

VALUING THE DEBT TAX SHIELD EFFECT ON PROFITABILITY – THRESHOLD APPROACH

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Abstract: *Uses of tax-shields present the main basis of Capital structure theory in finance. Whether companies use leverage efficiently to increase overall tax benefits presents a challenge for every financial manager of the company. This study uses the threshold approach to determine the non-linear impact of interest tax shield on companies' levels of corporate leverage. The trade-off theory framework of Capital structure states that companies should tend to use debt as long as the benefits of tax benefits exceed the bankruptcy costs. This study uses that framework to determine if companies from Serbia tend to significantly adjust their leverage levels once a certain level of tax shield is reached. The study includes the analysis of 25 listed companies on the Serbian stock exchange from 2010 to 2024. The study includes the variables of total debt as the dependent variable, while tax shield, non-tax shield, liquidity, profitability, tangibility, GDP, inflation, number of board members, and board member diversity present independent variables. The level of tax shield is used as a threshold variable as the authors implore the panel threshold regression approach. The results indicate that financial managers should prioritize tax planning and compliance in order to minimize the company's cost of capital and the negative effects of tax liabilities.*

Key words: *Capital structure, tax-shield, trade-off, pecking-order, panel threshold*

JEL classification: *G30, G32*

1. INTRODUCTION

Capital structure presents the optimal mix of debt and equity that companies use to finance their operations. The financial managers of these companies formulate that mix of debt and equity to minimize the overall cost of capital and reach an expected optimal Capital structure. The formulation of the optimal or most adequate Capital structure depends on the number of different factors and the nature of the company's business (Kumar, Colombage & Rao, 2015). In the literature, a number of Capital structure theories were developed to try to explain the influence of the configuration of particular Capital structures and their influence on company performance and overall value (Bajaj, Kashiramka, & Singh, 2021). Not rarely does the subject of tax shield appear when mentioning the formulation of optimal Capital structure (Gabrielli, 2023). The tax shield of the company represents the amount that is saved in taxes because of the use of debt. The debt is followed by the payments of interest, which are tax-deductible and provide the company with the opportunity to reduce taxable income and also reduce its total amount of tax obligations. The further separation of tax shield can be defined as debt-tax shield and non-debt tax shield. Debt-tax shields can be a useful tool for lowering overall operating costs, but they also carry some risks,

such as the potential for debt default (Sinebe, 2023). These shields are most frequently utilized by companies with high levels of debt, such as manufacturers or real estate developers. The main goal of this research is to investigate at what level do debt-tax benefits become strong enough to change the leverage behavior of companies. The trade-off theory states that companies increase their debt as long as the benefits of tax deductions are larger than the risk of bankruptcy that the company has due to the increased use of debt, while the pecking-order theory points to the tendency to first use internal funds rather than debt. The level of tax-shield directly corresponds with the main postulates of the trade-off theory of Capital structure. In this study, the authors also use a number of other independent variables to determine their influence on total, short-term, and long-term debt.

The study is constructed of five main sections. The first section represents the introduction of the main idea of the study. The second section delves into the relevant literature regarding Capital structure theories and studies that included the use of tax-shield in their research investigating their effect on the Capital structure of companies. The third section covers the methodology used and presents the variables used in the study. The methodology section also presents the construction of the models used in the research. The fourth section presents the main findings of the study, while the fifth section includes the conclusion of the study.

2. LITERATURE REVIEW

When examining the Capital structure of firms, the key concepts in the subject of Capital structure should be discussed. Modigliani & Miller's (1963) concepts of relevance and irrelevance served as the foundation for the idea of Capital structure. The relevance theory suggests that a firm's Capital structure has no effect on its market value in a perfect market, even when it accounts for factors like taxes and bankruptcy costs. A number of other theories of Capital structure have been developed over time by economists, such as the Pecking order theory (Myers, 1984), which argues that companies should favor debt issuance over stock and internal financing over external financing in order to maintain financial flexibility. The theories of agency and trade-off (Kraus & Litzenberger, 1973; Titman, 1984). Other ideas in the field of Capital structure include the agency theory (Kraus & Litzenberger, 1973; Titman, 1984). The trade-off argument, which is arguably the most widely accepted, contends that businesses will take on more debt as long as there are favorable tax advantages. However, the agency theory explores the issue of agency between managers and stakeholders, which is why it is called agency

theory. According to the notion, when adding debt to a company's liabilities, managers typically do not act in the best interests of shareholders.

