability, growth opportunities, and cash seemed to be relevant capital structure determinants in pre-crisis period. A negative influence of both profitability and cash on leverage is in favour of pecking-order theory. But a negative influence of growth on leverage is against that; and is in favour of agency costs theory. Agency costs theory, however, expects the association of cash and leverage to be opposite to that measured. ROA with minus effect also supports life-cycle theory and is against MM model with tax effect and trade-off theory. These theories are also not confirmed due to the insignificance of DA. As the positive influence of size on leverage is insignificant, it does not support the life-cycle theory. As a result, pecking-order theory seems to describe the capital structure and its relations in the first subperiod better than other theories.

Size became statistically significant in 2020, but its negative correlation with leverage is not in accordance with any theory. Such result can be justified with several explanations. We can deduce for example a lack of internal funds and owner's capital deposits in small and medium sized wood-processing enterprises that was even confirmed in the National program for the utilization of wood potential in the Slovak Republic (MINISTRY OF A&RD 2013). As this result occurs only in pandemic time, it can also indicate that reduction in equity – that can happen in any crisis – can be more severe in smaller enterprises. However, we did not find the evidence for the second interpretation, as there is only a weak correlation between yearly change of leverage in 2020 and size of an enterprise. Profitability and growth opportunities were not significant determinants of leverage during pandemic year. It can be explained by a reduction in profitability and growth opportunities, which is expectable during any crisis, as values of both variables changed on average in 2019 and 2020 comparing to the rest of the period. On the other hand, the role of cash as capital structure determinant was confirmed again and was even more significant in 2020 than before. This partially supports pecking-order theory. Moralization effect of debt on managers i.e., motivation not to spend disposable cash ineffectively, is therefore not confirmed or needed in the analysed enterprises in any subperiod. Non-interest tax shield was insignificant in both subperiods. Moreover, its positive correlation with leverage is not in accordance with any theory. Therefore, the question also is whether it should be considered as the substitute for interest tax shield. If an enterprise does not meet with tax shields exhaustion, the shields do not have to be substitutes. To sum up the second subperiod, the pecking-order theory is confirmed only partially, and previous relations between leverage and ROA, growth opportunities, respectively, cannot be confirmed.

**Tab. 3 Capital structure models. Lin-log model applied for variable SIZE.**

| Dependent variable: Leverage | | | | |
|---|---|---|---|---|
| Period | 2016-2019 | | 2020 | |
| Independent variables | Beta-coefficient | Significance | Beta-coefficient | Significance |
| LOG(SIZE) | 0.012940 | | -0.055265 | ** |
| ROA | -0.508273 | *** | -0.095323 | |
| GROWTH | -0.003715 | *** | 0.001611 | |
| DA | 0.016903 | | 0.005858 | |
| CASH | -0.281071 | ** | -0.740272 | *** |
| Intercept | 0.521946 | * | 1.524875 | *** |

Note: *, **, *** represents statistical significance according to p-value at the 10%, 5%, and 1% level, respectively.

Important limitation of these comparisons is that the first model is based on 4-year panel data, while the second one only on one-year data.

If we do not apply logarithmic transformation for variable SIZE (see Tab.4) the difference is that SIZE is significant only at 10% level in 2020, not 5%. Positive correlation in the first subperiod in the first model changed to the negative one in the second model, but it is still insignificant.

**Tab. 4 Alternative capital structure models. Lin-lin model applied for all variables.**

| Dependent variable: Leverage | | | | |
|---|---|---|---|---|
| Period | 2016-2019 | | 2020 | |
| Independent variables | Beta-coefficient | Significance | Beta-coefficient | Significance |
| SIZE | $-1.14 \cdot 10^{-09}$ | | $-2.67 \cdot 10^{-09}$ | * |
| ROA | -0.488647 | *** | -0.092732 | |
| GROWTH | -0.003367 | *** | -0.012408 | |
| DA | 0.005537 | | 0.235818 | |
| CASH | -0.292377 | ** | -0.667465 | *** |
| Intercept | 0.713054 | *** | 0.737256 | *** |

Note: *, **, *** represents statistical significance according to p-value at the 10%, 5%, and 1% level, respectively.

Capital structure determinants of wood-processing enterprises in Slovakia can be compared to the determinants confirmed in other industries and countries, especially when focusing on the 2016-2019 model. Slovak wood-processing enterprises are similar to French wine enterprises (VIVIANI 2008) regarding profitability, and cash, but growth opportunities show opposite results. There is also a similarity with the mining industry in Australia regarding profitability (ISLAM and KHANDAKER 2014). The results for profitability and cash show some similarity to the energy industry in the EU. However, size is an important determinant in that industry with a positive relation to leverage (JAWORSKI and CZERWONKA 2021) that is not confirmed in our sample. Growth opportunities and cash as leverage determinants with minus correlation are typical for the food & beverages industry in Indonesia. Moreover, size is not confirmed as statistically significant in those enterprises (SALIM and SUSILOWATI 2019), so we can find several similarities there with Slovak wood-processing enterprises. Regarding growth opportunities, we can find some linkage with the world airline industry, as well (CAPOBIANCO and FERNANDES 2004).

