

Determinants of Capital Structure

Empirical Evidence from the Czech Republic

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The modern theory of capital structure was established by Modigliani and Miller (1958). Thirty-seven years later, Rajan and Zingales (1995, p. 1421) stated: “Theory has clearly made some progress on the subject. We now understand the most important departures from the Modigliani and Miller assumptions that make capital structure relevant to a firm’s value. However, very little is known about the empirical relevance of the different theories.”

Similarly, Harris and Raviv (1991, p. 299) in their survey of capital structure theories claimed: “The models surveyed have identified a large number of potential determinants of capital structure. The empirical work so far has not, however, sorted out which of these are important in various contexts.” Thus, several conditional theories of capital structure exist (none is universal), but very little is known about their empirical relevance. Moreover, the existing empirical evidence is based mainly on data from developed countries (G7 countries). Findings based on data from developing countries have not appeared until recently – for example Booth et al. (2001)¹ or Huang and Song (2002)². So far, no study has been published based on data from transition countries of Central and Eastern Europe, at least to the extent of this author’s knowledge. The main goal of this paper is to fill this gap, exploring the case of the Czech Republic.

The structure of this paper is as follows. In Section 1 the most prominent theoretical and empirical findings are surveyed. In Section 2 the potential determinants of capital structure are summarized and theoretical and empirical evidence concerning these determinants is provided. Section 3 is the empirical part of the paper. Here the data is described, measures of

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¹ the cases of Brazil, Mexico, India, South Korea, Jordan, Malaysia, Pakistan, Thailand, Turkey and Zimbabwe

² the case of China

leverage are defined, the extent of leverage is characterized and the impact of potential determinants of capital structure on leverage is tested. Section 4 provides conclusions of the study.

1. Theoretical and Empirical Findings

According to Myers (2001, p. 81), “there is no universal theory of the debt-equity choice, and no reason to expect one”. However, there are several useful conditional theories³, each of which helps to understand the debt-to-equity structure that firms choose. These theories can be divided into two groups – either they predict the existence of the optimal debt-equity ratio for each firm (so-called static trade-off models) or they declare that there is no well-defined target capital structure (pecking-order hypothesis).

Static trade-off models understand the optimal capital structure as an optimal solution of a trade-off, for example the trade-off between a tax shield and the costs of financial distress in the case of trade-off theory. According to this theory the optimal capital structure is achieved when the marginal present value of the tax shield on additional debt is equal to the marginal present value of the costs of financial distress on additional debt. The trade-off between the benefits of signaling and the costs of financial distress in the case of signaling theory implies that a company chooses debt ratio as a signal about its type. Therefore in the case of a good company the debt must be large enough to act as an incentive compatible signal, i.e., it does not pay off for a bad company to mimic it. In the case of agency theory the trade-off between agency costs⁴ stipulates that the optimal capital structure is achieved when agency costs are minimized. Finally, the trade-off between costs of financial distress and increase of efficiency in the case of free cash-flow theory, which is designed mainly for firms with extra-high free cash-flows, suggests that the high debt ratio disciplines managers to pay out cash instead of investing it below the cost of capital or wasting it on organisational inefficiencies. On the other hand, the pecking-order theory suggests that there is no optimal capital structure. Firms are supposed to prefer internal financing (retained earnings) to external funds. When internal cash-flow is not sufficient to finance capital expenditures, firms will borrow, rather than issue equity. Therefore there is no well-defined optimal leverage, because there are two kinds of equity, internal and external, one at the top of the pecking order and one at the bottom.⁵

Existing empirical evidence is based mainly on data from developed countries. For example Bradley et al. (1984), Kim and Sorensen (1986), Friend

³ The most prominent theories are the trade-off theory, the signaling theory (first mentioned by (Ross, 1977)), the agency theory (Jensen – Meckling, 1976), (Myers, 1977), the free cash-flow theory (Jensen, 1986), and the pecking-order theory (Myers – Majluf, 1984), (Myers, 1984). For more details about conditional capital structure theories see (Bauer – Bubák, 2003).

⁴ Agency costs arise from two agency relations – the relation between owners and debt holders and the relation between owners and managers (non-owners), i.e., principal-agent relation.

⁵ For a comprehensive survey of capital structure theories see (Harris – Raviv, 1991), for theories based on asymmetric information see (Klein et al., 2002).

and Lang (1988), Titman and Wessels (1988) and Chaplinsky and Niehaus (1993) focus on United States companies; Kester (1986) compares United States and Japanese manufacturing corporations; Rajan and Zingales (1995) examine firms from G7 countries; and Wald (1999) uses data for G7 countries except Canada and Italy. Findings based on data from developing countries have appeared only in recent years, for example Booth et al. (2001) or Huang and Song (2002).⁶

Concerning the Czech Republic, no study has been published focusing on the determinants of capital structure, at least to the extent of this author's knowledge. Krauseová (1995) describes the capital structure of Czech firms in the period from 1990 to 1993. Bauer and Bubák (2003) test for the existence of optimal capital structure and for relevance of signaling theory in the case of Czech listed firms. Their results support the existence of optimal capital structure and they are in accordance with the signaling theory. Dvořák (2000) analyses financing of Czech companies. According to his results, the capital market in the Czech Republic is not an alternative source of financing. Because Czech companies pay free cash to the shareholders only rarely, the financing comes mainly from internal equity (retained earnings). The only alternative is a bank loan, implying that the capital structure reflects only the firm's cumulative needs for external funds. Therefore, the debt-equity ratio is not the strategic choice of a firm, but only an indicator of the firm's ability to generate sufficient cash-flow for its capital investment program. This would be consistent with the pecking-order hypothesis.

2. Determinants of Capital Structure

As Harris and Raviv (1991, p. 334) state: "Several studies shed light on the specific characteristics of firms and industries that determine leverage ratios. [...] These studies generally agree that leverage increases with fixed assets, non-debt tax shields, growth opportunities, and firm size and decreases with volatility, advertising expenditures, research and development expenditures, bankruptcy probability, profitability and uniqueness of the product." However, the results of both theoretical and empirical studies are not always unambiguous.

Based on the data availability, the following determinants of capital structure are analysed in this paper: size, profitability, tangibility, growth opportunities, tax, non-debt tax shields, volatility, and industry classification.

2.1 Size

From the theoretical point of view, the effect of size on leverage is ambiguous. As Rajan and Zingales (1995, p. 1451) claim: "Larger firms tend to be more diversified and fail less often, so size (computed as the logarithm

⁶ See footnotes 1 and 2.

of net sales) may be an inverse proxy for the probability of bankruptcy. If so, size should have a positive impact on the supply debt. However, size may also be a proxy for the information outside investors have, which should increase their preference for equity relative to debt.”

