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**DETERMINANTS OF CORPORATE DEBT RATIOS:
EVIDENCE FROM MANUFACTURING COMPANIES
LISTED ON THE BUCHAREST STOCK EXCHANGE**

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ABSTRACT

The aim of this article is to estimate how firm-specific indicators and macroeconomic conditions affect capital structure choices and to determine whether or not the current financial crisis may have a significant impact on corporate financing decisions. The sample analyzed consists of 196 companies operating in the manufacturing industry and it refers to a period of ten years (2003-2012). To reflect the capital structure, three indicators were included in the analysis: short-term debt, long-term debt and total debt. The potential capital structure determinants considered are asset tangibility, size, profitability, liquidity, tax, business risk and interest rate. The first stage of the analysis was to obtain results from pooled-OLS model, and least square dummy variable model, that absorbs the particular effects of each company. Then fixed effect and random effect models were used and based on the Hausman test, the best model is chosen in order to run a final regression corrected for heteroskedasticity or autocorrelation problems. Results indicate that asset tangibility, profitability and liquidity have a significant negative relationship with total debt and short-term debt ratios, while tax, risk and interest rate have a positive impact on the same ratios. In order to identify the influence of financial crisis on capital structure across Romanian manufacturing companies, the sample was divided in two, before and during recession, and retested.

Keywords: Capital Structure, Debt, Financial Crisis, Static Panel Models.

JEL Classification: G32, G01.

1. Introduction

Corporate financing decisions focus on the capital structure components, and their importance in determining the minimum cost of capital and the maximum value of the company. Since Modigliani and Miller established the irrelevance theory, many theories developed over time, but Trade-off theory and Pecking order theory are the most debated in the capital structure literature. Modigliani and Miller (1958) argued that capital structure is irrelevant to firm value in perfect market conditions. These market assumptions refer to zero transaction costs, free access to information for all market investors, and equal taxation for both capital gains and dividends. However, these conditions are not attainable by real economies; hence other theories should be considered when analyzing financing decisions. The trade-off theory presumes that the optimal capital structure can be achieved through balancing tax gains from interest expenses with bankruptcy costs. The pecking order-theory disregards the idea of optimal debt-equity mix, referring to a hierarchical financing, firstly using internal funds, then debt, and finally equity.

A consistent number of studies analyze the determinants of debt and equity mix taking into account various capital structure theories or properties of debt contract such as bankruptcy provision, payoffs of levered equity, corporate governance or the sensitivity of performance to debt. Harris and Raviv (1991) examined a wide variety of papers which refer to the most relevant determinants of capital structure in given environments. They realized that most of the models referring to these determinants consider that stock prices increase after firms increase their borrowings. The authors identified common principles of the capital mix theories. Some of these refer to the fact that debt concentrates the voting rights and forces managers to focus on corporate performance in order to be better rewarded; however, as long as debt is priced more accurately than equity, debt should not impact firm performance on a large extent. Additionally, most of the observed studies evidenced that firms follow the pecking-order trend, preferring internal funding to issuing debt. Subsequent studies such as Booth et al. (2001), Fama and French (2002) or Tong and Green (2005) also found results which support the pecking-order theory. These studies concluded that growing firms use internal funds to undertake new investments. If their capital is insufficient, they issue debt and as a last resort, they issue equity. Studies also show that debt is used in order to reduce the taxes owed, although large firms show a lower information asymmetry and more diversified risk, and thus they have the advantage of raising external finance easier. The empirical evidence showed that firm specific factors such as asset tangibility, growth opportunities, size or profitability maintain their influence on leverage on firms operating in both developed and developing economies. However, in terms of country specific factors like growth of GDP or inflation rates, there are systematic differences across countries.

The financing decisions represent a long debated topic in finance literature especially in terms of the funding mix that influences the cost of capital and its availability. Recently, more studies focused on developing countries and firms listed on emerging markets due to high information asymmetry, economic uncertainties and political instabilities, which characterize these countries. Nivorozhkin (2005) analyzed firms from both types of countries, concluding that in transition countries the leverage is lower than in stable EU countries. Overall, the results indicated that EU accession countries follow a corporate finance reform in order to achieve economic stability and thus they tend to a target level of leverage used by EU countries. Mitton (2007), who analyzed only countries with emerging markets, observed a significant increase in debt ratios over a long period of time, which was not considered a hazardous move, but a rational response to the environmental changes, He also suggested that sufficient external funding can only be provided by emerging markets that open up to those from wealthier countries.

This study tries to bring more insight into the capital structure determinants of Romanian listed companies. Moreover, little information is known about the effects financial crises have on corporate financing decisions. The subprime mortgage crisis that started in 2007 in the United States quickly spread, greatly affecting all financial markets, especially developing ones like the Romanian Capital Market. Therefore, an analysis of capital structure determinants will be realized on a sample of manufacturing companies listed on Bucharest Stock Exchange, including a comparison of pre- and post-crisis periods to provide some insights into Romanian corporate financial decision making. The choice of one industry is motivated by the fact that optimal leverage ratio is often related to the industry average, and so gathering companies from several industries might return inconsistent results. This study will refer to specific factors that showed most significance in the capital structure literature - asset tangibility, size, profitability, liquidity, business risk, tax and interest rate. The paper is structured in five sections. After this introductory part, a literature review will acknowledge some of the most relevant capital structure determinants, discussing the impact observed. The third section presents the sample and methodology of this empirical study. Results from overall period as well as from pre- and post-crisis subsamples are included in the fourth section, followed by the final part of this paper that states the final conclusions of this study.

2. Determinants of Capital Structure

The capital structure literature tries to explain what determines companies in choosing the financing sources mix and their use to finance investments. The empirical evidence of capital structure determinants and theories is very broad. However, in order to understand the financing decisions it is crucial to observe if companies operating in emerging economies have a different trend of financing, compared to those from developed countries. Although there is no universal theory to describe the exact amount of debt or equity to be raised, the most valuable theories are the trade-off and the pecking order theory. These are constantly mentioned in empirical studies, and there are a few studies such as Frank and Goyal (2003) or Tong and Green (2005) that even considered these two theories as the main point of view for the rest of the models.

Asset tangibility

Fixed assets are very important in accessing borrowed funds, especially with long maturities, because they can be used as collateral. Therefore, when they own a large proportion of fixed assets, firms can access debt under favorable conditions, including lower costs (Rajan & Zingales, 1995). This is an assumption of the trade-off theory, but various empiric studies observed the relationship between tangible assets and leverage, revealing different opinions. Jensen and Meckling (1976) observed a direct impact from tangibility to leverage. Additionally, a greater use of debt concentrates the ownership, compelling managers to align their objectives to shareholders' interests. However, agency costs may increase due to undertaking risky investments financed through debt, leading to a moral hazard problem that links leverage to performance negatively. Pandey (2001) observed an indirect relationship between tangibility and debt, considering that lenders closely monitor firms operating with high proportions of debt, ensuring that these funds are spent correctly. This is usually beneficial for small companies that cannot afford controlling managers and their expenses, and access debt in order to ensure a better control. Dragota et al. (2008) explained the negative relationship between tangible assets and debt through the common use of commercial debt, which has the predominant proportion. In addition, although financial debt should be used in financing fixed assets, Romanian firms prefer using their own resources because the interest rate is very high in the period analyzed (1997-2003).