## CONCLUSION

In the years 2016-2019, we found the negative relation between leverage and profitability, growth opportunities, cash, respectively. Except for the variable cash, these relations were not confirmed in 2020. Changes in profitability and lack of growth opportunities during crisis thus must have had the impact. Some evidence of a negative relation between leverage and size occurred only in the crisis period. The results are more in favour of the pecking-order theory, than in favour of other theories, but no theory is supported unequivocally. Some similarities between the wood-processing industry in Slovakia and other industries in other countries can be found regarding capital structure determinants. The best example seems to be the food & beverages industry in Indonesia. Regarding the hypotheses, only H5 and H6 are confirmed. Other hypotheses are not

confirmed because of the opposite than expected relation, or its statistical insignificance. Practical implications of the results lie for example in some recommendations for such wood-processing enterprises which set their target leverage only as the average of the industry. As the study reveals 'average' relations of leverage and its determinants, enterprises without complex capital structure targets can consider these relations rather than following only the industry median leverage.

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# APPENDIX

**Tab. A.1 Normality of residuals.**

| Model / Indicator | Panel lin-lin | Panel lin-log for SIZE | 2020 lin-lin | 2020 lin-log for SIZE |
|---|---|---|---|---|
| Skewness | -0.1633 | -0.1559 | 0.0352 | 0.1387 |
| Kurtosis | 2.6567 | 2.6807 | 3.1799 | 3.1890 |
| Jarque-Bera | 2.9564 | 2.6232 | 0.1213 | 0.3660 |
| p-value | 0.2280 | 0.2694 | 0.9411 | 0.8327 |

**Tab. A.2 Multicollinearity test of 2016-2019 data – correlation matrix.**

| | TAN | SIZE | ROA | GROWTH | DA | CASH |
|---|---|---|---|---|---|---|
| TAN | 1 | 0.2750 | -0.2515 | -0.0275 | 0.1589 | -0.4710 |
| SIZE | 0.2750 | 1 | 0.0494 | -0.0274 | -0.0161 | -0.1457 |
| ROA | -0.2515 | 0.0494 | 1 | 0.0066 | -0.0809 | 0.2597 |
| GROWTH | -0.0275 | -0.0274 | 0.0066 | 1 | -0.0123 | -0.0231 |
| DA | 0.1589 | -0.0161 | -0.0809 | -0.0123 | 1 | -0.0501 |
| CASH | -0.4710 | -0.1457 | 0.2597 | -0.0231 | -0.0501 | 1 |

| | | | |
|---|---|---|---|
| Determinant of the matrix | 0.621542 | | |
| Farrar & Glauber - X | 148.2927 | Degrees of freedom | 21 |
| p-value | <0.0001 | | |

**Tab. A.3 Multicollinearity test of 2020 data – correlation matrix.**

| | TAN | SIZE | ROA | GROWTH | DA | CASH |
|---|---|---|---|---|---|---|
| TAN | 1 | 0.3156 | -0.1768 | -0.2084 | 0.5739 | -0.4866 |
| SIZE | 0.3156 | 1 | 0.0873 | -0.0024 | 0.0153 | -0.1714 |
| ROA | -0.1768 | 0.0873 | 1 | 0.0961 | -0.0879 | 0.3147 |
| GROWTH | -0.2084 | -0.0024 | 0.0961 | 1 | -0.2124 | -0.0925 |
| DA | 0.5739 | 0.0153 | -0.0879 | -0.2124 | 1 | -0.2259 |
| CASH | -0.4866 | -0.1714 | 0.3147 | -0.0925 | -0.2259 | 1 |

| | | | |
|---|---|---|---|
| Determinant of the matrix | 0.337548 | | |
| Farrar & Glauber - X | 80.1865 | Degrees of freedom | 21 |
| p-value | <0.0001 | | |

**Tab. A.4 Stationarity tests. Null Hypothesis: Unit root. P-values in the table.**

| Method/Variable | LEV | SIZE | ROA | GROWTH | DA | CASH |
|---|---|---|---|---|---|---|
| PP - Fisher Chi-square | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| PP - Choi Z-stat | 0.0034 | 0.0006 | - | <0.0001 | 0.0144 | - |

**Tab. A.5 Hausman test. Cross-section random effects.**

| Test Summary | Chi-Sq. Statistic | Chi-Sq. degrees of freedom | P-value |
|---|---|---|---|
| Cross-section random | 0.000000 | 5 | 1.0000 |

**Tab. A.6 White test for 2020 model. Null hypothesis: Homoskedasticity.**

| | | | |
|---|---|---|---|
| F-statistic | 17.04961 | Prob. F(5,72) | 0.0000 |
| Obs*R-squared | 42.28573 | Prob. Chi-Square(5) | 0.0000 |
| Scaled explained SS | 39.27062 | Prob. Chi-Square(5) | 0.0000 |

**Tab. A.7 Ramsey RESET Test for lin-log 2020 model. Omitted Variables: Squares of fitted values.**

| Specification: LEV LOG(SIZE) ROA GROWTH DA CASH C | | | |
|---|---|---|---|
| | Value | Degrees of freedom | P-value |
| t-statistic | 1.413219 | 71 | 0.1620 |
| F-statistic | 1.997187 | (1, 71) | 0.1620 |
| Likelihood ratio | 2.163800 | 1 | 0.1413 |

**Tab. A.8 Ramsey RESET Test for lin-lin 2020 model. Omitted Variables: Squares of fitted values.**

| Specification: LEV SIZE ROA GROWTH DA CASH C. | | | |
|---|---|---|---|
| | Value | Degrees of freedom | P-value |
| t-statistic | 2.024602 | 71 | 0.0467 |
| F-statistic | 4.099011 | (1, 71) | 0.0467 |
| Likelihood ratio | 4.377946 | 1 | 0.0364 |

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