Also empirical studies do not provide us with clear information. Some authors find a positive relation between size and leverage, for example Huang and Song (2002), Rajan and Zingales (1995)⁷ and Friend and Lang (1988). On the other hand, some studies report a negative relation, for example (Kester, 1986), (Kim – Sorensen, 1986) and (Titman – Wessels, 1988). Moreover, the results are very often weak as far as the level of statistical significance is concerned.

To proxy for the size of a company, the natural logarithm of sales is used in this study (as it is in most studies of similar character). Another possibility is to proxy the size of a company by the natural logarithm of total assets. In this study there is a high correlation between the natural logarithm of total assets and the natural logarithm of sales (0.68 in 2000, 0.70 in 2001), therefore the use of the natural logarithm of total assets as a proxy variable for the size of a company should lead to similar results.

2.2 Profitability

There are no consistent theoretical predictions on the effects of profitability on leverage. From the point of view of the trade-off theory, more profitable companies should have higher leverage because they have more income to shield from taxes. The free cash-flow theory would suggest that more profitable companies should use more debt in order to discipline managers, to induce them to pay out cash instead of spending money on inefficient projects. However, from the point of view of the pecking-order theory, firms prefer internal financing to external. So more profitable companies have a lower need for external financing and therefore should have lower leverage.

Most empirical studies observe a negative relationship between leverage and profitability, for example (Rajan – Zingales, 1995)⁸, (Huang – Song, 2002), (Booth et al., 2001), (Titman – Wessels, 1988), (Friend – Lang, 1988) and (Kester, 1986).

In this study, profitability is proxied by return on assets (defined as earnings before interest and taxes divided by total assets).

2.3 Tangibility

It is assumed, from the theoretical point of view, that tangible assets can be used as collateral. Therefore higher tangibility lowers the risk of a creditor and increases the value of the assets in the case of bankruptcy. As Booth

⁷ for all G7 countries, except Germany

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et al. (2001, p. 101) state: “The more tangible the firm’s assets, the greater its ability to issue secured debt and the less information revealed about future profits.” Thus a positive relation between tangibility and leverage is predicted.

Several empirical studies confirm this suggestion, such as (Rajan – Zingales, 1995), (Friend – Lang, 1988) and (Titman – Wessels, 1988) find. On the other hand, for example Booth et al. (2001) and Huang and Song (2002) experience a negative relation between tangibility and leverage.

In this study, tangibility is defined as tangible assets divided by total assets.

2.4 Growth Opportunities

According to Myers (1977), firms with high future growth opportunities should use more equity financing, because a higher leveraged company is more likely to pass up profitable investment opportunities. As Huang and Song (2002, p. 9) claim: “Such an investment effectively transfers wealth from stockholders to debtholders.” Therefore a negative relation between growth opportunities and leverage is predicted. As market-to-book ratio is used in order to proxy for growth opportunities, there is one more reason to expect a negative relation – as Rajan and Zingales (1995, p. 1455) point out: “The theory predicts that firms with high market-to-book ratios have higher costs of financial distress, which is why we expect a negative correlation.”

Some empirical studies confirm the theoretical prediction, such as (Rajan – Zingales, 1995), (Kim – Sorensen, 1986) or (Titman – Wessels, 1988) report. However, for example, Kester (1986) and Huang and Song (2002) demonstrate a positive relation between growth opportunities and leverage.

In this study, the *P/B* ratio (market-to-book ratio) is used as a proxy for growth opportunities.

2.5 Tax

According to the trade-off theory, a company with a higher tax rate should use more debt and therefore should have higher leverage, because it has more income to shield from taxes. However, for example Fama and French (1998) declare that debt has no net tax benefits. As MacKie-Mason (1990, p. 1471) claims: “Nearly everyone believes taxes must be important to financing decision, but little support has been found in empirical analysis.” As he also points out (MacKie-Mason, 1990, p. 1471): “This paper provides clear evidence of substantial tax effects on the choice between issuing debt or equity; most studies fail to find significant effects. [...] Other papers miss the fact that most tax shields have a negligible effect on the marginal tax rate for most firms. New predictions are strongly supported by an empirical analysis; the method is to study incremental financing decisions using discrete choice analysis. Previous researchers examined debt-equity ratios, but tests based on incremental decisions should have greater power.” As he adds, debt-equity ratios “are the cumulative result of years of sepa-

rate decisions. Tests based on a single aggregate of different decisions are likely to have low power for effects at the margin.” (MacKie-Mason, 1990, p. 1472).

However, as data to perform similar analysis as (MacKie-Mason, 1990) is not available in the Czech Republic, the average tax rate defined as the difference between earnings before taxes and earnings after taxes, scaled by earnings before taxes, is used as a proxy variable to analyse the tax effects on leverage in this study.

2.6 Non-debt Tax Shields

Other items apart from interest expenses, which contribute to a decrease in tax payments, are labelled as non-debt tax shields (for example the tax deduction for depreciation). According to Angelo – Masulis (1980, p. 21): “Ceteris paribus, decreases in allowable investment-related tax shields (e.g., depreciation deductions or investment tax credits) due to changes in the corporate tax code or due to changes in inflation which reduce the real value of tax shields will increase the amount of debt that firms employ. In cross-sectional analysis, firms with lower investment related tax shields (holding before-tax earnings constant) will employ greater debt in their capital structures.” So they argue that non-debt tax shields are substitutes for a debt-related tax shield and therefore the relation between non-debt tax shields and leverage should be negative.

Some empirical studies confirm the theoretical prediction, for example Kim and Sorensen (1986, p. 140) declare: “DEPR⁹ has a significantly negative coefficient. [...] This is consistent with the notion that depreciation is an effective tax shield, and thus offsets the tax shield benefits of leverage.” A negative relation between non-debt tax shields and leverage is also found by (Huang – Song, 2002) and (Titman – Wessels, 1988). However, for example Bradley et al. (1984) and Chaplinsky and Niehaus (1993) observe a positive relationship between non-debt tax shields and leverage.

Depreciation divided by total assets is used in order to proxy for non-debt tax shields in this study.

2.7 Volatility

Volatility may be understood as a proxy for risk of a firm (probability of bankruptcy). Therefore it is assumed that volatility is negatively related to leverage. However, as Huang and Song (2002, p. 9) state based on findings of Hsia (1981): “As the variance of the value of the firm’s assets increases, the systematic risk of equity decreases. So the business risk is expected to be positively related to leverage.”

The positive relation between volatility and leverage is confirmed by (Kim

⁹ Kim and Sorensen (1986, p. 138) define DEPR as the average rate of depreciation, i.e., depreciation charges divided by fixed assets.