Regarding the studies about the use of tax benefits, Castillo et al. (2017) examined and determined that the impact of corporate taxation on Capital structure differs by the nature of the tax system and proved the presence of a significant positive influence of tax shield on the Capital structure of companies from OECD countries. A study by Nguyen & Bui (2025) investigated the effects on tax shields of companies in the case of the Chinese stock exchange. The findings of the study indicates that a non-debt tax shield was negatively correlated with Capital structure, while a regular debt tax shield did not present any statistically significant results. This points to the fact that companies with high depreciation and amortization tend not to use excessive debt. Colombo & Caldeira (2018) claim that taxes are a first-order predictor of financial decisions made by businesses. The debt and equity tax shields function as alternative financial instruments that businesses utilize to modify their plans since different financial instruments are interconnected. A study by Kovacova et al. (2022) investigating Visegroup countries found that companies primarily followed the pecking order theory of financing business operations and that the structure of liabilities dictated the influence of the tax shield. In the case of companies from Poland, Jaworski & Santos (2021) found that Capital structure was positively influenced by tax-shield levels and negatively affected by non-debt tax shield. Jaworski & Czerwonka (2021) also confirmed those findings, but in the case of companies from 25 EU member countries. In contrast to the findings of non-debt tax shield, Ali, Rangone & Farooq (2022) found a positive and significant effect on total the debt of multinational companies from the UK and the USA. Another study investigating US companies, Heider & Ljungqvist (2015), found that taxation directly impacted corporate structure in a positive way. Using a dynamic Capital structure model, Devereux et al. (2018) discovered a significant tax impact on leverage among both domestic and foreign companies in the UK. Desai et al. (2004) also demonstrated that, because they distribute their debt internally in accordance with several tax jurisdictions in order to reduce their tax obligations, multinational corporations react to changes in tax rates very differently than do domestic companies. In the case of companies from China, Wenhong et al. (2015) stated that the corporate tax rate had a negative impact on financial leverage which further pointed to the presence of a positive influence of debt-tax shield on Capital structure. This finding was also

confirmed in the case of US companies by Longstaff & Strebulaev (2014).

Regarding other factors influencing Capital structure decisions of companies, trade risk, firm age, tangibility, liquidity, profitability, and business size are some of the elements that affect a firm's decision to adopt financial leverage, according to Kumar & Gupta (2022). Studies by Gajdosikova, Lazaroiu & Valaskova (2023), Gajdosikova, Valaskova, Kliestik & Kovačova (2023), discovered statistically significant variations in the leverage coefficient values according to the size of the company and its legal form of organization. These results corroborated earlier studies that identified important internal factors influencing a company's debt, such as Mazanec (2023), Ranjan (2021), Ersoi (2022), and Milovanović, Bašić & Bubaš (2022). A study by Ezeani et al. (2023) that examined businesses in France, the UK, and Germany in relation to corporate governance indicators emphasized the significance of the corporate board in affecting leverage adjustment speed. A study by Javaid, Nazir, & Fatima (2023) that examined Pakistani listed businesses similarly supported these conclusions. Studies like (Heider & Ljungqvist, 2015; Faccio & Xu, 2018; Omori & Kitamura, 2020) have focused especially on examining the connections between nations' tax policies and their relationship with the adjustment of companies' Capital structures. The authors used the preceding findings of studies regarding the influence of certain factors on Capital structure to formulate the following hypothesis:

Hypothesis 1 (H1) – There is a positive relationship between corporate debt-tax shield and Capital structure

Hypothesis 2 (H2) – Liquidity and profitability have a significant negative effect on total debt, suggesting that firms in the sample prefer internal financing over debt

Hypothesis 3 (H3) – Micro-economic factors present a statistically significant influence over macro-economic and corporate governance variables

3. METHODOLOGY AND DATA

As it was stated in the earlier part of the study, the authors use the threshold regression approach to determine the influence of different tax shield levels, alongside other independent variables, on companies' leverage levels. The data sample was obtained using financial statements and annual reports of 25 listed companies on the Serbian stock exchange. The data was obtained using the available financial statements. The companies are listed on the Serbian benchmark BelexLine stock index. The period of the study from 2010 to 2024 was used. The study incorporates the different models and conducts the threshold regression analysis using the level of tax shield. The sample of 25 companies is considered adequate because it incorporates all companies listed on the benchmark stock index. Dependent variables include the use of total debt, short-term debt, and long-term debt. In the case of explanatory variables, the main one represents tax shield levels, while other independent variables are divided into three groups: micro-economic, macro-economic, and corporate governance variables. Micro-economic variables used include profitability, liquidity, tangibility, and non-tax shield. Macro-economic variables include GDP and inflation, while corporate governance variables include the number of board members and board member diversity. The authors, before the use of selected data, also conducted a series of relevant diagnostic tests to determine the adequacy of the selected models. The tests involve unit-root testing, threshold specification and model selection testing, heteroscedasticity and cross-sectional dependence testing, as well as multicollinearity of data testing. Table no. 1 provides an overview of the used variables as well as the expected effects according to the previous studies.