Size

According to trade-off theory large firms are usually more diversified, face less bankruptcy risk, and consequently support a great proportion of debt. Due to their reputation, larger firms can obtain better credit conditions and access financial markets more easily (Rajan & Zingales,

1995; Booth et al., 2001; Chen, 2004). However, different relationships were found when liabilities are separated into short-term and long-term debt. Titman and Wessels (1988) were the first to indicate a negative relationship between size and short-term debt: small firms handle severe agency conflicts, and so managers are restricted to access long-term liabilities. Additionally, when companies operate under bankruptcy risk, managers tend to accumulate funds internally, and if necessary they access short-term debt in order to protect against enduring risk. Dragota et al. (2008) also found an indirect relationship between size and short-term, but in the analysis of long-term debt they observed how large Romanian firms access

Profitability

The pecking order hypothesis assumes a negative relationship between the effectiveness in generating profits and the proportion of debt, because firms use their operating cash flows

undertake investments, whilst debt is unnecessary (Titman & Wessels, 1988; Rajan & Zingales,

1995; Dragota et al., 2008). On the contrary, Jensen (1986) argued that the more profitable the companies are, the more debt they raise. It was also demonstrated that companies with high profits over a long period face reduced financial risk, raising equity in favor of debt (Hovakimian et al., 2001; Frank & Goyal, 2003). Opposite to the pecking order assumption, the trade-off theory considers that profitable companies prefer borrowed funds, especially when they own a great proportion of fixed assets they can use as collateral. Different relationships between size and debt are obtained when other indicators such as investors' behavior or financial markets are taken into consideration. Shenoy and Koch (1996) underlined that opposite relationships between profitability and leverage appear because the trade-off theory describes the dynamic aspect, while the pecking order considers the correlation between both variables. Fama and French (2002) and Nivorozhkin (2005) confirm in their studies the negative effect of profitability on debt, although they suggest that higher growth opportunities for recently privatized companies in developing economies would induce them to raise equity in order to undertake future investments.

Liquidity

The pecking order theory implies an indirect impact from liquidity to leverage, respectively that firms with high liquidity will tend to borrow less. In addition, when firms have low earnings volatility they prefer long-term debt to keep a relatively constant structure of capital. But when they face high business risk, companies are affected by agency costs, and thus they shorten debt maturities in order to reduce their agency costs. This is the main reason why the expected relationship between long-term debt and liquidity is a negative one. Firms with excessive liquidity also encounter difficulties when raising borrowings due to their reduced ability to commit to investments (Deesomsak et al., 2004). Harris and Raviv (1991) define optimal capital structure as a trade-off between liquidity and investigation costs, but they also accept a direct correlation between debt and liquidity. It is important to approach the impact of liquidity on debt through intermediaries, such as investors' point of view or investment opportunities, because managers have the ability to manipulate liquid assets to meet shareholders' expectations.

Tax

Considering that interest is a deductible expense, the after-tax income can be altered based on the proportion of debt raised. Modigliani and Miller (1958) were the first to consider the impact of tax on capital structure, after revising their irrelevancy theory: they considered that on one hand, borrowings create a tax shield through deductible interest, but on the other hand, they increase costs of financial distress.

Some studies referred to taxes as a factor with significant impact on capital structure decisions (Lim, 2012) whilst others did not find it relevant (Titman and Wessels, 1988; Chen, 2004). According to trade-off theory, companies use debt as it provides a non-debt tax shield; therefore, the higher the tax rate is, the more borrowings businesses will access. Mitton (2007) analyzed firms from emerging markets and observed that the use of debt increased although

was not induced by the tax shield, as long as tax rates reduced over the period analyzed. Assuming a direct impact from taxation on debt maturity, this is more significant in large companies. However, beside debt, non-cash expenses such as depreciation are also tax-deductible. Hence, when firms face agency problems, supplementary borrowings are not the optimal choice, hence depreciation on tangible and intangible assets could offer deductions for tax income (Tekker et al., 2009).

Business risk

Pindado et al. (2008) studied the role of financing decisions and realized that shareholders are more focused on control than on business risk. When investing in projects with negative net present value is excluded, managers should raise the dividend payout ratio in order to increase the investors' interest. According to trade-off theory, companies listed on risky markets are more probable to experience financial difficulties. Therefore, this theory is based on a negative relationship between risks and leverage. In addition, when companies perform under significant systematic risk, they bear high bankruptcy costs. When bankruptcy risk is great, businesses deal with the underinvestment problem: managers refuse to undertake new projects, as creditors would benefit from these investments. Accordingly, small entities with large investment opportunities access long-term debt in order to invest in risky projects and achieve immediate gains. But small companies do not own a reputation and thus they cannot access consistent borrowings. By contrast, large firms have limited growth opportunities, but they choose secured projects financed through debts. Besides, big organizations usually keep a long-term relationship with creditors and they can obtain favorable borrowing conditions (Dragota et al., 2008).

Corporate governance

According to trade-off theory, optimal capital structure balances the benefits of debt with the bankruptcy costs associated. This is why good corporate governance is expected to have a positive impact on capital structure and leverage adjustments (Morellec et al, 2012). Liao et al. (2012) suggested that a firm would adjust the capital mix only if the future benefits would exceed the adjustment costs. This is why the firm would be able to make more rapid adjustments in capital if transaction costs and the information asymmetry between investors and managers would be reduced. Considering that corporate governance attributes such as executive incentives, board independence or institutional ownership speed up the adjustment

processes and reduce the leverage deviation, it is expected for poorly governed companies to be severely over or under-leveraged.

Results indicated that managerial ownership and remuneration have a negative effect on long-term debt, while outside directors or ownership concentration have a direct impact on debt ratios. Compared to developed countries, firms operating in emerging economies usually present weak external and internal corporate governance mechanisms. However, there is evidence that confirms the role of corporate governance in determining the corporate financing behavior (Sheikh and Wang, 2012).

Investor protection

The economic environment and firm characteristics have a major role in determining firms' capital structure. This is why investor protection is also considered a determinant of debt, depending on the economic conditions. On one hand, companies use more debt in countries where the law emphasizes shareholders' rights and investors' protection. On the other hand, in countries that focus on creditors' protection, companies tend to be highly leveraged (Cheng and Shiu, 2007). Differences in environments and institutional features of the countries are expected to aggregate the capital mix choices depending on firm characteristics and economic sectors. Whereas solid banking regulations and a better protection of creditors results in an abundance of borrowings, shareholder protection constrains the leverage and enhances the development of financial markets. Utrero-Gonzales (2007) considered the connection of investor protection to industry characteristics. For example, in sectors that focus on intangible assets, firms are penalized by creditors due to the lack of collateral; therefore, in countries with low creditor protection, these companies will face difficulties in accessing borrowed funds. Similarly, growth opportunities may facilitate credit conditions, and thus companies operating in expansive sectors will receive benefits from creditors.

Interest rate

High interest rates are expected to restrain firms from borrowing resources. An important reason for accessing debt is the deductibility expense of interest. However, interest rates have a direct impact on the cost of capital, and thus higher loan rates induce companies to bare higher weighted average cost of capital, causing a decline in company value. Considering long-term borrowings the loan interest can be understood as a commitment for a long period of time, and thus there is a preference for borrowings when the market rate of interest is reduced. Consequently, managers decide upon the capital structure of the companies based on the market rate of interest. Antoniou et al. (2002) observed that during times of high interest rates companies are reluctant to access more borrowings and try to raise equity in order to meet their financial obligations. Huang and Song (2006) disregarded the negative role of high interest rates, arguing that in countries where the interest rates are dictated by the central bank and not through the market force, listed companies are usually considered top-firms. As a result, although they operate with high business risk, they can still obtain loans with regulated interest rates, these being lower than the market interest rate.

3. Data and Methodology

3.1. Sample

The sample selection includes listed Romanian companies operating only in the manufacturing sector, in order to avoid industry particularities. For example, the industry risk may influence the relationships between debt ratios and capital structure determinants, and this might return misleading results. The sample consists of 196 Romanian companies listed on the Bucharest Stock Exchange and operating in the manufacturing industry. Data includes the main financial

indicators reported annually, for a period of ten years, from 2003 to 2012, and it was gathered from the official website of the Bucharest Stock Exchange.

3.2. Variables

In order to identify the determinants of capital structure most determinants mentioned in the literature review will be used in this study, depending on data availability.

The debt ratios (TOTD, LGTD, SHTD) are the ratios of total liabilities, long-term liabilities and respectively short-term liabilities to total assets. All debt ratios were taken into consideration because it would be interesting to observe if the unstable environment influences external funding availability for Romanian companies in terms of the amount and the maturity of debt. This approach was used in recent studies where the same regression model was used for several debt ratios (Fosberg, 2012; Ramjee and Gwatidzo, 2012).

The independent variables are some of the most influential leverage determinants found so far in the capital structure literature and mentioned in the literature review section. Corporate governance and investor protection cannot be included in this study due to lack of information regarding these factors. The next step is to present the explanatory variables and the calculation formula.