– Sorensen, 1986) and (Huang – Song, 2002). Conversely, a negative relation is found by (Bradley et al., 1984) and (Titman – Wessels, 1988).

In this study, standard deviation of return on assets is used as a proxy for volatility.

2.8 Industry Classification

Some empirical studies identify a statistically significant relationship between industry classification and leverage, such as (Bradley et al., 1984), (Long – Malitz, 1985), and (Kester, 1986). As Harris and Raviv (1991, p. 333) claim, based on a survey of empirical studies: “Drugs, Instruments, Electronics, and Food have consistently low leverage while Paper, Textile Mill Products, Steel, Airlines, and Cement have consistently large leverage.”

To estimate the effect of industry classification on leverage, firms in our sample are divided into groups according to the Industrial Classification of Economic Activities of the Czech Statistical Office. The following classification is used in order to create reasonably large groups of firms: C – Mining of Raw Materials, D – Manufacturing, and E – Production and Distribution of Electricity, Gas, and Water. Firms not belonging to any of these groups make up the reference group. Titman (1984) and Titman and Wessels (1988) point out that firms manufacturing machines and equipment should be financed with relatively less debt. Because group D is sufficiently large, it is possible to drop the firms that belong to sub-industry 29 (Manufacturing and Repair of Machines and Equipment) and create from these firms the group D1.

Therefore four dummy variables are used in the empirical analysis to estimate the effect of industry classification on leverage – *C*, *D*, *D1*, and *E*.

Table 1 provides a brief summary of theoretical and empirical findings (except for industry dummies).

3. Empirical Analysis

3.1 Data Description

Data used in the analysis were collected from financial reports of companies as available on the Prague Stock Exchange website and in the Securities Centre of the Czech Republic data base; prices of ordinary shares at year-end were obtained from “Burzovní noviny”, the official stock market supplement to the “Hospodářské noviny” daily. The data are based on financial reports according to Czech Accounting Standards (the only data available for all companies).

The sample comprises a total of 74 companies listed on the Prague Stock Exchange within the period from 2000 to 2001 (i.e., all non-financial companies traded on the Prague Stock Exchange in November 2002).

After a data set investigation it was decided to exclude 2 companies – one because of negative book value and one because of unusual changes in balance sheet items between the years 2000 and 2001. Therefore the final sample comprises 72 observations for each year.

TABLE 1 Summary of Theoretical and Empirical Findings

	Theoretical prediction	G7 Countries	Developed countries	Developing countries	China
Size	+/-	+(-)	- ^a (+ ^a)	+(-)	+
Profitability	+/-	-(+ ^b)	-(+ ^a)	-	-
Tangibility	+	+	+	-(+)	-
Growth opportunities	-	-	- ^a (+)	+(-)	+
Tax	+			-(+)	+ ^b
Non-debt tax shields	-		+(-)		-
Volatility	+/-		-(+)	-(+)	+

Source: G7 Countries: (Rajan – Zingales, 1995)

Developed countries: (Harris – Raviv, 1991), i.e., a survey of the following empirical studies: (Bradley, et al., 1984), (Chaplinsky – Niehaus, 1990), (Friend – Hasbrouck, 1988), (Friend – Lang, 1988), (Gonedes, et al., 1988), (Long – Malitz, 1985), (Kester, 1986), (Kim – Sorensen, 1986), (Marsh, 1982), (Titman – Wessels, 1988)

Developing countries: (Booth et al., 2001)

China: (Huang – Song, 2002)

Notes: ^a According to (Harris – Raviv, 1991, p. 336): “Indicates that the result was either not statistically significantly different from zero at conventional significance levels or that the result was weak in a non-statistical sense.”

^b Indicates that the result is weak in a statistical sense.

TABLE 2 Selected Items of the Average Balance Sheet (N = 72 companies)

Item	Line	2000	2001
Total assets	001	100	100
Tangible assets	012	53	52
Total liabilities + Shareholders' funds	061	100	100
Shareholders' funds	062	58	59
Liabilities	079	39	38
Reserves	080	3	3
Long-term liabilities	084	4	3
Short-term liabilities	091	20	21
Bank loans and short-term notes	101	12	11
Other liabilities	105	3	3

Note: First, the respective item for each firm was scaled by total assets and then averaged across all firms in the sample. Subsequently it was multiplied by 100, thus, the reported values are in % of total assets.

3.2 International Comparison of the Extent of Leverage

This study uses data based on Czech Accounting Standards and hence the comparison of the results obtained for other countries can be inaccurate. Each country, in fact, has its own specific accounting practices, which cause difficulty in comparison – for example Rajan and Zingales (1995) use the Global Vantage database for G7 countries and they still experience differences in accounting practices). Therefore any comparison undertaken ought to keep this shortage in mind.

Table 2 reports the average balance sheet for the years 2000 and 2001. Only items used in later analysis are described.

Several interesting observations can be made from the average balance sheet as reported in *Table 2*. The proportion of tangible assets is relatively

TABLE 3 Measures of Leverage

<i>TL</i>	Book Total Liabilities Ratio	Total Liabilities / (Total Liabilities + BV Equity)
<i>TD</i>	Book Total Debt Ratio	Total Debt / (Total Debt + BV Equity)
<i>MTL</i>	Market Total Liabilities Ratio	Total Liabilities / (Total Liabilities + MV Equity)
<i>MTD</i>	Market Total Debt Ratio	Total Debt / (Total Debt + MV Equity)

Notes: BV Equity denotes Book value of equity, MV Equity denotes Market value of equity. According to data availability, Total Debt is defined as Long-term liabilities plus Short-term liabilities plus Bank loans and short-term notes.

high on the assets side of the balance sheet – higher than in the case of six from the group of G7 countries – and it is very similar as in the case of Canada.¹⁰ On the side of liabilities, Czech companies exhibit a much higher proportion of equity than companies in G7 countries. They also use a lower share of long-term debt than companies in most G7 countries and the dominant role in total liabilities represent short-term liabilities. Here the problem arises how to measure the leverage of a company. As Rajan and Zingales (1995, p. 1427) state: “Clearly, the extent of leverage – and the most relevant measure – depends on the objective of the analysis.” A discussion concerning the different measures of leverage can be found in (Rajan – Zingales, 1995, pp. 1427–1433)

In this study, the main purpose is to analyse the determinants of capital structure. Therefore as a basic definition of leverage we use the ratio of total liabilities to total assets (i.e., the non-equity share of total assets – therefore one minus this measure can be interpreted as “what is left for shareholders in the case of liquidation”). However, if leverage is viewed as a piece of information on how a firm is financed, then the ratio of total liabilities to total assets is not the best measure. According to Rajan and Zingales (1995, p. 1429): “The effects of past financing decisions is probably best represented by the ratio of total debt to capital (defined as total debt plus equity).” Therefore, the ratio of total debt to capital (defined as total debt plus equity) is used as a second measure of leverage in this study. Both measures of leverage are used in book value as well as in market value (thus four measures of leverage are used in this study; they are summarized in *Table 3*).