Table 1. Variable construction

Symbol	Variables	Mesure	Expected effects
Dependant variable			
Td	Total debt	Book value of total debt / Book value of total assets	
Independent - microeconomic			
Stax	Tax-shield	Interest expense * corporate tax rate	+

NSTax	Non tax - shield	Depresation and ammortization / Total assets	+/-
Liq	Liquidity	Current assets / Current liabilites	-
Roa	Profitability	Net profit / Total assets	+/-
Tan	Tangiability	Fixed assets / Total assets	+
Independent - macroeconomic			
Gdp	Gross-domestic product	Annual % change	+/-
Inf	Inflation	% change in CPI	+
Independent - Corproate governance			
Bn	Corporate board members	Number of board members	+
Bgd	Board members gender diversity	Number of female memebrs of the board	-

Source: Author's illustration

According to the defined variables, the authors specified the models as follows:

$$y_{it} = \mu_{it} + \beta_1 x_{it} I(q_{it} \leq \gamma) + \beta_2 x_{it} I(q_{it} > \gamma) + \varepsilon_{it}$$

Where:

q_{it} – is the threshold variable

γ – is the threshold parameter

$I()$ – is the indicator function

y – dependant variables

x – independent variable

β – coefficient (parameter)

A number of diagnostic tests were conducted for the establishment of adequate models. Augmented Dickey-Fuller test, Breitung and Im-Pesaran-Shin tests were used for testing for stationarity of data. The variance inflation factor (VIF) was used by the authors to establish the absence of multicollinearity. The Breuch-Pagan test was used to test for heteroskedasticity of data while the Pesaran test was used for cross-sectional dependence.

4. FINDINGS

In this section of the article, the authors present the descriptive statistics of the used variables alongside the diagnostic tests that were conducted. Alongside these statistics, the authors also present the main findings of the study in Table 4.

Table 2. Descriptive statistics

Var	Mean	Std. Dev.	Min	Max
Td	0,462	0,318	0,006	1,472
Liq	2,649	4,587	0,020	44,250
Roa	0,025	0,094	-0,600	0,577
Tan	0,628	0,244	0,001	0,999
Stax	30166,790	77850,170	0,300	544328,400
NSTax	0,032	0,019	0,000	0,086
Gdp	2,301	2,243	-1,590	7,389
Inf	4,831	3,331	1122,000	11,462
Bn	4,500	1,939	2,000	11,000
Bgd	1,125	0,882	0,000	3,000

Source: Author's illustration

The results of descriptive statistics in Table 2 indicate that companies listed on the stock exchange of Serbia have an average value of total debt of 0,46, which indicates that selected companies use more equity than debt when financing their operations. The maximum value of 1,472 indicates that some companies had exhibited financial loss in the financial statements and used debt to finance the loss, while the minimum value of 0,006 indicates that other companies used a very small amount of debt. In the case of micro-economic independent variables, Liquidity presented the largest amount of standard deviation of 2,649, which points to the fact that selected companies in the sample exhibited the largest

amount of variance between minimum and maximum values. The most relevant independent variable for this study, and the threshold variable used for tax shield, is presented in Table 2 in total amounts. The average value of 30167 indicates that selected companies, on average, save that amount of tax at the end of a business year. Inflation, as a representative variable of macro-economic factors, exhibited a higher amount of standard deviation than GDP, while in the case of corporate governance variables, the number of board members ranged from a minimum of 2 people to a maximum of 11 people.

Table 3. Diagnostic tests

	Coef.	Prob.
Heteroskedasticity	2,37	0,1233
Pesaran CD	3,788	1
Average VIF	1,29	
Stationarity	(0) - 6	(1) - 3

Source: Author's illustration

Table 3 provides the results of the conducted diagnostic tests. For determining that the used data is valid, the authors used the Breusch-Pagan test of heteroskedasticity. The results of the test indicate that the data did not present the presence of heteroskedasticity. The Pesaran CD test was used to test for the presence of cross-sectional dependence, and the results also indicates the absence of dependence of panel sections. The variance inflation factor was used to determine the presence of multicollinearity in the independent variables. The average VIF of 1,29 failed to exceed the coefficient value of 10 which pointed to the absence of multicollinearity of data. In the case of unit root testing, the Im-Pesaran-Shin, Breitung, and Augmented-Dickey Fuller tests were used to determine stationarity. The results of the test pointed to the validity of the used data sample and confirmed the adequacy of the threshold model. In the particular case of the tax shield amount, the authors applied logarithmic values to control for stationarity. The results showed that six independent variables presented stationarity at level, while 3 variables presented stationarity after first difference.