Asset tangibility (TANG) is defined as the ratio of fixed assets to total assets. The size variable (SIZE) is obtained from the logarithm of annual turnover. Profitability (PROF) is the ratio of earnings before interest and tax to total assets. Liquidity (LIQUID) is defined as the ratio of current assets to current liabilities. Tax (TAXRATIO) is defined as the ratio of taxable income to earnings before interest and tax. Business risk (BUSRISK) is the standard deviation of earnings before interest and tax divided by total assets over the past period; for example, in 2006 business risk considers the standard deviation of the ratio from 2003 to 2006, or in 2010 business risk considers the standard deviation over the period 2003-2010. Finally, interest rate (INTRATE) is the average of monthly rates provided by the National Bank of Romania.

3.3. Model

This study tries to discover the most influential variables of capital structure on a time series cross-sectional data over the 2003-2012 period. Assuming that debt ratios will be regressed on a group of explanatory variables, leverage can be understood as follows:

$$Debt = f(\text{tangibility, size, profitability, liquidity, tax, business risk, interest rate}) \quad (1)$$

The static simple linear model is the one from the second equation:

$$DebtRatio_{it} = \alpha_i + \beta_1 Tangibility_{it} + \beta_2 Size_{it} + \beta_3 Profitability_{it} + \beta_4 Liquidity_{it} + \beta_5 Tax_{it} + \beta_6 BusinessRisk_{it} + \beta_7 InterestRate_{it} + \epsilon_{it} \quad (2)$$

where α_i ($i = 1...196$) is the unknown intercept for every company, t ($t = 2003...2012$) represents the year analyzed, the β s are the coefficients for every independent variable and ϵ_{it} is the error term. Three models will be considered, one for every debt ratio: total debt, long-term debt and short-term debt.

Several methods will be used to test the static model considered: Pooled Ordinary Least Squares (OLS), Fixed Effects using least squares dummy variable for companies (LSDV), Fixed Effects with n entity-specific intercepts (cross section FE) and Random Effects (RE). The Hausman test will indicate the most appropriate model from the latter two, fixed or random. In order to obtain accurate results, a final regression will be estimated including the necessary corrections for heteroskedasticity or autocorrelation issues.

The fixed effect models are used to explore the relationship between explanatory and dependent variables in separate entities, assuming that every company has representative characteristics that will influence the correlations between variables. In this type of analysis fixed effects characterize the arbitrary correlations between the explanatory variables and the unobserved effect, also called firm fixed effect. The random effect models imply a random variation across companies, not correlated to the independent variables in the model. A random effect assumes no correlation between the independent variables and the unobserved effect, and it is a method that is used when the heterogeneity problem is neglected (Wooldridge, 2001) Since the most important issue in choosing between random and fixed effects is whether or not the error term is correlated to the independent variables, Hausman (1978) was the first to test the differences between these two models: as long as the correlation exists, it is opposing to random effects; the statistically significant difference is interpreted as evidence against random effect assumptions.

As stated earlier, besides discovering the most influential determinants of capital structure in listed Romanian manufacturing firms, the second objective of this paper is to examine the possible effects of the financial crisis on the capital structure decision process. To achieve this, the overall sample will be divided: a pre-crisis period between 2003 and 2007, and a post-crisis period from 2008 to 2012. The sub-samples will be retested, using the same model presented in Equation 2, only for the respective cross-sectional periods.

3.4. Descriptive statistics

Before testing the models, data will be observed in order to better understand the variables. *Table 1* presents the summary statistics of the financial data included in the whole sample, while *table 2* includes the descriptive statistics of the variables included in the fragmented periods.

Descriptive statistics for overall sample

The average ratio of total debt is 0.45, while long-term debt shows an average of 0.09, and short-term debt indicates a mean of 0.37. Long-term liabilities indicate the smallest numbers,

meaning that Romanian manufacturing companies prefer a higher proportion of short-term debt in their capital structure avoiding indebtedness over long periods.

Table 1

Summary Descriptive Statistics (Overall Period)

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|----------|------|--------|-----------|--------|--------|
| totd | 1718 | 0.454 | 0.356 | 0.000 | 2.952 |
| lgtd | 1546 | 0.091 | 0.169 | 0.000 | 1.763 |
| shtd | 1738 | 0.372 | 0.321 | 0.000 | 2.952 |
| tang | 1741 | 0.546 | 0.202 | 0.184 | 0.999 |
| size | 1739 | 7.248 | 0.803 | 2.844 | 10.091 |
| prof | 1739 | 0.003 | 0.154 | -1.383 | 2.040 |
| liquid | 1722 | 2.132 | 2.261 | 0.005 | 14.396 |
| taxratio | 1739 | 0.219 | 1.128 | 0.000 | 39.549 |
| busrisk | 1547 | 0.096 | 0.110 | 0.000 | 1.695 |
| intrate | 1960 | 10.167 | 4.897 | 5.380 | 20.270 |

Source: Own preparation.

Approximately 21% of the long-term debt data is missing, and more than 22% of it is 0. Therefore, it is expected that the significance of results obtained from regressing debt ratio with long maturity will be affected. It is also interesting to observe that operating without long-term debt is fairly common among Romanian manufacturing companies.

Table 2

Summary descriptive statistics (pre-crisis and post-crisis periods)

| Variable | Obs | | Mean | | Std. | | Min | | Max | |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 2003- | 2008- | 2003- | 2008- | 2003- | 2008- | 2003- | 2008- | 2003- | 2008- |

| | 2007 | 2012 | 2007 | 2012 | 2007 | 2012 | 2007 | 2012 | 2007 | 2012 |
|----------|------|------|-------|--------|-------|-------|--------|--------|--------|--------|
| totd | 933 | 785 | 0.475 | 0.429 | 0.325 | 0.389 | 0.011 | 0 | 2.857 | 2.952 |
| lgttd | 940 | 606 | 0.082 | 0.104 | 0.161 | 0.181 | 0 | 0 | 1.764 | 1.576 |
| shtd | 939 | 799 | 0.392 | 0.348 | 0.283 | 0.360 | 0 | 0.001 | 2.857 | 2.952 |
| tang | 940 | 801 | 0.521 | 0.576 | 0.181 | 0.221 | 0.018 | 0.031 | 0.997 | 0.999 |
| size | 941 | 798 | 7.261 | 7.232 | 0.726 | 0.886 | 4.005 | 2.845 | 9.763 | 10.09 |
| prof | 939 | 800 | 0.022 | -0.020 | 0.162 | 0.140 | -1.108 | -1.384 | 2.041 | 0.439 |
| liquid | 933 | 788 | 1.870 | 2.440 | 1.820 | 2.659 | 0.007 | 0 | 14.335 | 14.396 |
| taxratio | 940 | 798 | 0.203 | 0.238 | 0.351 | 1.627 | 0 | 0 | 7.300 | 39.55 |
| busrisk | 757 | 804 | 0.089 | 0.102 | 0.126 | 0.096 | 0 | 0.002 | 1.695 | 0.889 |
| intrate | 980 | 980 | 12.92 | 7.414 | 5.481 | 1.671 | 7.46 | 5.38 | 20.27 | 9.46 |

Source: Own preparation.

Descriptive statistics for sub-samples

The summary statistics in *table 2* present both sub-samples in comparison. It can be observed that since the recession began the mean value of long-term debt ratio shows a slight increase, whereas total debt and short-term debt ratios decreased.

Although before crisis the average profitability was fairly above 0, from 2008 the mean of this variable became negative, meaning that the majority of companies operating in manufacturing industry registered losses during the crisis. Even the most profitable ones have a very low profitability rate (0.439) after 2007. Before 2008, liquidity ratio indicates that Romanian companies finance about half of their current assets through short term debt. Moreover, since the crisis started, firms tend to use even less of this debt in order to sustain their current assets. After the crisis started, taxes and business risk increased, while the average interest rate reduced from approximately 13% to 7.4%.

3.5. Correlations

The correlations between dependent and independent variables for the whole sample, and for the two sub-samples are presented in *table 3* and *table 4*, respectively.

Correlations for Overall Sample

In the following table the only problematic correlations appear between total debt and short-term debt, as its value is very large (0.86). However, this will not have an adverse impact on the analysis as long as every regression includes only one of the three debt ratios considered.