Table 4 shows the extent of leverage (as defined in *Table 3*) for selected developed and developing countries.

As can be seen in *Table 4*, Book Total Liabilities Ratio (*TL*) in the Czech Republic is much lower than in G7 countries. It is also lower than in most developing countries (only Brazil and Mexico exhibit a lower *TL* value, China, Malaysia and Zimbabwe show similar values). In general, developing countries seem to have a lower *TL* value than G7 countries, so firms in developing countries have a higher share of equity in total assets. Measured by Book Total Debt Ratio (*TD*), the Czech Republic shows similar values as

¹⁰ It is possible to compare the average balance sheet with G7 countries as reported in (Rajan – Zingales, 1995, p. 1428). Unfortunately, the comparison is not based on the same year (the G7 countries report is based on the year 1991). However, it is made just to illustrate the basic differences across countries.

TABLE 4 Extent of Leverage in Selected Countries, Median (Mean)

Country	Obs.	Period	<i>TL</i>	<i>TD</i>	<i>MTL</i>	<i>MTD</i>
Czech Republic	72	2000	0.44 (0.42)	0.41 (0.39)	0.65 (0.62)	0.60 (0.59)
Czech Republic	72	2001	0.40 (0.41)	0.36 (0.37)	0.66 (0.62)	0.62 (0.58)
USA	2580	1991	0.58 (0.66)	0.37 (0.37)	0.44 (0.44)	0.28 (0.32)
Japan	514	1991	0.69 (0.67)	0.53 (0.52)	0.45 (0.45)	0.29 (0.31)
Germany	191	1991	0.73 (0.72)	0.38 (0.39)	0.60 (0.56)	0.23 (0.28)
France	225	1991	0.71 (0.69)	0.48 (0.46)	0.64 (0.61)	0.41 (0.41)
Italy	118	1991	0.70 (0.67)	0.47 (0.46)	0.70 (0.67)	0.46 (0.47)
UK	608	1991	0.54 (0.57)	0.28 (0.29)	0.40 (0.42)	0.19 (0.23)
Canada	318	1991	0.56 (0.61)	0.39 (0.39)	0.49 (0.47)	0.35 (0.36)
China	954	2000	0.45 (0.46)	0.28 (0.31)	0.12 (0.14)	0.06 (0.08)
Brazil	49	85–91	0.30	N/A	N/A	N/A
Mexico	99	84–90	0.35	N/A	N/A	N/A
India	99	80–90	0.67	N/A	N/A	N/A
South Korea	93	80–90	0.73	N/A	N/A	N/A
Jordan	38	83–90	0.47	N/A	N/A	N/A
Malaysia	96	83–90	0.42	N/A	N/A	N/A
Pakistan	96	80–87	0.66	N/A	N/A	N/A
Thailand	64	83–90	0.49	N/A	N/A	N/A
Turkey	45	83–90	0.59	N/A	N/A	N/A
Zimbabwe	48	80–88	0.42	N/A	N/A	N/A

Source: Czech Republic: own calculations; G7 countries: (Rajan – Zingales, 1995); China: (Huang – Song, 2002); other countries: (Booth et al., 2001)

G7 countries. The *TD* value for developing countries is not available except for China, which exhibits a lower *TD* value than G7 countries (and compared to the Czech Republic). Different results are obtained when leverage is measured in market value. Because of a very low *P/B* ratio in the Czech Republic (for more details, see below), the value of Market Total Liabilities Ratio (*MTL*) in the case of the Czech Republic is higher than in G7 countries (only Italy exhibits a higher *MTL* value, France shows a similar value). China presents a very special case; the reason is given below where *P/B* ratios are discussed. Measured by Market Total Debt Ratio (*MTD*), the value of leverage is much higher in the Czech Republic than in G7 countries or China (which is again a very special case). Therefore the Czech Republic shows relatively low leverage if measured in book value, but relatively high if measured in market value.

3.3 Determinants of Capital Structure

As stated in Chapter 2, eight possible determinants of leverage are analysed in this study. They are summarized in *Table 5*, descriptive statistics of both dependent and explanatory variables and the size of industry groups are reported in *Table 6*, and an international comparison of descriptive statistics of explanatory variables (except for industry dummies) is shown in *Table 7*.

TABLE 5 Determinants of Capital Structure

SIZE	Size	In Sales
<i>ROA</i>	Profitability	<i>EBIT/TA</i>
<i>TANG</i>	Tangibility	Tangible Assets/ <i>TA</i>
<i>PB</i>	Growth opportunities	<i>P/B</i> ratio
<i>TAX</i>	Average tax rate	$(EBT - E)/EBT$
<i>NDTS</i>	Non-debt tax shields	Depreciation/ <i>TA</i>
<i>VOLTY</i>	Volatility	<i>SD (ROA)</i>
<i>IND_C</i>	Industry dummy	= 1 if the firm belongs to Mining of Raw Materials; = 0 otherwise
<i>IND_D</i>	Industry dummy	= 1 if the firm belongs to Manufacturing, except for Manufacturing and Repair of Machines and Equipment; = 0 otherwise
<i>IND_D1</i>	Industry dummy	= 1 if the firm belongs to Manufacturing and Repair of Machines and Equipment; = 0 otherwise
<i>IND_E</i>	Industry dummy	= 1 if the firm belongs to Production and Distribution of Electricity, Gas, and Water; = 0 otherwise

Note: *TAX* is defined as $TAX = 0$ in cases where the value of *TAX* is outside the interval $<0;1>$ (for example when both *EBT* and *E* are negative and $EBT > E$). This happened in 10 cases in 2000, and in 3 cases in 2001.

