VERİMLİLİK DERGİSİ
JOURNAL OF PRODUCTIVITY

The Effect of Capital Structure on Profitability: Evidence from the Turkish Manufacturing Companies

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ABSTRACT

Purpose: This study analyses the relationship between capital structure and profitability levels of manufacturing industry companies operating in Türkiye between the years 2006-2020.

Methodology: The relationship between capital structure and the profitability of Turkish manufacturing industry companies was analyzed using the standard error estimator proposed by Driscoll and Kraay (1998). In this context, sub-panel data models were created.

Findings: The findings showed that capital structure changes (short-term debt, long-term debt, and total debt) in the manufacturing industry are negatively related to both return on assets and return on equity.

Originality: It is thought that this study will contribute to the existing literature in terms of better understanding the relationship between the changes in the capital structure decisions of the manufacturing industry companies operating in Türkiye, both their return on assets and their return on equity, taking into account their sub-sectors.

Keywords: Profitability, Return on Assets, Return on Equity, Capital Structure, Debt, Manufacturing Industry, Driscoll-Kraay Panel Data Model.

JEL Codes: G32, L6, O14.

Sermaye Yapısının Kârlılığa Etkisi: Türkiye İmalat Sanayi Şirketlerinden Kanıtlar

ÖZET

Amaç: Bu çalışma, Türkiye'de faaliyette bulunan imalat sanayi şirketlerinin, 2006-2020 yılları arasında, sermaye yapıları ile karlılık düzeyleri arasındaki ilişkiyi analiz etmektedir.

***Yöntem*:** Türkiye imalat sanayi şirketlerinin sermaye yapıları ile karlılıkları arasındaki ilişki, Driscoll ve Kraay (1998) tarafından önerilen standart hatalar tahmincisi kullanılarak analiz edilmiştir. Bu kapsamda alt panel veri modelleri oluşturulmuştur.

Bulgular: Bulgular, imalat sanayi sektöründe sermaye yapısı değişikliklerinin (kısa vadeli borçlar, uzun vadeli borçlar ve toplam borçlar) hem aktif karlılığı, hem de özkaynak karlılığı ile negatif ilişkili olduğunu göstermiştir.

Özgünlük: Türkiye'de faaliyette bulunan imalat sanayi şirketlerinin, alt sektörleri de dikkate alınarak, sermaye yapısı kararlarındaki değişimlerin gerek aktif karlılıkları gerekse özkaynak karlılıkları ile ilişkisinin daha iyi anlaşılması açısından bu çalışmanın mevcut literatüre katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler*:* Kârlılık, Aktif Getirisi, Özkaynak Getirisi, Sermaye Yapısı, Borç, İmalat Sanayi, Driscoll-Kraay Panel Veri Modeli.

JEL Kodları: G32, L6, O14.

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DOI: 10.51551/verimlilik.1295705
Research Article | Submitted: 11.05.2023 | Accepted: 29.11.2023
Cite: Özdemir, B., Özel, Ö. (2024). "The Effect of Capital Structure on Profitability: Evidence from the Turkish Manufacturing Companies", *Verimlilik Dergisi,* 58(1), 45-60.

1. INTRODUCTION

Efficiency refers to the methods that positively affect the results of operations in a company that produces goods or services by using the factors of production. In detail, it describes positive situations that are revealed by measuring and rationing the economic results, rather than just about increasing production or being suitable for productivity (İleri, 1999). Debt financing is also a component of production. The efficiency of debt financing can only be recognised provided that it reflects positively on business income or expenses, thus increasing the profitability of the company. In other words, a financial manager should consider loan features such as maturity, cost, etc. in debt financing. The decisions made taking these factors into account can positively or negatively affect the profitability of the company.