Table 3

Correlations (Overall Period)

| | totd | lgtd | shtd | tang | size | prof | liquid | taxratio | busrisk | intrate |
|----------|--------|--------|---------|--------|---------|--------|--------|----------|---------|---------|
| totd | 1 | | | | | | | | | |
| lgtd | 0.463 | 1 | | | | | | | | |
| shtd | 0.861 | -0.039 | 1 | | | | | | | |
| tang | -0.165 | 0.115 | -0.256 | 1 | | | | | | |
| size | 0.041 | -0.027 | 0.061 | -0.113 | 1 | | | | | |
| prof | -0.369 | -0.096 | -0.3642 | -0.202 | 0.148 | 1 | | | | |
| liquid | -0.482 | -0.082 | -0.499 | -0.183 | -0.130 | 0.204 | 1 | | | |
| taxratio | -0.019 | -0.037 | 0.0003 | -0.073 | -0.0008 | 0.022 | 0.066 | 1 | | |
| busrisk | 0.211 | 0.114 | 0.177 | -0.027 | -0.107 | -0.021 | -0.051 | -0.034 | 1 | |
| intrate | 0.039 | -0.052 | 0.074 | -0.093 | -0.029 | 0.129 | -0.058 | -0.006 | -0.057 | 1 |

Source: Own preparation.

Tangibility is negatively correlated to total debt and short-term debt, but positively related to long-term debt. The latter correlation could be indicating that fixed assets are used as collateral in accessing more long-term debt. Size indicates a positive correlation to total and short-term debt ratios, which might imply that Romanian manufacturing companies use borrowed resources with short maturities to fund their activity. Business risk shows a direct impact on all debt ratios, while profitability and liquidity indicators are indirectly correlated to borrowed funds. Although the trade-off theory presumes that companies tend to access more debt when taxes rise, in this case this assumption is not proven, as total debt and long-term debt ratios are negatively related to tax. Finally, interest rates show a positive impact on total debt and short-term debt ratios, but a negative influence on long-term debt.

Correlations for Sub-Samples

The highest correlations between variables indicate a high association between total debt and short-term debt (0.88, 0.84), but only one of these variables will be used in the econometric models, and thus results will not be negatively influenced. It can be observed that fixed assets are used as collateral for raising debt with long maturity only after the crisis started. Additionally, the size variable indicates differences across periods: before 2007 long term-debt was used to finance firms' activity, but since the crisis began this debt category is avoided by companies with high turnover. Profitability and liquidity maintain the negative correlation to debt ratio. Taxes have the same negative influence, but only on total and long-term debt. Large companies facing high business risk are expected to use more external funding. However, since the crisis began, companies use less debt when interest rates increase.

Table 4a

Correlations (Pre-Crisis Period)

| | | 2003 - 2007 | | | | | | | | | |
|------|--------|-------------|--------|------|------|------|------|--------|----------|---------|---------|
| | | totd | lgtd | shtd | tang | size | prof | liquid | taxratio | busrisk | intrate |
| totd | 1 | | | | | | | | | | |
| lgtd | 0.477 | 1 | | | | | | | | | |
| shtd | 0.881 | 0.034 | 1 | | | | | | | | |
| tang | -0.177 | -0.001 | -0.212 | 1 | | | | | | | |

| | | | | | | | | | | |
|----------|--------|--------|--------|--------|--------|-------|--------|--------|--------|---|
| size | 0.020 | 0.031 | 0.003 | -0.104 | 1 | | | | | |
| prof | -0.328 | -0.063 | -0.344 | -0.243 | 0.153 | 1 | | | | |
| liquid | -0.475 | -0.052 | -0.518 | -0.148 | -0.147 | 0.221 | 1 | | | |
| taxratio | -0.004 | -0.049 | 0.021 | -0.127 | -0.033 | 0.095 | -0.041 | 1 | | |
| busrisk | 0.181 | 0.120 | 0.149 | -0.042 | -0.056 | 0.096 | -0.036 | -0.140 | 1 | |
| intrate | 0.060 | -0.018 | 0.082 | -0.047 | -0.023 | 0.110 | -0.074 | 0.101 | -0.061 | 1 |

Table 4b

Correlations (Post-Crisis Period)

| | 2008 - 2012 | | | | | | | | | |
|----------|-------------|--------|--------|--------|--------|--------|--------|----------|---------|---------|
| | totd | lgtd | shtd | tang | size | prof | Liquid | taxratio | busrisk | intrate |
| totd | 1 | | | | | | | | | |
| lgtd | 0.462 | 1 | | | | | | | | |
| shtd | 0.840 | -0.093 | 1 | | | | | | | |
| tang | -0.154 | 0.188 | -0.287 | 1 | | | | | | |
| size | 0.064 | -0.086 | 0.124 | -0.136 | 1 | | | | | |
| prof | -0.457 | -0.122 | -0.439 | -0.118 | 0.163 | 1 | | | | |
| liquid | -0.491 | -0.115 | -0.480 | -0.229 | -0.118 | 0.210 | 1 | | | |
| taxratio | -0.027 | -0.043 | 0.004 | -0.078 | 0.007 | 0.009 | 0.102 | 1 | | |
| busrisk | 0.283 | 0.116 | 0.246 | -0.016 | -0.209 | -0.309 | -0.085 | -0.013 | 1 | |
| intrate | -0.027 | -0.029 | -0.013 | -0.039 | -0.000 | -0.011 | -0.016 | -0.083 | 0.016 | 1 |

Source: Own preparation.

4. Empirical Results

4.1. Cross-Sectional Results over the Whole Sample Period

Unit-root tests were applied to the panel data in order to inspect if there is a possibility for spurious correlations among variables. Due to panel missing values the only option available was the Fisher test. The hypothesis tested is that all panels contain unit-root and it was rejected showing that all the variables considered have a stationary trend, and hence the regression analysis can be performed. First, the capital structure determinants will be examined over the whole period. Then, based on these results, a comparative analysis will discuss if there are any important changes in the corporate financing decisions before and during the financial crisis.

The cross sectional results obtained for the ten-year period are presented in *Table 5, 6 and 7*. These include the most important results the regression models, referring to every leverage ratio considered.

Total Debt

The Pooled OLS results show that 42.24% of the variance in total debt is determined by the model, more exactly by the deviation in asset tangibility, profitability, liquidity, business risk and interest rate. On one side, tangibility, profitability and liquidity show a negative relationship to total debt ratio; on the other side, business risk and interest rate indicate a positive impact.

Differences across companies can mediate the influence of predictor variables on explained variables. Therefore, the next step is to compute a least square dummy variable model in order to provide a better understanding of these effects. Through this process, a dummy

variable will be added for each company, absorbing particular corporate effects. This way, results estimate the pure effect of explanatory variables. The new adjusted R-square indicates that 81% of the variance in total debt can be explained through the variance of explanatory variables. Considering the large difference between the R-squared, it is recommended to use a model that takes into account the particular characteristics of every company. The coefficients are very similar to the previous obtained through OLS model. The differences in results come with the size indicator that becomes statistically significant.