TABLE 6 Descriptive Statistics

2000	Obs.	Mean	Median	Min.	Max.	<i>SD</i>	2001	Obs.	Mean	Median	Min.	Max.	<i>SD</i>
<i>TL</i>	72	0.42	0.44	0.07	0.96	0.19	<i>TL</i>	72	0.41	0.40	0.01	0.95	0.20
<i>TD</i>	72	0.39	0.41	0.00	0.95	0.20	<i>TD</i>	72	0.37	0.36	0.00	0.94	0.21
<i>MTL</i>	72	0.62	0.65	0.10	0.98	0.23	<i>MTL</i>	72	0.62	0.66	0.02	0.99	0.23
<i>MTD</i>	72	0.59	0.60	0.00	0.97	0.24	<i>MTD</i>	72	0.58	0.62	0.02	0.99	0.25
<i>SIZE</i>	72	21.47	21.84	11.78	24.71	2.17	<i>SIZE</i>	72	21.52	21.89	11.87	24.68	2.16
<i>ROA</i>	72	0.06	0.05	-0.21	0.71	0.12	<i>ROA</i>	72	0.05	0.05	-0.27	0.37	0.09
<i>TANG</i>	72	0.53	0.59	0.00	0.95	0.25	<i>TANG</i>	72	0.52	0.55	0.00	0.93	0.26
<i>PB</i>	72	0.53	0.39	0.02	2.11	0.43	<i>PB</i>	72	0.47	0.37	0.03	2.25	0.38
<i>TAX</i>	72	0.21	0.24	0.00	0.66	0.18	<i>TAX</i>	72	0.22	0.26	0.00	0.74	0.18
<i>NDTS</i>	72	0.05	0.05	0.00	0.10	0.03	<i>NDTS</i>	72	0.05	0.05	0.00	0.12	0.03
<i>VOLTY</i>	72	0.03	0.01	0.00	0.31	0.04	<i>VOLTY</i>	72	0.03	0.01	0.00	0.31	0.04
Obs (<i>IND_C</i>) = 8			Obs (<i>IND_D</i>) = 17				Obs (<i>IND_D1</i>) = 8			Obs (<i>IND_E</i>) = 25			

The explanation of descriptive statistics is best in the context of an international comparison as shown in Table 7.

In general, the firm *SIZE* is higher in G7 countries than in developing countries including the Czech Republic. Among G7 countries, values of *SIZE* are very similar. The value of *SIZE* in the Czech Republic is higher than in most other developing countries. In the Czech Republic, the value of *ROA* is slightly lower than in G7 countries and much lower than in developing countries. The value of *ROA* is 1.5 points higher in developing countries than in G7 countries. The highest profitability is exhibited by firms in Thailand and Zimbabwe; in G7 countries firms in the UK show the highest profitability. Tangibility in the Czech Republic is higher than in G7 countries except Canada, where the value is similar. Only in two developing countries, Brazil and Malaysia, is the tangibility higher than in the Czech Republic. In general, tangibility is higher in developing countries than in developed countries.

TABLE 7 International Comparison of Descriptive Statistics, Mean (standard deviation)

	SIZE (USD)	ROA	TANG	PB	TAX	NDTS	VOLTY
CR 2000	17.98 (2.17)	0.06 (0.12)	0.53 (0.25)	0.53 (0.43)	0.21 (0.18)	0.05 (0.03)	0.03 (0.04)
CR 2001	18.02 (2.16)	0.05 (0.09)	0.52 (0.26)	0.47 (0.38)	0.22 (0.18)	0.05 (0.03)	0.03 (0.04)
USA	21.61	0.07 (0.08)	0.36	1.65	0.30 (0.18)	0.10 (0.04)	0.07 (0.12)
Japan	21.83	0.05 (0.03)	0.29	1.67	N/A	N/A	0.02 (0.04)
UK	20.59	0.09 (0.08)	0.41	1.35	N/A	N/A	0.06 (0.09)
Germany	21.65	0.06 (0.04)	0.33	1.57	N/A	N/A	0.04 (0.06)
France	21.69	0.07 (0.05)	0.24	1.26	N/A	N/A	0.04 (0.05)
Italy	N/A	N/A	0.32	1.00	N/A	N/A	N/A
Canada	N/A	N/A	0.52	1.36	N/A	N/A	N/A
China	19.7 (1.0)	0.08 (0.04)	0.34 (0.16)	3.19 (1.24)	0.16 (0.06)	0.02 (0.02)	0.04 (0.04)
Brazil	13.1 (1.0)	0.07 (0.12)	0.68 (0.19)	N/A	0.14 (0.17)	N/A	0.09 (0.05)
Mexico	11.2 (1.4)	0.08 (0.08)	0.33 (0.30)	N/A	0.26 (0.57)	N/A	0.06 (0.03)
India	18.4 (1.0)	0.07 (0.07)	0.41 (0.18)	1.4 (1.1)	0.22 (0.21)	N/A	0.05 (0.03)
South Korea	18.9 (0.9)	0.04 (0.04)	0.49 (0.15)	0.7 (0.7)	0.30 (0.20)	N/A	0.03 (0.02)
Jordan	9.8 (0.3)	0.07 (0.11)	0.47 (0.22)	1.4 (0.7)	0.16 (0.18)	N/A	0.08 (0.04)
Malaysia	17.4 (1.6)	0.07 (0.07)	0.58 (0.22)	2.3 (1.8)	0.32 (0.44)	N/A	0.05 (0.03)
Pakistan	17.1 (1.1)	0.09 (0.10)	0.38 (0.20)	0.9 (0.7)	0.12 (0.20)	N/A	0.06 (0.04)
Thailand	16.7 (1.3)	0.13 (0.07)	0.36 (0.17)	3.2 (2.1)	0.29 (0.09)	N/A	0.03 (0.03)
Turkey	17.2 (1.7)	0.10 (0.09)	0.41 (0.19)	1.9 (1.3)	0.30 (0.19)	N/A	0.06 (0.03)
Zimbabwe	16.7 (1.6)	0.12 (0.09)	0.44 (0.13)	0.6 (0.6)	0.29 (0.21)	N/A	0.06 (0.06)

Source: Czech Republic: own calculations; G7 countries: see notes below; China: (Huang – Song, 2002); other countries: (Booth et al., 2001)

Notes: Number of observations and the year under analysis are the same as reported in Table 4. *PB* in the case of China means Tobin's *Q* (defined as market-to-book ratio of total assets); the corresponding value of *P/B* ratio is 5.24 (calculated from (Huang – Song, 2002)). *TANG* in the case of (Booth et al., 2001) is defined as total assets less current assets divided by total assets. Values for G7 countries were obtained as follows – *TANG* and *PB* were calculated from (Rajan – Zingales, 1995); *VOLTY*, *ROA* and *SIZE* from (Wald, 1999), where the same time period as in (Rajan – Zingales, 1995) is used, *SIZE* is defined as ln (total assets). *TAX* and *NDTS* for USA are from (Kim – Sorensen, 1986), however, the values are from the period 1975–1980.

The most interesting comparison concerns the value of *PB*. In the Czech Republic, the *P/B* ratio is the lowest of all the countries reported in Table 7. Three other developing countries, South Korea, Pakistan and Zimbabwe, also exhibit a *P/B* ratio less than one. There is the opposite situation in all G7 countries, where the lowest *P/B* ratio is exhibited by Italy (exactly one). In all other countries the *P/B* value is greater than one. China is a very special case, the average value of *P/B* ratio is over five; therefore leverage in market value is much lower than leverage in book value.