Financial management has three basic functions: financing decision, investment decision, and dividend decision. Within these, the financing decision or function requires a finance manager to decide on an appropriate mix of alternative sources of financing. To this end, a finance manager identifies all available sources of finance and evaluates them based on various quantitative and qualitative variables. He then chooses the ones that best suit the needs of the company. When we look at the lower-level decisions of the Financing Decision, three basic decisions or functions can be mentioned: Determining the Capital Structure, that is, the ratio of various resources in the total capital of the company. Determination of the Cost of Capital, i.e. calculating the cost and total cost of each resource as a weighted average Cost of Capital. Leverage analysis, i.e. analyzing the financial risk associated with a particular financing plan, providing profitability to shareholders in terms of earnings, and choosing plans accordingly (Sana et al., 2017: 25)

Capital structure is an important part of financial decisions that affect the value of the firm, leading to changes in the EBIT and market value of shares. There is a relationship between the capital structure, the cost of capital, and the value of the firm. The purpose of an effective capital structure is to maximize the value of the firm and reduce the cost of capital. There are two main theories that explain the relationship between capital structure, cost of capital and firm value: the traditional approach and the modern approach. On the basis of these two concepts, which will be explained in the following section, they argue that different capital structures are more suitable for firms (Paramasivan and Subramanian, 2009: 50). The most basic resources that companies can use to finance their assets are internal financing resources, expressed as equity, and external financing resources, expressed as debt. Companies generally use a mix of internal and external sources of finance, or a mix of equity and debt (Nassar, 2016). All choices made by companies among financing options, also referred to as capital structure decisions, can have negative as well as positive effects on the income and profits of the companies. The increase in company revenues and profits can also contribute positively to company value. Companies' financing decisions involve establishing the appropriate mix of resources. The composition of these resources is formed by taking into account parameters such as favorable maturity conditions, appropriate interest cost and additional costs. When the internal resources obtained as a result of the activities of the companies are excluded, it is understood that the financing decisions are a preference between debt and equity. Capital structure choices should serve the purpose of minimizing the cost of capital, which also helps to maximize company value.

Despite numerous theories developed to explain the capital structure of firms, scholars have yet to find a single optimal capital structure model. The lack of consensus on the relationship between capital structure and performance still drives practitioners to prioritize this area of financial management. This study examines the effect of capital structure of manufacturing companies on the performance in Türkiye. To be more specific, the purpose of this study is to measure the effect of increasing or decreasing the weight of the debt financing option of manufacturing companies, as well as the impact of maturity structure on their return on assets and return on equity. Based on the data in the balance sheets of Turkish manufacturing industry companies, empirical research has been conducted to examine and reveal the relationship between the company's leverage ratios and performance. To act within this framework, first of all, 15 years (2006-2020) data from 22 subsectors in the Turkish Manufacturing Industry were obtained from online databases and made suitable for analysis.[3] In the next step, the panel data methodology was applied and the results obtained were compared with theoretical expectations and similar studies in the literature. In regression analysis, two main profitability indicators, return on assets (ROA) and return on equity (ROE) were used as dependent variables. As for independent variables, it is used as the ratio of short-term debt

[3] In this study, Entrepreneur Information System (GBS) data of the Ministry of Industry and Technology of the Republic of Türkiye were used. Entrepreneur Information System (EIS, 2023) refers to the information system created based on Article 388/B of the Presidential Decree on Presidential Organization No. 1 dated 10/7/2018. For the data obtained within the scope of the analysis, publicly available data at www.gbs.sanayi.gov.tr was used. However, proportional calculations were made to make the data suitable for analysis.

to total debt, the ratio of short-term debt to total debt, and the ratio of total debt to total assets. Additionally, total asset size, net sales, and the size of R&D expenditures were also included as control variables.

This study differs from other studies in the following aspects. Firstly, it focuses solely on the impact of the capital structure on the performance of manufacturing subsectors in Türkiye. Secondly, in terms of the data used, it includes not only publicly traded companies but also encompasses the entire manufacturing sector. Thirdly, it involves research and development (R&D) capacity into the set of control variables. Finally, to measure the related relationship, panel data methodology has been applied. It is thought that this study will be beneficial for the managers of the manufacturing industry companies to decide on the right combination of equity and debt in order to maximize the value of the company while evaluating the financial options, and will contribute to the sectoral capital structure studies, too.