Table 5

Regressions Results for Total Debt (Overall Period)

| Independent Variable | OLS | LSDV | Cross section | RE | Corrected |
|----------------------|-----------|-----------|---------------|-----------|-----------|
| | -0.489*** | -0.477*** | -0.477*** | -0.471*** | -0.477*** |
| | [0.336] | [0.039] | [0.039] | [0.036] | [0.067] |
| tang | 0.001 | -0.049*** | -0.049*** | -0.024* | -0.048** |
| | [0.009] | [0.017] | [0.017] | [0.013] | [0.022] |
| size | -0.797*** | -0.470*** | -0.470*** | -0.511*** | -0.470*** |
| | [0.051] | [0.037] | [0.037] | [0.037] | [0.071] |
| prof | -0.069*** | -0.041*** | -0.041*** | -0.046*** | -0.041*** |
| | [0.003] | [0.003] | [0.003] | [0.002] | [0.004] |
| liquid | 0.007 | 0.0002 | 0.0002 | 0.002 | 0.0002 |
| | [0.006] | [0.004] | [0.004] | [0.004] | [0.006] |
| taxratio | 0.528*** | 0.831*** | 0.831*** | 0.747*** | 0.831*** |
| | [0.062] | [0.099] | [0.099] | [0.083] | [0.315] |
| busrisk | 0.003* | 0.004*** | 0.004*** | 0.003*** | 0.004*** |
| | [0.001] | [0.001] | [0.001] | [0.001] | [0.001] |
| intrate | 0.782*** | 1.611*** | 1.039*** | 0.883*** | 1.039*** |
| | [0.077] | [0.151] | [0.138] | [0.107] | [0.198] |
| cons | 155.95*** | 27.39*** | 77.53*** | | 26.10*** |
| | 0.4224 | 0.81 | 0.2948 | 0.2913 | 0.2948 |
| F-test | | | 92779.83*** | | |
| R-squared | | | 34.630*** | 679.17*** | |
| Modified Wald test | | | | 84.09*** | |
| (χ^2) | | | | | |

Wooldridge test (F)
Wald $\chi^2(9)$

Hausman $\chi^2(7)$

*Note: *, **, *** Significant at 10%, 5% and 1% level, respectively. Standard errors in parenthesis.
Source: Own preparation.*

Now that it was proven that representative characteristics of companies influence the correlations between variables, regressions with fixed and random effects should be computed. The fixed effects results are almost identical to those from the model using the dummy variable for companies. The F test confirms the validity of the instruments included in the equation. Although results discussed so far indicate that differences between manufacturing companies influence the total debt ratio, it is important to also evaluate the

presumed relationships through a random effects model and after, decide on the best alternative for the sample.

The random effects model found tangibility, size, profitability and liquidity as explanatory variables with significant negative impact on total debt ratio, while business risk and interest rate carry a positive impact.

The decision between fixed or random effect model was made through a Hausman test. This indicates the former as a better model for our cross-sectional sample. The fixed effects assumption presumes that every company included in the cross-sectional data would face independent time effects that can be correlated with the regression predictors. Additional tests indicate some evidence for heteroskedasticity and serial correlation, and thus another regression must be used in order to correct these issues.

The corrected model validates significant coefficients with negative correlation between total debt and asset tangibility, size, profitability and liquidity and a positive correlation to business risk and interest rate. Tax ratio is positively related to total debt, but its coefficient is not found statistically significant. These final results are very similar to the ones obtained in the previous models discussed, proving consistent results.

From the overall period analysis, it can be concluded that large Romanian manufacturing companies raise more debt when they own less fixed assets, assuming they do not use debt for investments or for their operations. This is somehow related to the next assumptions based on results obtained: firms depend on debt when they have low profits and liquidity problems. Despite the fact that they have to handle high business risk or an increasing interest rate, companies continue to access debt.

Long-Term Debt

Considering the long-term debt to total assets ratio as dependent variable, the OLS model reveals only 3.5% of the variance in long-term debt. From all predictors, tangibility, profitability, liquidity and business risk were statistically significant. As opposed to the ratio of total debt, the long-term ratio indicates a positive relationship to tangibility. This is according to the trade-off theory and it proves that companies with high proportion of fixed assets seek more long-term borrowings. Another positive relationship is indicated between business risk and long-term debt, while the other two relationships with liquidity and interest rate are negative. So, manufacturing companies use their fixed assets as collateral for obtaining debt with long-term maturity, and they prefer this type of borrowings when they are in financial difficulties or when they face a great extent of business risk.

The least square dummy variable model increases the Adjusted R-squared up to 0.599 indicating that companies characteristics influence the relationships between variables. In this

case, tangibility, profitability, liquidity and business risk are influencing debt, inducing a direct effect.

The fixed effects model returns the same coefficients as the dummy variable regression, while results from the random effects model sustain the positive relationships between long-term debt and fixed assets, liquidity and business risk. The heteroskedasticity and autocorrelation tests indicate that the sample does not comply with these conditions. An ultimate regression model is computed, correcting these issues. Final results indicate that an F-test that is not statistically significant. This means that the model should either be reconsidered or it can be concluded that the missing values of total debt affect the regressions results.

Table 6

Regressions Results for Long-Term Debt (Overall Period)

| Independent Variable | OLS | | Cross section FE | | Corrected FE |
|----------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | OLS | LSDV | RE | RE | FE |
| | 0.073*** [0.022] | 0.056* [0.029] | 0.057* [0.029] | 0.062** [0.025] | 0.057 [0.042] |
| tang | -0.0008 [0.006] | -0.021 [0.015] | -0.021 [0.015] | -0.006 [0.009] | -0.021 [0.031] |
| | -0.066** [0.031] | 0.050* [0.026] | 0.050* [0.026] | 0.027 [0.025] | 0.050 [0.055] |
| size | -0.004* [0.002] | 0.006*** [0.002] | 0.006*** [0.002] | 0.004* [0.002] | 0.006** [0.002] |
| | -0.003 [0.003] | -0.002 [0.002] | -0.002 [0.002] | -0.001 [0.002] | -0.002* [0.0008] |
| prof | 0.160*** [0.039] | 0.208*** [0.077] | 0.208*** [0.077] | 0.171*** [0.054] | 0.208 [0.141] |
| | -0.001 [0.001] | -0.0004 [0.0007] | -0.0004 [0.0007] | -0.0006 [0.0007] | -0.0004 [0.001] |
| liquid | 0.061 [0.049] | 0.140 [0.125] | 0.187 [0.120] | 0.081 [0.073] | 0.187 [0.229] |
| | 6.98*** | 8.41*** | 4.26*** | | 1.58 |
| | 0.035 | 0.599 | 0.0256 | 0.0228 | 0.0256 |
| taxratio | | | 4.7e+6*** | | |
| | | | 69.953*** | | |
| | | | | 23.45*** | |
| | | | | 32.07*** | |

busrisk

intrate

cons

F-test

R-squared

Modified Wald test

(χ^2)

Wooldridge test (F)

Wald $\chi^2(9)$

Hausman $\chi^2(7)$

*Note: *, **, *** Significant at 10%, 5% and 1% level, respectively. Standard errors in parenthesis.
Source: Own preparation.*

Short-Term Debt

The simple regression of short-term debt ratio returns an adjusted R-square of 0.46 and a statistically significant F-test, showing that almost 50% of the variation in short-term debt is explained through the variation of the explanatory variables. Negative coefficients were found when describing the impact of asset tangibility, profitability and liquidity, while size, tax ratio, business risk and interest rate indicate positive relationships. However, size was not found statistically significant.

Including the company dummy variable, the model explains even more of the variance in this debt ratio (76%). The coefficients remain similar to the OLS model with the difference that tax ratio is no longer statistically significant and size becomes a significant variable with a negative influence.

Table 7

Regressions Results for Short-Term Debt (Overall Period)

| Independent Variable | Cross | | | | |
|----------------------|-------|------|------------|----|--------------|
| | OLS | LSDV | section FE | RE | Corrected FE |
| tang | | | | | |
| size | | | | | |
| prof | | | | | |
| liquid | | | | | |
| taxratio | | | | | |
| busrisk | | | | | |
| intrate | | | | | |
| cons | | | | | |

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| | | | | | |
|---------------------|-----------|-----------|-----------|-----------|-----------|
| | [0.044] | [0.037] | [0.037] | [0.037] | [0.097] |
| | -0.063*** | -0.042*** | -0.042*** | -0.047*** | -0.042*** |
| | [0.002] | [0.002] | [0.002] | [0.002] | [0.004] |
| | 0.099* | 0.002 | 0.002 | 0.004 | 0.0006 |
| | [0.005] | [0.004] | [0.004] | [0.004] | [0.006] |
| | 0.422*** | 0.673*** | 0.673*** | 0.575*** | 0.694** |
| | [0.054] | [0.102]p | [0.102] | [0.077] | [0.343] |
| | 0.003* | 0.004*** | 0.004*** | 0.003*** | 0.003 |
| F-test | [0.001] | [0.001] | [0.001] | [0.001] | [0.002] |
| | 0.742*** | 1.505*** | 0.891*** | 0.773*** | 0.849*** |
| R-squared | [0.067] | [0.154] | [0.141] | [0.097] | [0.221] |
| Modified Wald test | 183.98*** | 20.35 *** | 80.10*** | | 12.41*** |
| | 0.4605 | 0.758 | 0.2991 | 0.2963 | 0.3088 |
| (χ^2) | | | 4.3e+5*** | | |
| Wooldridge test (F) | | | | | |
| Wald $\chi^2(9)$ | | | 22.700*** | 796.04*** | |
| Hausman $\chi^2(7)$ | | | | 208.34*** | |

Note: *, **, *** Significant at 10%, 5% and 1% level, respectively. Standard errors in parenthesis.