The value of *TAX* is not available for G7 countries except for the USA, where the value is higher than that of the Czech Republic. In developing countries, in four cases, the value of *TAX* is lower. It is the same in the case of India and in six other cases it is higher than in the Czech Republic. The value of *NDTS* is available only for two other countries. A sensible comparison is, therefore, not possible. However, the value of *NDTS* is highest in USA and lowest in China. The value of *VOLTY* is lower in the Czech Republic than in G7 countries, except for Japan; the highest value is exhibited by the USA. Concerning developing countries, the value of *VOLTY* in the Czech Republic is less than or equal to any of them. The value of *VOLTY*

TABLE 8 Correlation Matrix (2000 left, down / 2001 right, up)

	TL	TD	MTL	MTD	SIZ	ROA	TAN	PB	TAX	NDTS	VOL	L_C	L_D	L_D1	L_E
TL	1	0.98	0.70	0.73	0.56	-0.22	0.05	0.05	0.24	0.01	-0.10	-0.17	-0.03	0.09	0.24
TD	0.99	1	0.66	0.73	0.51	-0.20	0.02	0.07	0.24	-0.03	-0.07	-0.22	-0.01	0.09	0.25
MTL	0.61	0.59	1	0.96	0.31	-0.58	0.17	-0.66	-0.07	0.15	-0.12	0.01	0.16	0.10	0.06
MTD	0.63	0.64	0.98	1	0.29	-0.55	0.14	-0.62	-0.06	0.11	-0.08	-0.06	0.19	0.12	0.09
SIZE	0.52	0.48	0.35	0.36	1	-0.06	0.41	0.18	0.28	0.38	-0.16	0.12	0.00	-0.05	0.25
ROA	-0.09	-0.09	-0.45	-0.43	0.15	1	-0.11	0.62	0.27	0.00	0.43	0.07	0.04	-0.17	0.03
TANG	-0.07	-0.09	0.06	0.07	0.40	0.05	1	-0.11	-0.06	0.64	-0.12	0.06	-0.13	-0.27	0.41
PB	0.03	0.06	-0.57	-0.49	0.18	0.64	-0.19	1	0.24	-0.15	0.18	-0.05	-0.09	-0.20	0.14
TAX	0.25	0.23	0.07	0.08	0.42	0.27	0.20	0.22	1	-0.08	-0.35	0.19	-0.10	-0.16	0.18
NDTS	-0.09	-0.12	0.02	0.03	0.42	-0.12	0.61	-0.06	-0.01	1	-0.10	0.14	-0.07	0.07	0.01
VOLTY	-0.10	-0.08	-0.11	-0.08	-0.18	-0.13	-0.26	0.06	-0.09	0.09	1	-0.09	0.09	0.11	-0.33
IND_C	-0.18	-0.24	0.03	-0.06	0.12	0.08	0.05	-0.13	0.08	0.21	-0.09	1	-0.20	-0.13	-0.26
IND_D	0.07	0.09	0.25	0.28	0.01	-0.19	-0.15	-0.13	-0.16	-0.09	0.09	-0.20	1	-0.20	-0.41
IND_D1	0.14	0.13	0.15	0.14	-0.04	-0.12	-0.27	-0.13	-0.33	0.02	0.11	-0.13	-0.20	1	-0.26
IND_E	0.18	0.19	-0.04	-0.03	0.22	-0.02	0.48	0.13	0.31	0.09	-0.33	-0.26	-0.41	-0.26	1

is higher in developing countries than in G7 countries; the highest values are recorded for Brazil and Jordan.

An empirical analysis of the determinants of capital structure in the Czech Republic follows. *Table 8* shows correlation coefficients of all variables.

TL, *TD*, *MTL* and *MTD* are dependent variables; therefore always only one of them is explained by any model. Concerning the explanatory variables, relatively high correlation coefficients (higher than 0.5) between *NDTS* and *TANG* and *PB* and *ROA* can be observed. Therefore there is a possibility of multicollinearity. Generally, the presence of multicollinearity in the sample poses a problem – it results in large standard errors of the estimated regression coefficients and leads to instability of regression estimates. However, the results prove to be relatively consistent and stable across numerous regressions that were run. Moreover, the results are stable and consistent also in the case of restricted models, where just one out of two correlated explanatory variables is used.

The determinants of capital structure were analysed by using the OLS estimation, as in most papers of similar character. Therefore the results should be comparable with the majority of them. The results are reported in *Table 9*.

Before commenting on the results, restricted models are presented in *Table 10*. Restricted models are useful as tests for robustness of the results reported in *Table 9*.

Theoretical prediction about the relationship of size and leverage is ambiguous. Empirical studies experience mainly a positive relation. This is also the result of our study. *SIZE* is statistically significant at the 1% level in all the models, the sign being always positive. Thus the theory that size is an inverse proxy for the probability of bankruptcy is supported by the results.

TABLE 9 OLS Estimation Results

N = 72	2000				2001			
	TL	TD	MTL	MTD	TL	TD	MTL	MTD
Intercept	-0.692 *** (-3.62)	-0.671 *** (-3.34)	-0.296 (-1.65)	-0.325 (-1.59)	-0.877 *** (-4.17)	-0.835 *** (-3.78)	-0.446** (-2.17)	-0.535** (-2.22)
SIZE	0.055 *** (5.07)	0.053 *** (4.60)	0.054 *** (5.30)	0.054 *** (4.61)	0.071 *** (5.91)	0.066 *** (5.26)	0.063 *** (5.38)	0.061 *** (4.45)
ROA	-0.420* (-1.73)	-0.407 (-1.60)	-0.256 (-1.12)	-0.285 (-1.10)	-0.153 (-0.51)	-0.237 (-0.75)	-0.381 (-1.29)	-0.591* (-1.71)
TANG	-0.136 (-1.16)	-0.127 (-1.03)	-0.111 (-1.01)	-0.098 (-0.78)	-0.288** (-2.17)	-0.272* (-1.96)	-0.213 (-1.64)	-0.148 (-0.97)
PB	-0.111 (-0.17)	-0.007 (-0.10)	-0.392 *** (-6.46)	-0.385 *** (-5.59)	-0.078 (-1.08)	-0.046 (-0.61)	-0.379*** (-5.36)	-0.311*** (-3.75)
TAX	0.239** (2.11)	0.243** (2.03)	0.079 (0.74)	0.100 (0.82)	-0.045 (-0.33)	-0.030 (-0.21)	-0.048 (-0.36)	0.014 (0.09)
NDTS	-1.062 (-1.07)	-1.296 (-1.25)	-0.856 (-0.92)	-1.080 (-1.02)	-0.974 (-0.96)	-1.113 (-1.04)	-0.756 (-0.76)	-0.853 (-0.73)
VOLTY	0.353 (0.71)	0.412 (0.79)	0.625 (1.34)	0.803 (1.51)	0.186 (0.37)	0.239 (0.46)	0.193 (0.40)	0.310 (0.54)
IND_C	-0.090 (-1.22)	-0.113 (-1.46)	-0.011 (-0.16)	-0.065 (-0.82)	-0.113 (-1.49)	-0.130 (-1.64)	0.025 (0.34)	0.001 (0.01)
IND_D	0.023 (-0.40)	0.037 (0.61)	0.080 (1.48)	0.100 (1.63)	-0.034 (-0.55)	-0.014 (-0.22)	0.079 (1.32)	0.130* (1.86)
IND_D1	0.102 (-1.38)	0.107 (1.38)	0.064 (0.92)	0.071 (0.89)	-0.005 (-0.06)	0.013 (0.15)	0.000 (-0.01)	0.059 (0.64)
IND_E	0.049 (-0.83)	0.058 (0.94)	0.047 (0.86)	0.053 (0.83)	0.072 (1.13)	0.085 (1.29)	0.093 (1.50)	0.114 (1.57)
Adj. R ²	0.43	0.40	0.65	0.59	0.40	0.37	0.57	0.49