Following the introduction part of this study, the theoretical framework and literature research on capital structure decisions are included. In the following stage, information about the methodology of the study was given and the research findings were explained. In the last part of the research study, a general summary and evaluations of the study are presented.

2. SCOPE of CAPITAL STRUCTURE and LITERATURE REVIEW

Firms' financing decisions involve financial risk. Financial risk occurs when debt is used as a financial resource. Debt repayments are payments that include principal and interest on the debt and are not dependent on the profitability or loss of the company. Furthermore, when the debt financing option costs less than the cost of equity, the increase in the level of borrowing of companies can positively affect their profitability due to the lower cost of resources. Thanks to tax advantages, increases in debt level can increase firm profits and hence, earnings of the firm's shareholders. However, increases in debt level may increase financial risk. In this case, it can be assumed that a firm without debt will not encounter financial risk. In this sense, financial risk is an avoidable risk. Yet, without debt financing, it may not be possible to increase the shareholder's return as equity financing does not have the tax advantage (Sana et al., 2017: 167). For companies operating in the related market, the financial resource is essential for the fixed assets and working capital they need. Companies obtain the necessary financing from three main sources: excess cash resulting from operating activities, new capital, borrowing from banks, and non-bank sources (Coyle, 2006).

Company strategic planning is one of the important tools to achieve the goal of maximising shareholder value. The strategic plan includes all the financing and investment decisions, as well as the company's sales forecasts For businesses, financial planning is a plan regarding which financial instruments and with what maturity the business assets should be financed, and is also an issue providing the right working capital. Under normal circumstances, the capital structure of any company is basically a combination of three kinds of sources or the result of the changes in the usage weights of these three sources. These are debt, equity created internally as a result of company activities, and the supply of new equity. Debt financing imposes interest and principal obligations on companies. Failure to pay or possible delays may cause creditors to take legal action. If the company's activities are carried out with the equity financing method, there will be expectations such as cash dividends and an increase in the value of the stock shares (Fabozzi and Drake, 2009).

The capital structure, in essence, expresses the distribution of alternative financing resources among all resources of the firm, but it can be said that this structure is also represented by equity and debt ratios. Both types of resources have their advantages and disadvantages. Although debt involves a higher risk, it is a significantly cheaper type of resource than equity. Any firm manager must make a capital structure decision that will maximize the firm value and minimize risk. For this, the optimum capital structure combination should be created (Sana et al., 2017: 32).

Having the appropriate capital structure can positively affect the profitability and share value of any firm. Firms can increase their borrowing opportunities until the weighted marginal cost of capital calculated for their investment equals the marginal return calculated for the last unit of capital. After this point, the marginal cost of the resource provided will exceed the marginal return, and therefore the return on investment will decrease, the company's revenues may be adversely affected, and in this case, the company's profitability and share value may be adversely affected. From this point of view, it would not be a mistake to state that maximizing firm value is directly related to the firm's cost of capital (Eun and Resnick, 2018: 432).

There is no single optimum capital structure ratio that applies to every company. Different combinations of assets require different combinations of resources. As capital structure decisions are closely related to company value. It is one of the most critical challenges for a company's finance manager. The appropriate capital structure contributes to the company in producing the optimal output with the most suitable resource

at the lowest cost, thus maximising its profitability. Furthermore, an increase (or decrease) in profit before interest and tax leads to an increase (or decrease) in the market value of the company's shares

The transformation of efficient use of resources into more output indicates efficiency. In other words, the efficient use of provided resources reflects on the amount of output produced and profitability. These sources include equity or debt financing alternatives. The main purpose of an effective capital structure is to maximize the value of the company with the resources obtained and to reduce the cost of capital.