Source: Own preparation.

Fixed effects model indicates the same results the previous one and a larger and significant F-test value, confirming the validity of the model tested. In addition, the random effects model invalidates the significance of size. Considering the previous preferences for fixed effects model, the Hausman test reconfirms this choice.

Correcting autocorrelation and heteroskedasticity, and adding time fixed effects, the final model shows significant negative coefficients for tangibility, profitability and liquidity, and positive for business risk. It can be observed that the interpretation of the results is consistent to those obtained from the models including total debt ratio. This proves a consistency in results, considering that short-term debt is the most predominant type of borrowed funds in the case of Romanian manufacturing companies.

Consistent Relationships in Overall Results

Considering the three debt ratios, asset tangibility was found relevant for all, having a positive impact on long-term debt and negative influence on short-term debt and total debt. While the first relationship is an assumption of trade-off theory, the latter relationships might indicate that small manufacturing companies in terms of fixed assets, access debt in order to ensure closely monitoring from lenders.

Size showed a negative influence on all debt ratios. However, from corrected models only the one explaining total debt found size as a relevant regressor. Although coefficients indicate that companies with growth potential access more short-term debt, these relationships were not statistically proven.

Profitability shows negative impact on debt ratios, according to the pecking-order theory. This means that profitable companies reinvest their profits, and thus, need less borrowed funds for their operations or investments. The capital structure in companies facing liquidity problems indicates a preference for debt. Although companies with financial difficulties are expected to cut down the cost of debt, this is not the case for Romanian manufacturing

companies. As an explanation for this action, managers raise more short-term debt because it can easily be accessed, and they use it in order to meet their financial obligations.

Tax ratio has a direct influence on total debt and short term. This means that when taxes are increasing manufacturing companies from Romania tend to borrow more debt, confirming the trade-off theory. Although these results show that Romanian companies try to use borrowed funds with short maturities in order to make some tax savings through interest, a deductible expense, this cannot be a certain statement as long as some models did not return statistically significant results.

The business risk is positively related to all debt ratios, rejecting the trade-off assumption. In general, companies facing high business risk should choose a capital structure with low proportion of debt in order to meet its financial obligations. The Romanian manufacturing

companies are clearly a special case of handling business risk, but this might also be related to the fact that accessing equity on developing financial markets, like the Bucharest Stock Exchange, can be very often a complicated process. Therefore, when companies need funds they access debt, although in this way they are increasing their financial risk.

Interest rate indicates a direct impact on short-term borrowings and total debt. A great extent of economic risk is due to increasing interest rates. The sample analyzed also shows that manufacturing companies avoid long-term debt when interest rate is high, but the coefficients are not significant. Therefore, it can be said that despite of high interest rates, firms access more borrowed funds with maturities up to one year. Although this is not the appropriate action in unstable economies, it limits to some extent the risks over long periods of time.

4.2. Cross-Sectional Results Before and After the Crisis

After testing the variables in both fragmented samples with the Fisher unit-root test, they returned evidence for stationary trends. Therefore, the sub-samples can be retested with the comparative analysis in order to observe any differences in capital structure decisions before and after the recession started.

Total Debt

Table 8 summarizes the results obtained for the regression models explaining total debt, and it includes both sub-samples.

Regardless of the crisis commencement, the proportion of tangible assets and the profitability and liquidity variables keep the negative impact on total debt, showing that Romanian firms use more borrowed funds when they own less fixed assets, or when they register losses and do not dispose of sufficient liquid assets. Tangibility and liquidity present a slightly stronger impact before recession whilst profitability indicator shows a higher coefficient after the crisis began.

Companies registering higher revenues use less borrowed finance ensuring a more profitable activity. Although size has a negative impact on total debt, this relationship is statistically relevant only after the crisis started. High taxation induced manufacturing firms to raise their total debt, but since 2008 an opposite relationship can be observed, as the same companies tend to avoid borrowings when tax rates are up.

Before recession, results indicate that firms used to access more debt when taxes increased. For the second sub-sample, this influence remains statistically significant, but becomes negative: under conditions of high tax ratios, Romanian companies limit their access to borrowed funds.

Table 8a

Regressions Results for Total Debt Ratio (Pre-Crisis Period)

| Independent Variable | OLS | LSDV | Cross section FE | RE | Corrected FE |
|---------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | -0.539*** [0.051] | -0.551*** [0.058] | -0.551*** [0.058] | -0.538*** [0.052] | -0.551*** [0.079] |
| | -0.007 [0.012] | -0.069* [0.036] | -0.069* [0.036] | -0.024 [0.019] | -0.069 [0.059] |
| | -0.641*** [0.060] | -0.339*** [0.040] | -0.339*** [0.040] | -0.395*** [0.040] | -0.339*** [0.075] |
| | -0.070*** [0.004] | -0.041*** [0.004] | -0.042*** [0.004] | -0.049*** [0.004] | -0.042*** [0.006] |
| | -0.011 [0.024] | 0.030* [0.017] | 0.030* [0.017] | 0.022 [0.017] | 0.030** [0.014] |
| | 0.452*** [0.071] | 0.259** [0.122] | 0.259** [0.122] | 0.414*** [0.091] | 0.259 [0.231] |
| | 0.004** [0.001] | 0.002** [0.001] | 0.002** [0.001] | 0.002** [0.001] | 0.002* [0.001] |
| | 0.864*** [0.106] | 1.413*** [0.279] | 1.290*** [0.278] | 0.957*** [0.149] | 1.290*** [0.450] |
| F-test | 72.31*** | 18.90*** | 30.53*** | | 14.39*** |
| R-squared | 0.4101 | 0.8775 | 0.2862 | 0.2797 | 0.2862 |
| Modified Wald test (χ^2) | | | 3.1e+31*** | | |
| Wooldridge test (F) | | | 0.883 | | |
| Wald $\chi^2(9)$ | | | | 322.98*** | |
| Hausman $\chi^2(7)$ | | | | 317.22*** | |

Note: *, **, *** Significant at 10%, 5% and 1% level, respectively. Standard errors in parenthesis.

Source: Own preparation.

The most relevant between all models used is the last one, the corrected regression. In this equation, business risk has a direct impact on debt but it is not significant for either period considered. Interest rate carries a significant direct impact on debt before the crisis started. In the second sub-period, Romanian companies became more reluctant to borrow under the condition of high interest rates.

Table 8b

Regressions Results for Total Debt Ratio (Post-Crisis Period)

| Independent Variable | OLS | LSDV | Cross section FE | RE | Corrected FE |
|----------------------|-----------|-----------|------------------|-----------|--------------|
| | -0.459*** | -0.466*** | -0.466*** | -0.440*** | -0.466*** |
| | [0.049] | [0.056] | [0.056] | [0.050] | [0.130] |
| | 0.009 | -0.055** | -0.055** | -0.018 | -0.055* |
| | [0.012] | [0.023] | [0.023] | [0.016] | [0.029] |
| | -1.048*** | -0.365*** | -0.365*** | -0.464*** | -0.365*** |
| | [0.093] | [0.058] | [0.058] | [0.058] | [0.138] |
| | | -0.039*** | -0.039*** | -0.046*** | -0.039*** |
| liquid | -0.068*** | [0.004] | [0.004] | [0.003] | [0.006] |

| Independent Variable | OLS | LSDV | Cross section FE | RE | Corrected FE |
|---------------------------------|---------------------|---------------------|---------------------|---------------------|----------------------|
| | 0.007 [0.006] | -0.007** [0.003] | -0.007** [0.003] | -0.005 [0.003] | -0.007*** [0.001] |
| | 0.502*** [0.119] | 0.909*** [0.288] | 0.909*** [0.288] | 0.794*** [0.171] | 0.909 [0.736] |
| | -0.006 [0.006] | -0.004 [0.003] | -0.004 [0.003] | -0.006* [0.003] | -0.004 [0.003] |
| cons | 0.772 [0.118] | 2.024*** [0.199] | 1.136*** [0.183] | 0.894*** [0.137] | 1.135*** [0.272] |
| F-test | 85.43*** | 30.63*** | 28.05*** | | 11.82*** |
| R-squared | 0.4417 | 0.9169 | 0.2592 | 0.2509 | 0.2592 |
| Modified Wald test (χ^2) | | | 9.4e+31*** | | |
| Wooldridge test (F) | | | 56.844*** | | |
| Wald $\chi^2(9)$ | | | | 317.72*** | |
| Hausman $\chi^2(7)$ | | | | 67.54*** | |

Note: *, **, *** Significant at 10%, 5% and 1% level, respectively. Standard errors in parenthesis.