Notes: *** = 1%, ** = 5%, * = 10% level of significance. Figures under the values estimated represent t-statistics (in parentheses).

Because the OLS method is used in order to estimate coefficients, the basic assumptions must be checked. The hypothesis of homoskedasticity is not rejected at the 5% level in any case, when White's test is applied. The hypothesis of normality is not rejected at the 5% level of significance in any case when the Kolmogorov-Smirnov test is used; when Shapiro-Wilk's *W* test is employed, the hypothesis of normality is rejected at the 5% level in two cases – *MTL* in 2001 and *MTD* in 2001. The hypothesis of non-autocorrelation is not rejected at the 5% level in six cases when the Durbin-Watson test is utilized; in the cases of *MTL* in 2000 and *MTL* in 2001 the result is inconclusive.

There is no consistent theoretical prediction on the influence of profitability on leverage. However, in the majority of empirical studies, a negative relationship between profitability and leverage is observed. This study provides the same result. *ROA* is not highly statistically significant in unrestricted models (i.e., models as reported in Table 9), however, in restricted models it is significant in five cases; the sign is always negative. This result confirms the pecking-order theory rather than static trade-off models.

From the theoretical point of view, a positive relationship is expected between leverage and tangibility. However, based on the results of this study, the relationship is negative. This is also the result of empirical studies for developing countries, whereas developed countries exhibit a positive relation. The relationship between tangibility and leverage is statistically sig-

TABLE 10 OLS Estimation Results of Restricted Models

	2000				2001			
	<i>TL</i>	<i>TD</i>	<i>MTL</i>	<i>MTD</i>	<i>TL</i>	<i>TD</i>	<i>MTL</i>	<i>MTD</i>
<i>N</i>	70	71	68	71	72	72	69	69
Intercept	-0.635*** (-3.88)	-0.617*** (-3.46)	-0.282** (-2.03)	-0.331* (-1.84)	-0.798*** (-4.27)	-0.761*** (-3.89)	-0.380** (-2.50)	-0.378* (-1.99)
<i>SIZE</i>	0.054*** (6.58)	0.050*** (5.51)	0.058*** (8.05)	0.056*** (6.02)	0.066*** (6.93)	0.061*** (6.24)	0.059*** (7.75)	0.057*** (6.15)
<i>ROA</i>	-0.409*** (-2.89)	-0.367** (-2.42)				-0.380* (-1.71)	-0.519** (-2.34)	-0.691** (-2.57)
<i>TANG</i>	-0.228*** (-3.32)		-0.165*** (-2.67)		-0.355*** (-4.22)	-0.330*** (-3.87)		
<i>PB</i>			-0.467*** (-12.69)	-0.397*** (-9.06)	-0.098* (-1.98)		-0.341*** (-6.79)	-0.298*** (-4.89)
<i>TAX</i>	0.265*** (2.79)	0.277** (2.57)						
<i>NDTS</i>		-2.164*** (-2.82)		-1.573* (-1.94)			-1.558** (-2.64)	-1.978** (-2.77)
<i>VOLTY</i>								
<i>IND_C</i>	-0.145*** (-2.89)	-0.132** (-2.39)		-0.113* (-1.95)	-0.109* (-1.81)	-0.133** (-2.10)		
<i>IND_D</i>				0.105** (2.41)			0.064* (1.77)	0.086* (1.97)
<i>IND_D1</i>		0.124** (2.16)						
<i>IND_E</i>					0.098** (2.22)	0.093** (2.03)		
Adj. <i>R</i> ²	0.50	0.46	0.74	0.62	0.44	0.41	0.68	0.59

Notes: *** = 1%, ** = 5%, * = 10% level of significance. Figures under the values estimated represent *t*-statistics (in parentheses).

Results were obtained as follows. First, outliers were identified and removed from the analysis (outliers were defined as the cases in which the standard residual value, i.e., the difference between the observed and predicted value divided by the square root of the residual mean square, was greater than ± 2 times the standard deviation). Consequently the least significant regressor was removed after each run until all regressors were statistically significant at the 10% level.

nificant in two unrestricted model and in four restricted models. The sign is always negative.

Theoretically, the expected relationship between growth opportunities and leverage is negative. The results of this study confirm this expectation, as do the empirical studies for developed countries. A rather positive relation is detected in developing countries. However, *PB* is highly statistically significant only in cases when leverage is expressed in market value.

The theory expects a positive impact of taxes on leverage. However, empirical findings are not clear. This is equally true for the results of this study. *TAX* is statistically significant in two unrestricted and two restricted models, in which it shows a positive sign. Nevertheless, the relationship between *TAX* and leverage exhibits rather a negative sign in models for the year 2001. However, it is statistically insignificant.

For non-debt tax shields, the results confirm theoretical prediction, i.e.,

TABLE 11 General Results

	Regressor	Sign
Significant regressors	<i>SIZE</i>	+
	<i>ROA</i>	-
	<i>TANG</i>	-
	<i>PB</i>	-
Less significant	<i>TAX</i>	+
	<i>NDTS</i>	-
	<i>IND_C</i>	-
	<i>IND_D</i>	+
	<i>IND_D1</i>	+
	<i>IND_E</i>	+
Insignificant	<i>VOLTY</i>	

Note: *PB* is statistically significant only when leverage is expressed in market value.

a negative relation to leverage. *NDTS* is not statistically significant in any unrestricted model. However, it is significant in four restricted models. The sign is always negative.