One of the most basic theories for determining the relationship between capital structure, cost of capital, and company value is the traditional approach, and the other is the modern approach. According to theorists who adopt the traditional approach, companies can increase the value of the company up to an optimum level of debt, and borrowing up to this optimum level of debt affects the company positively. However, exceeding the optimum level negatively impacts the company value and starts to negatively affect the company value. Thus, borrowing up to a certain debt level may be a demandable situation for companies, but after this level, it has negative consequences. Modern approaches, on the other hand, consist of three sub-sections. These approaches are "Net Income Approach, Net Operating Income Approach, and Modigliani-Miller Approach". According to the net income approach, companies can increase their value by borrowing. According to this approach proposed by Durand (1952), companies should borrow more and take advantage of debt financing to increase their value. However, there are some problems with the assumptions of the net income approach. Namely, this approach assumes that there is no corporate tax and that borrowing costs are lower than equity financing. Additionally, it is argued that the use of debt will not change the perception of risk in the market regarding the company. The validity of these approaches in real life is questionable. The approach, which is defined as the net operating income approach, argues that, unlike the previous approach, the company value is independent of the capital structure and the company value will not be affected by this decision. It is possible to state that the traditional approach adopts a combination of the net income approach and the net operating income approach (Paramasivan and Subramanian, 2009: 51-55).

Modigliani and Miller (1958) put forward an approach claiming that companies' capital structure decisions are unrelated to company value. The researchers argue that capital structure decisions have nothing to do with company value, ignoring any tax expenses and the costs of financial distress due to the increased probability of bankruptcy. However, if taxes are included in the analysis for capital structure decisions, it is highly likely that these decisions will become associated with company value. Because the tax deduction of the interest paid turns the interest into a tax shield and encourages the use of debt. In addition to taxes, the costs associated with financial distress can reduce the benefits of debt in changes in capital structure. Therefore, the value of the company can be affected by financial distress costs. As a result, the way we finance the company's assets can impact on the company's value and therefore its equity (Fabozzi and Drake, 2009: 405).

Also, some modern approaches have been developed in this research field. According to the information asymmetry theory developed by Myers and Majluf (1984), one of these approaches is if the investors who are not currently in the management of the company buy shares as partners instead of lending to the company, they discount the shares they will receive with a higher earnings ratio, and the company managers create new solutions to avoid the financing hierarchy. They claim to delay their joint purchases as much as possible. The theory, which is another modern approach, is a theory that should be evaluated within the scope of information asymmetry theory. According to the finance hierarchy theory of Myers (1984), companies should exercise options in their use of financing options, starting with retained earnings, and finally issuing new shares or hiring new partners. For this reason, financing opportunities should first be provided with internal resources and then with external resources, and the option of acquiring new partners should be considered as the last alternative/option. According to the market timing theory, another modern approach developed by Baker and Wurgler (2002), there is a tendency for company management to sell company shares when they are overvalued relative to their book values and past market prices, and to buy their own shares from the market when they become worthless. It reveals that the capital structures of companies are affected by the prices of stocks on the market. Another modern approach is the Barter theory, developed by Frank and Goyal (2008: 135), where choice of capital structure can have both beneficial and detrimental aspects to companies. The point where the cost of the last debt unit is equal to the benefit of the last unit may be the most appropriate level (Sayılgan, 2017: 342-344).

Today and in recent years, it has been possible to come across many studies on the effect of capital structure decisions on profitability. It should not be overlooked that different results were obtained in these studies. These differences may be due to the fact that different sectors or different periods were investigated in these studies, or there may be other reasons. In other words, there is different empirical evidence rather than a definitive finding that high debt ratios will lead to high profitability.

There exist many studies that have found a positive relationship between high borrowing rates and profitability. One of these studies is that of González and González (2012). In this study, taxes and bankruptcy costs (or financial distress costs) are shown as justification to detect a positive relationship.

Azhagaiah and Gavoury (2011) examined companies operating in the information technology sector in India. Their research states that the increase in debt ratios of these companies had significant effects on their profitability. Despite researchers concludes that these effects are negative, Gill et al. (2011) determines a positive relationship between borrowing and return on equity (for both sectors) as a result of their study on the service and manufacturing sectors in the USA.