Table 4. Regression results

Variables	Coef.	Std.Err	P-value	
Threshold - Stax	0	-0,016	0,009	0,062
	1	0,004	0,005	0,416
Liq	-0,001	0,002		0,568
Roa	-0,238	0,084		0,005
Tan	0,288	0,069		0,000
NSTax	-2,625	1,023		0,011

Gdp	-0,0014	0,003	0,644
Inf	-0,004	0,002	0,071
Bn	0,0064	0,019	0,737
Bgd	-0,138	0,041	0,001
c	0,350	0,060	0,000
R-squared			0,320
Prob > F			0,000
Threshold	Lower(0)	Upper(1)	
	5,4013	5,188	5,5645
Expon	251941,6	154170	366859

Source: Author's illustration

The results of the regression model show statistically significant effects of profitability variables (Roa), tangibility (Tan), non-debt tax shield (NSTax), inflation (Inf), and board gender diversity (Bgd). The significance values that were taken into account include the values at 1%, 5%, and 10% significance. Tax shield (Stax) as the threshold variable also presented statistically significant effects, but only at the lower bound. Roa presented a negative effect on total debt as well as Bgd, which indicated that selected companies tend to reinvest their profits back into the business, and that those particular companies also tend to have more female members on the board. These findings are in line with the pecking order theory which suggests that companies tend to risk use internal funds, then debt, to finance business operations. The Tan variable presented a positive effect, which points to the fact that companies use debt to finance fixed assets, which is in line with the trade-off theory of Capital structure. The inflation variable (Inf) presented a negative effect, but at 10% significance, which indicated that selected companies decrease debt in periods of price uncertainty. The most relevant findings for this study are the findings regarding the debt tax shield and non-debt tax shield of selected companies. The results indicated a presence of statistically negative effects of debt-tax shield (Stax) at the lower bound, beneath the threshold amount of 5,41. The value in Serbian currency is 251942 RSD. The negative effects point to the tendency of selected companies to rely more on non-debt tax shield. That finding is further confirmed by the presence of a statistically significant negative effect of non-debt tax shield (-2,625; p=0,001). Serbian companies in this sample presented a tendency to substitute debt tax shields with non-debt tax shields, such as depreciation and amortization, to reduce taxable income. Above the upper bound of the tax shield of 5,56, or 366859 RSD the results indicated a positive effect on debt, but it was not statistically significant. Overall, the results suggest that at lower levels of

tax shield, the tax advantage of debt is not strong enough to outweigh potential costs, which is a more regular occurrence in emerging markets such as Serbia, leading to a statistically significant negative relationship between tax shield and total debt. From the standpoint of the Capital structure theories, the findings do not confirm the postulates of the trade-off theory, while the postulates of the pecking-order theory are confirmed. The negative relationship at the lower level of tax shield suggests that companies are not actively targeting an optimal Capital structure level but rather using internal financing and accounting mechanisms over external debt. According to the findings, the authors can conclude that hypothesis (H1) can be rejected while hypotheses (H2) and (H3) can be accepted.

CONCLUSION

The authors in this study used the sample of companies listed on the Serbian stock exchange to mainly investigate the effects of the use of debt and non-debt tax shields on Capital structure. The author employed a panel threshold regression model and used the debt-tax shield variable as the threshold. Other independent variables were also used in the study to determine the nature and significance of their effect on the leverage of selected companies. The independent variables included micro-economic, macro-economic, and corporate governance variables. The main goal was to determine whether companies suddenly change leverage at a certain level of tax benefits or mostly prefer the use of internal financing. The authors also used the findings to investigate the practical implications of the trade-off and pecking order theories of Capital structure. In summary, the results suggested that Serbian listed companies exhibited a preference for non-debt tax shields over debt financing, as confirmed by the significant negative effect of non-debt tax shield on leverage, while the tax shield from debt does not play a strong or consistent role. This implies that both substitution effects (trade-off theory) and financing hierarchy considerations (pecking order theory) are relevant, with stronger empirical support for the dominance of non-debt tax shields and internal financing behavior. The main limitations of this study are the use of only Serbian companies and the use of only listed companies. For further studies, the authors suggest the use of a larger number of companies from different countries as well as regions and the use of a segmentation process in the case of industry sectors that the companies operate.

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