Theoretical prediction about the relation of volatility and leverage is not clear. This study does not provide us with a clear empirical result, because *VOLTY* is not statistically significant in any model.

As far as industry classification is concerned, the results show a statistically insignificant relationship between industry dummies and leverage in unrestricted models. The restricted models reveal that firms belonging to industry C (Mining of Raw Materials) demonstrate lower leverage, whereas firms belonging to industries D (Manufacturing except for Manufacturing and Repair of Machines and Equipment), D1 (Manufacturing and Repair of Machines and Equipment), and E (Production and Distribution of Electricity, Gas, and Water) exhibit larger leverage than firms belonging to the reference group.

According to the values of adjusted coefficient of determination (Adj. R^2), the explanatory power of models is higher when the leverage is expressed in market value than in book value. The explanatory power of models presented in this study is, in general, relatively high compared to studies of similar character.

Based on the fact that two measures of leverage are used in this study, each of them in book value and in market value, that unrestricted and restricted models are presented, and that two cross-sectional data samples, i.e., data for the years 2000 and 2001, are used for analysis, the results prove to be quite robust.

For greater clarity, the results are summarized in *Table 11*.

4. Conclusions

In this paper, the determinants of capital structure of listed companies in the Czech Republic are analysed.

In general, Czech listed firms exhibit lower leverage than firms in G7 count-

ries and firms in the majority of developing countries¹¹, when measured by Book Total Liabilities Ratio. When evaluated by Book Total Debt Ratio, Czech companies show similar leverage as companies in G7 countries. Different results are obtained when leverage is expressed in market value. Because of very low P/B ratio, leverage in the Czech Republic is higher than in G7 countries. Thus, Czech firms show relatively low leverage measured in book value, but high leverage assessed in market value.

Based on data availability, eight potential determinants of capital structure were analysed in this paper – size, profitability, tangibility, growth opportunities, tax, non-debt tax shields, volatility, and industry classification.

Several interesting findings can be derived from an international comparison of values of proxy variables for the above-mentioned determinants of leverage. Firms are generally bigger in G7 countries than in developing countries including the Czech Republic. Concerning Czech firms, they are generally bigger than firms in most developing countries. Firms in the Czech Republic are slightly less profitable than firms in G7 countries and much less profitable than firms in developing countries. Tangibility in the Czech Republic is higher than in G7 countries and in most developing countries. The P/B ratio in the Czech Republic is the lowest among all countries as reported in this paper. Three reported developing countries (except for the Czech Republic) exhibit a P/B ratio less than one. The opposite situation exists in all G7 countries, where the P/B ratio is greater than or equal to one. In the USA, the average tax rate is higher than in the Czech Republic. The average tax rate is lower in four developing countries reported in this study than in the Czech Republic, in one case it is the same and in six cases it is higher. The value of non-debt tax shields is available only for two other countries, therefore no sensible comparison is possible. The profit volatility is on average lower in the Czech Republic than in G7 countries. Concerning the developing countries, profit volatility in the Czech Republic is less than or equal to any of them.

According to the results of empirical analysis, leverage of Czech listed firms is positively correlated with size, this result supports the view of size as an inverse proxy for the probability of bankruptcy. Leverage is negatively correlated with profitability. This finding is consistent with the pecking order hypothesis rather than with static trade-off models. A negative relation between tangibility and leverage is in contradiction with theoretical prediction. The reason for this result would need some theoretical support, which is not provided by this study. The relationship between leverage and P/B ratio (proxy for growth opportunities) is negative, given that the leverage is measured in market value. This result confirms that firms with higher future growth opportunities should use more equity financing.

It can be stated, on the lower level of statistical significance, that leverage is positively correlated with tax, and dummy variables for Manufacturing except for Manufacturing and Repair of Machines and Equipment, Manufacturing and Repair of Machines and Equipment, and Production and Distribution of Electricity, Gas, and Water, and it is negatively corre-

¹¹ “Developing countries” comprise eleven developing countries reported in this study.

lated with non-debt tax shields and the dummy variable for Mining of Raw Materials.

It is problematic to speculate about these findings because of the lower level of statistical significance. However, in the case of tax, the result is in accordance with theoretical prediction. A negative relationship between leverage and non-debt tax shields is in accordance with theoretical prediction and shows non-debt tax shields as substitutes to debt-related tax shield. Concerning industry dummies, it is difficult to compare the results with other studies because sample size allows one to distinguish only a limited number of categories. The industry classification is, moreover, based on the Czech Statistical Office classification, which causes other problems in comparison. However, the results prove the differences in leverage between industries.

No relationship was found between leverage and volatility.

When it concerns size, profitability and non-debt tax shields, the results are similar to the conclusions of most other empirical studies. In the case of tangibility, the findings of this study correspond to the results obtained for developing countries, whereas in the case of growth opportunities the findings are in accordance with the results obtained for developed countries. Results and comparisons are not clear in cases of tax and volatility.

In general, leverage of listed firms in the Czech Republic seems to be determined by the same factors as leverage of listed firms in G7 countries and in developing countries reported in this paper. The explanatory power of models used in this study is relatively high.

Finally, several comments should be made with regard to possible limitations and prospective extensions of this study.

First, as data used in this study is based on Czech Accounting Standards, a comparison of the results with other studies is not always appropriate. However, there is no other data available for the years 2000 and 2001.

Second, some results are either unclear or statistically insignificant. It is reasonable to assume that had the sample been larger, the conclusions would have been clearer and more exact. However, because of the limited number of companies listed on the Prague Stock Exchange, it is not possible to expand the cross-sectional data set. Nevertheless, there are possible solutions to this problem. It is possible to collect data for a longer period and to use panel data instead of cross-sectional data, as is the case in this study. Unfortunately, this approach has another drawback, because leverage is the result of long-run evolution. In the case of the Czech Republic, it is not feasible to analyse a long enough period to obtain clearer results than what our cross-sectional data set yielded. A more efficient approach could be to collect data for several transition countries of Central and Eastern Europe and analyse such a cross-sectional data set, taking into consideration different accounting practices of respective countries.

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SUMMARY

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Determinants of Capital Structure Empirical Evidence from the Czech Republic

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This paper analyses determinants of capital structure of listed companies in the Czech Republic during the period from 2000 to 2001. In general, leverage of Czech listed firms is relatively low if measured in book value, but it is relatively high if measured in market value. According to our results, leverage of a firm is positively correlated with size and it is negatively correlated with profitability and tangibility. There is the negative relationship between leverage measured in market value and growth opportunities. Moreover, leverage is positively correlated with tax and negatively correlated with non-debt tax shields, albeit on a lower level of statistical significance. This study also provides evidence concerning the relationship between leverage and industry classification.