Source: Own preparation.

Long-Term Debt

The results for the long-term debt regressions are included in Table 9. Results indicate some significance from tangibility, profitability, liquidity and business risk, but not for all the static models considered.

Table 9a

Regressions Results for Long-Term Debt Ratio (Pre-Crisis Period)

| Independent Variable | OLS | LSDV | Cross section FE | RE | Corrected FE |
|----------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | -0.014 [0.029] | 0.086* [0.044] | 0.086* [0.044] | 0.032 [0.033] | 0.086 [0.061] |
| tang | 0.008 [0.007] | 0.032 [0.028] | 0.033 [0.028] | 0.010 [0.010] | 0.033 [0.054] |
| size | -0.067** [0.034] | 0.070** [0.031] | 0.070** [0.031] | 0.027 [0.029] | 0.070 [0.066] |
| | -0.002 [0.002] | 0.006* [0.003] | 0.006* [0.003] | -0.002 [0.002] | 0.006 [0.004] |
| | -0.009 [0.014] | 0.009 [0.013] | 0.009 [0.013] | 0.003 [0.012] | 0.009 [0.007] |
| | 0.137*** [0.041] | 0.256*** [0.093] | 0.256*** [0.093] | 0.176*** [0.054] | 0.256 [0.165] |
| | -0.00005 [0.001] | -0.0001 [0.0007] | -0.0001 [0.0007] | -0.0003 [0.0007] | -0.0001 [0.0009] |
| | 0.019 [0.061] | -0.264 [0.213] | -0.242 [0.212] | -0.031 [0.081] | -0.242 [0.405] |
| | 2.57** | 4.85*** | 3.11*** | | 0.67 |

prof

liquid

taxratio

busrisk

intrate

cons

F-test

| Independent Variable | OLS | LSDV | Cross section FE | RE | Corrected FE |
|---------------------------------|--------|--------|------------------|----------|--------------|
| R-squared | 0.0240 | 0.6462 | 0.0390 | 0.0342 | 0.0390 |
| Modified Wald test (χ^2) | | | 5.6e+07 | | |
| Wooldridge test (F) | | | 10.785*** | | |
| Wald χ^2 (9) | | | | 14.28** | |
| Hausman χ^2 (7) | | | | 35.45*** | |

Note: *, **, *** Significant at 10%, 5% and 1% level, respectively. Standard errors in parenthesis.

Source: Own preparation.

Table 9b

Regressions Results for Long-Term Debt Ratio (Post-Crisis Period)

| Independent Variable | OLS | LSDV | Cross section FE | RE | Corrected FE |
|------------------------|----------|-----------|------------------|---------|--------------|
| | 0.133*** | -0.019 | -0.019 | 0.050 | -0.019 |
| tan α | [0.034] | [0.051] | [0.051] | [0.189] | [0.090] |
| | -0.009 | -0.024 | -0.024 | -0.010 | -0.024 |
| size | [0.009] | [0.022] | [0.022] | [0.012] | [0.030] |
| | -0.084 | -0.142*** | -0.142*** | -0.071 | -0.142** |
| prof | [0.065] | [0.055] | [0.055] | [0.047] | [0.062] |
| | -0.005 | 0.007** | 0.008** | 0.004 | 0.008** |
| liquid | [0.003] | [0.003] | [0.003] | [0.003] | [0.003] |
| | -0.003 | -0.001 | -0.001 | -0.0005 | -0.001 |
| taxratio | [0.004] | [0.002] | [0.002] | [0.002] | [0.001] |
| | 0.191** | -0.981*** | -0.981*** | -0.049 | -0.981** |
| busrisk | [0.093] | [0.305] | [0.305] | [0.118] | [0.414] |
| | -0.003 | 0.0007 | 0.0007 | -0.0008 | -0.0007 |
| intrate | [0.004] | [0.002] | [0.002] | [0.002] | [0.003] |
| | 0.113 | 0.341* | 0.363** | 0.142 | 0.363 |
| Cons | [0.087] | [0.189] | [0.180] | [0.101] | [0.246] |
| F-test | 5.35*** | 10.73*** | 2.72** | | 1.55 |
| R-squared Modified | 0.0597 | 0.8419 | 0.0456 | 0.0121 | 0.0456 |
| Wald test (χ^2) | | | 5.1e+34*** | | |
| Wooldridge test (F) | | | 27.961*** | | |
| Wald χ^2 (9) | | | | 18.15** | |
| Hausman χ^2 (7) | | | | | |

Note: *, **, *** Significant at 10%, 5% and 1% level, respectively. Standard errors in parenthesis.

Source: Own preparation.

Before the crisis fixed effect model indicates that manufacturing companies use more long-term debt when they have a higher proportion of fixed assets, and also when they face higher risks in their business. After 2007, risky firms started to avoid raising more debt because they wanted to limit their bankruptcy exposure. During the first period, profitable and liquid companies used a larger amount of borrowed funds. After the crisis began, firms were more profitable when avoiding accessing debt. Nevertheless, the results were significant only in a few regression models.

Some of the variables coefficients change their sign from one test to another, indicating that there inconsistent results. Moreover, none of the variables were found significant in the final corrected model; the F-test is very low and not significant, indicating that the model considered is not adequate to explain the variation of debt with long maturities.

Short-Term Debt

Table 10 refers to the sub-sample analysis of short-term liabilities. Regardless of the financial crisis starting point, short-term liabilities react similarly to total debt, being indirectly influenced by tangibility, profitability and liquidity. Therefore firms use less debt with short maturities when they register profits and dispose of a large amount of liquidities.

Table 10a

Regressions Results for Short-Term Debt Ratio (Pre-Crisis Period)

| Independent Variable | OLS | LSDV | Cross section FE | RE | Corrected FE |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| tang | -0.540*** [0.041] | -0.645*** [0.064] | -0.645*** [0.006] | -0.581*** [0.049] | -0.645*** [0.110] |
| size | -0.016 [0.010] | -0.099** [0.040] | -0.989** [0.040] | -0.028* [0.015] | -0.099 [0.097] |
| prof | -0.579*** [0.049] | -0.411*** [0.044] | -0.411*** [0.044] | -0.475*** [0.042] | -0.411*** [0.122] |
| liquid | -0.068*** [0.003] | -0.048*** [0.005] | -0.048*** [0.005] | -0.058*** [0.004] | -0.048*** [0.008] |
| taxratio | -0.0005 [0.020] | 0.022 [0.018] | 0.022 [0.018] | 0.012 [0.018] | 0.022 [0.016] |
| busrisk | 0.322*** [0.058] | -0.018 [0.133] | 0.018 [0.133] | 0.282*** [0.079] | 0.018 [0.318] |
| intrate | 0.004*** [0.0144] | 0.002** [0.001] | 0.002** [0.001] | 0.003*** [0.001] | 0.002** [0.001] |
| cons | 0.859*** [0.086] | 1.659*** [0.304] | 1.511*** [0.302] | 0.955*** [0.121] | 1.512** [0.733] |
| F-test | 95.33*** | 11.14*** | 35.78*** | | 11.84*** |

| | | |
|---------------------------------|------------|----------|
| Modified Wald test (χ^2) | 6.8e+29*** | |
| Wooldridge test (F) | | |
| Wald χ^2 (2) | 4.339** | |
| Hausman χ^2 (7) | | 60.54*** |

Note: *, **, *** Significant at 10%, 5% and 1% level, respectively. Standard errors in parenthesis.
Source: Own preparation.