On the other hand, there are many studies that reveal negative relationships between debt ratios and profitability in the literature. The studies by Yat Hung et al. (2002), Shubita and Alsawalhah (2012), and Çöllü (2021) can be given as examples. Yat Hung et al. (2002) examined Hong Kong construction and development companies and concluded the negative association between profitability and capital structure due to increased bankruptcy risk. Likewise, Shubita and Alsawalhah analysed Jordanian manufacturing industry firms for a period of 2004-2009 and found negatively association between debt and profitability. He explains this result with increasing credit default risk and corporate illiquidity.The paper by Çöllü results in negative relationship between debt ratios and profit, after analyzing data from 17 sectors for the years 2010-2019 in Türkiye. The study by Revathy and Santhi (2016) reveals that the increase in the debt equity ratio of the manufacturing sector in India adversely affects the profits of this sector. In the study of Herciu and Ogrean (2017), a very strong and positive relationship was found between ROE and debt-equity in the technology, health and telecommunications sectors, while it was concluded that the relationship was positive but not very strong in the energy and motor vehicles and spare parts sectors. Studies on the Turkish manufacturing industry have also been carefully examined.

In the study conducted by Avcı (2016) on the effect of capital structures of manufacturing companies traded on Borsa Istanbul in the 2003-2015 period, it was determined that both short-term debt and long-term debt have a negative and statistically significant effect on return on assets and return on equity. On the other hand, İskenderoğlu et al. (2012) found that increases in deposit(debt)/equity ratio in the Turkish banking sector have a negative effect on return on assets and return on equity. Similarly, Eriotis et al. (2002) concluded that the debt/equity ratio has a negative effect on the profitability of the firms, thus, the firms that prefer to finance their investments with equity capital are more profitable than those that finance their investments by borrowing.

Rouf (2015) revealed that the debt ratio and debt/equity ratio of non-financial companies traded on the Dhaka Stock Exchange (DSE) for the period 2008-2011 are negatively related to the return on assets (ROA). It is possible to find different results in the study by Abor (2005). In this study, a positive relationship was found between return on equity and the ratio of short-term debts to total assets, while negative correlations were found with the ratio of long-term debts to total assets. Other remark of the aforementioned study is the positive relationship between total debt ratios and return on equity. Similar to this study, De Mesquita and Lara (2003) found that return on equity (ROE) was positively correlated with short-term debt ratios, in addition, they concluded that long-term debt ratios and return on equity were negatively related.

This research provides evidence about the capital structure alternatives by using data from the Turkish manufacturing industry. Different ways in which the capital structure is managed can have a significant impact on the profitability of firms. The academic literature includes a number of studies that attempt to identify and quantify the effects of capital structure decisions on profitability. The results obtained in these researches conducted on a national and international scale are remarkable. However, in this study, a broad perspective research was carried out by taking into account all sub-sectors of the manufacturing industry sector, which was not encountered in other studies. In addition, in this study, which includes a wide period of 15 years, the dependent variable was also differentiated and an analysis was carried out not only on the return on assets but also on the return on equity. In this sense, efforts have been made to be as inclusive as possible.

3. METHODOLOGY

As this research aims to contribute to one of the significant research fields, that is, the relationship between capital structure and performance with reference to the Turkish manufacturing sector, applied econometric analysis is discussed, as well as data used. This section also includes the dependent and independent variables used in the panel data regression analysis to capture the relationship between capital structure and performance in the Turkish manufacturing sector.

3.1. Data

As the objective of the article is to evaluate the relationship between capital structure and performance in the Turkish manufacturing sector, the Panel Data (yearly) was collected from the Entrepreneur Information

System (EIS, 2023), a databank that releases consolidated balance sheets of all entrepreneurs in Türkiye, for the period from 2006 to 2020 (15 years). Using 22 manufacturing sub-sector consolidated balance sheet data, 330 observation numbers are provided in total. All analyses were carried out using Stata 14.2.