Since 2008 the tax ratio proved its indirect influence on current borrowings, while business risk carries a positive impact. Short-term debt is the easiest to access, and it does not imply financial risk growth, and thus it is a viable option for companies in financial distress, especially during recessions. Interest rate proved its positive influence before 2008, when the higher the interest rates were, the more short-term debt the companies would use. In unstable economies, where interest rates are floating, short-term borrowings are the proper way to obtain borrowed funds, as they are limited and more easily repayable. After the crisis started, Romanian manufacturing firms limited their access to short-term debt when the interest rates were high.

Table 10b

Regressions Results for Short-Term Debt Ratio (Post-Crisis Period)

| Independent Variable | OLS | LSDV | Cross section | RE | Corrected |
|----------------------|-----------|-----------|---------------|-----------|-----------|
| | -0.564*** | -0.421*** | -0.421*** | -0.442*** | -0.421*** |
| | [0.044] | [0.053] | [0.053] | [0.046] | [0.126] |
| tang | 0.014 | -0.036 | -0.036 | -0.006 | -0.036 |
| | [0.011] | [0.021] | [0.021] | [0.015] | [0.025] |
| size | -1.015*** | -0.312*** | -0.312*** | -0.433*** | -0.312** |
| | [0.084] | [0.055] | [0.055] | [0.055] | [0.133] |
| prof | -0.059*** | -0.039*** | -0.039** | -0.044*** | -0.039*** |
| | [0.003] | [0.003] | [0.003]* | [0.003] | [0.005] |
| liquid | 0.0079 | -0.007** | -0.007** | -0.005 | -0.007*** |
| | [0.006] | [0.003] | [0.003] | [0.003] | [0.001] |
| taxratio | 0.456*** | 1.204*** | 1.204*** | 0.839*** | 1.204* |
| | [0.108] | [0.276] | [0.276] | [0.156] | [0.712] |
| busrisk | -0.011* | -0.008*** | -0.008*** | -0.009*** | -0.008** |
| | [0.005] | [0.003] | [0.003] | [0.003] | [0.003] |
| intrate | 0.742*** | 1.819*** | 0.892*** | 0.744*** | 0.892*** |
| | [0.107] | [0.190] | [0.174] | [0.126] | [0.238] |
| cons | 96.81*** | 29.21*** | 31.25*** | | 13.60*** |
| | 0.4633 | 0.8800 | 0.2756 | 0.2674 | 0.2756 |
| | | | 7.3e+31*** | | |
| F-test | | | 40.236*** | | |
| R-squared | | | | 360.94*** | |
| | | | | 72.74*** | |
| Modified Wald test | | | | | |

(chi2) Wooldridge
test (F) Wald
chi2(9)

Hausman chi2(7)

*Note: *, **, *** Significant at 10%, 5% and 1% level, respectively. Standard errors in parenthesis.
Source: Own preparation.*

Consistent Relationships Before and After the Crisis

Consistent to overall sample, results for both sub-periods indicate that fixed assets have an indirect impact on total debt and short-term debt. The expected direct impact on long-term debt is not statistically significant, and thus it can only be said that whenever manufacturing companies own a low proportion of tangible assets, they tend to use more borrowings over

short periods of time, because the lack of collateral makes borrowings with long maturities very hard to obtain.

The size variable was not relevant in all the static models used. However, considering the statistically significant coefficient from the total debt model, period 2008-2012, results show that companies with large turnovers use less debt and focus on their internal funds.

Profitability and liquidity maintain their indirect influence on debt ratios regardless the sub-period considered. But during the recession liquidity is no longer a significant variable in determining leverage variation. In conclusion, profitable companies operating in manufacturing industry and earning high current assets use limited borrowings.

Tax ratio proved to be significant for total and short-term debt. Before 2007 firms used more borrowed funds when the taxes were high. On the contrary, since the crisis began, Romanian companies tried to limit their use of debt during times of high taxation policy. High taxes owed could be reduced through the deductibility of interest expenses. The negative tax-debt relationship rejects the trade-off theory, indicating that firms do not borrow funds in order to reduce their taxes. Nevertheless, another way of saving tax is through depreciation, and referring to the relationships between fixed assets and debt ratios, this method is more probable to be used by analyzed firms.

Results for business risk indicate a direct impact: companies facing business risk to a greater extent use more borrowings. This is not the best solution as long as high business risk should be related to low financial risk, but Romanian companies request more debt when they are in financial distress. Although it was not found statistically significant in the final corrected model, during the crisis risky companies avoid raising debt with long maturities, preferring short-term debt to finance their operations.

In the pre-crisis sample interest rate indicates a positive influence on debt. The outcome revealed that the higher the interest rates, the more debt, especially short-term debt the companies use. The preference for borrowings with short maturities or those offered overnight is expected, and in a way connected to business risk-debt relationship: as long as high interest rates induce higher financial risk, the best choice the firms have is to restrain their borrowings over short periods in order to avoid facing high risks over long time. After the crisis, companies tried to avoid accessing debt during times of high interest rates in order to avoid increasing their risks.

5. Conclusions

The comparative analysis indicated that fixed effects should be used for analyzing the Romanian manufacturing companies. This means that every firm included in the sample has characteristics that influence the relationships between the variables. In addition, there is a consistency in the

relationships revealing determinants of total debt and short-term debt because manufacturing companies have a preference for borrowings with short maturities. This was also observed in other studies focusing on Romanian listed companies (Dragota et al., 2008).

Romanian companies follow the pecking-order theory, choosing to reinvest their internal funds if they register profits and they do not face liquidity problems. When their funds are insufficient, manufacturing companies access short-term debt, and long-term debt as a last resort.

The role of fixed assets in accessing debt confirms previous findings regarding Romanian companies (Dragota et al., 2008): firms with a reduced value of tangible assets use more short-term debt. This option either means that manufacturing companies use short-term debt, as the lack of security pledge makes impossible the borrowing over long periods, or that firms try to increase external control from lenders. Romanian companies prefer short-term debt because it is easier to access it, and it does not increase the risks over a long period of time. This idea is confirmed by the direct influence business risk has on total and short-term debt ratios. This is not the normal case of handling risk, because a greater extent of business risk should imply low financial risk, hence limited use of debt. However, Romanian companies in financial difficulties need supplementary funds for their operations, but they can hardly access equity through financial markets; as a consequence, they are constrained to raise more debt. These firms access borrowings with short maturities because managers try to limit the financial risk implied by the large amounts of debt.

During the pre-crisis period firms preferred short-term borrowings when the level of interest rates was high. When borrowings are expensive, manufacturing companies avoid long-term debt, preferring loans with maturities up to one year. Although in the Romanian unstable economy the risks implied are higher, this may be the ultimate solution for companies in financial constraints. Since the crisis emerged, companies tried to avoid all types of borrowings whenever the interest rates increased.

For the pre-crisis period, tax variable shows a positive influence on total and short-term debt ratios. This means that Romanian firms try to obtain some tax savings through borrowings,

following the trade-off theory. Since the crisis began, results are opposite: companies tend to limit their use of debt during times of high fiscal pressure. This does not necessarily reject the trade-off theory because another way of saving taxes and increasing profits is through depreciation; considering that companies performing with limited loans usually own a larger proportion of tangible assets, they can use depreciation expenses in order to obtain tax savings.

The findings of this study are consistent to previous studies focused on emerging markets (Nivorozhkin, 2005; Mitton, 2007). The Romanian economy is unstable and the financial market cannot provide sufficient funds. Therefore, it is difficult for Romanian companies to raise funds through equity and accessing borrowings is most of the time the only solution. As a consequence, financing decisions in Romanian firms may not be considered the most prudent.

These results are more reliable than previous ones in the capital structure literature focused on Romanian companies, because the sample analyzed is very large (196 companies over a ten year period) and it refers to one industry only. Moreover, this study is offering information regarding some of the changes the financial crisis brought to financing decisions. The main limitation of this study relates to long-term debt models. Due to a large proportion of missing data in this variable, the model failed to identify the most relevant determinants of long-term debt. Future research should establish a new model for this debt ratio and consider extending the linear model presented in this study to dynamic models for more accurate results.

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