Within the scope of this research, the Turkish manufacturing industry sub-sectors have been examined. The content of Turkish manufacturing industry sub-sectors is shown in Table 1 in detail. The average number of companies operating in these sub-sectors during the research period is given in Table A1 in Appendix 1.

Table 1. The subsectors of the manufacturing industry in Türkiye

No	*Subsector Name (Manufacture of…)*
1	Food Products
2	Beverages
3	Textiles
4	Wearing Apparel
5	Leather and Related Products
6	Wood and of Products of Wood and Cork, Except Furniture; Articles of Straw and Plaiting Materials
7	Paper and Paper Products
8	Printing and Reproduction of Recorded Media
9	Chemicals and Chemical Products
10	Basic Pharmaceutical Products and Pharmaceutical Preparations
11	Rubber and Plastic Products
12	Other Non-Metallic Mineral Products
13	Basic Metals
14	Fabricated Metal Products, Except Machinery and Equipment
15	Computer, Electronic and Optical Products
16	Electrical Equipment
17	Machinery and Equipment N.E.C.
18	Motor Vehicles, Trailers and Semi-Trailers
19	Other Transport Equipment
20	Furniture
21	Other Manufacturing
22	Repair and İnstallation of Machinery and Equipment

Source: www.gbs.sanayi.gov.tr

In compliance with the related literature Vătavu (2015), Nassar (2016), Chinaemerem and Anthony (2012), Salim and Yadav (2012), El-Sayed Ebaid (2009), ROA, Return on assets (net income to total assets), and ROE Return on equity (the ratio of net income to shareholders' equity) were selected as performance indicators and dependent variables. The reason for choosing these variables as performance indicators is that they are widely used variables reflecting the performance of companies in the related literature. To research a relationship between capital structure and performance, it is used short-term debt to total assets (STTA), long-term debt to total assets (LTTA), and total debt to total assets (TDTA) as independent variables. Thus, the Natural Logarithm of the firm's Assets (LNTA), Natural Logarithm of the firm's R&D expenditures (LNRD), Natural Logarithm of the firm's net sales (LNNS) were determined as control variables in our models.

Some sub-sectors, such as the manufacture of tobacco products, were excluded from the analysis due to the unavailability of some data. The data in the EIS (2023) is given as the sum of the data of the companies in that sector as of that year. For instance, the asset size data of a sector included in the research for a certain year is the sum of the asset sizes of all companies in that sector as of that year. As the related data is given in the format of the total amount, the average values of the assets, R&D, and net sales have been calculated by dividing them by the number of firms. The average value of these variables has been used in the models as control variables in order to obtain consistent models.

Table 2. Variables and abbreviations used in the research

Abbreviation	*Variable Definition*	*References*	*Data Sources*
Dependent Variables			
ROA	Net Income/ Assets	Avcı (2016), Azhagaiah and Gavoury (2011), Chinaemerem and Anthony (2012), Çöllü (2021), El-Sayed (2009), González and González (2012), Herciu and Ogrean (2017), İskenderoğlu et. al. (2012), Nassar, S., 2016, Rouf (2015), Salim and Yadav (2012), Vătavua (2015)	EIS(2023)
ROE	Net Income/ Equity	Abor (2005), Avcı (2016), Chinaemerem and Anthony (2012), Çöllü (2021), De Mesquita and Lara (2003), El-Sayed (2009), Gill et al. (2011), Herciu and Ogrean (2017), İskenderoğlu et. al. (2012), Nassar, S., 2016, Salim and Yadav (2012), Shubita and Alsawalhah (2012), Vătavua (2015)	EIS(2023)
Independent Variables			
STTA	Short-term debt/total assets.	Avcı (2016), Çöllü (2021), El-Sayed (2009), Gill et al. (2011), Salim and Yadav (2012), Shubita and Alsawalhah (2012), Vătavua (2015)	EIS(2023)
LTTA	The long-term debt/total assets.	Avcı (2016), Çöllü (2021), El-Sayed (2009), Gill et al. (2011), Salim and Yadav (2012), Shubita and Alsawalhah (2012), Vătavua (2015)	EIS(2023)
TDTA	Total debt/total assets	Azhagaiah ve Gavoury (2011), Chinaemerem and Anthony (2012), Çöllü (2021), El-Sayed (2009), Gill et al. (2011), İskenderoğlu et. al. (2012), Nassar (2016), Revathy and Santhi (2016), Rouf (2015), Salim and Yadav (2012), Shubita and Alsawalhah (2012), Vătavua (2015)	EIS(2023)
Control Variables			
LNTA	Natural Logarithm of firm's Assets	Avcı (2016), Chinaemerem and Anthony (2012), Çöllü (2021), El-Sayed (2009), Herciu and Ogrean (2017), İskenderoğlu et. al. (2012), Rouf (2015), Salim and Yadav (2012)	EIS(2023)
LNRD	Natural Logarithm of firm's R&D expenditures	Rafiq, S. et al. (2016).	EIS(2023)
LNNS	Natural Logarithm of the firm's net sales	Abor (2005), Avcı (2016), Rouf (2015), Shubita and Alsawalhah (2012)	EIS(2023)

3.2. Method and Findings

The purpose of this analysis is to determine whether there is a relationship between the capital structure of Turkish manufacturing companies and their profitability as well as to capture the direction and severity of this relationship. To this aim, based on the findings in related literature six hypotheses are put forward:

H1: There is no relationship between the Short-Term Debt Ratio and ROA.

H2: There is no relationship between the Long-Term Debt Ratio and ROA.

H3: There is no relationship between the Total Debt Ratio and ROA

H4: There is no relationship between the Short-Term Debt Ratio and ROE.

H5: There is no relationship between the Long-Term Debt Ratio and ROE.

H6: There is no relationship between the Total Debt Ratio and ROE.

The relationship between variables was estimated by applying linear model as in Equation 1.

$$Y_{i,t} = \beta_{0it} + \beta Debt_{i.t} + \delta Control_{i,t} + \varepsilon_{i,t} \quad (1)$$

In the model, Y represents return on assets (ROA) or return on equity (ROE) for each company (i) and year (t), while Debt stands for Short-Term (STTA), Long-Term (LTTA), Total Debt Ratio (TDTA) and Control

represent LNTA, LNRD and LNNS. Where $\boldsymbol{\beta_i}$ (i=1,2,3…22) constant term for every sector, t (*t*=1,2,3…16) illustrates the year $\boldsymbol{\beta's}$ are coefficients for each independent variable $\boldsymbol{\varepsilon_{i,t}}$ is the error term. In each model was one leverage ratio included to see the impact of every single debt ratio on output, and in doing so we avoided the autocorrelation.

The econometric relationship between variables was estimated using the standard error estimator proposed by Driscoll and Kraay (1998). Driscoll and Kraay (1998) claim a panel estimation model, providing autocorrelation and heteroscedasticity consistent standard errors in the case of n>t. This estimator also ensures standard errors that are robust to conventional forms of cross-sectional and temporal dependence (Hoechle, 2007).

We can see the summary statistics of the dependent and independent variables used in the models in Table 3. As one can infer from Table 3, the average ratio of ROA is about 4 %, that is, the Turkish manufacturing sector uses its assets efficiently. Considering the value of ROE, another indicator gives us information on how efficiently equity is used in firm activities, it is in alignment with ROA. The Standard deviation for ROA and ROE are calculated as 0.032 and 0.073 respectively. The higher standard deviation of ROE displays different responses among subsectors in terms of ROE. As ROA has a fewer standard deviation, similar behaviour is shown between subsectors regarding ROA. The variable TDTA is the leverage ratio that refers to what extent firms' assets are financed by debt. Considering the ratio of 62%, it can be stated that manufacturing firms in Türkiye prefer liabilities in general. In detail, with an average mean of 45 % the share of short-term debts in total resources is higher. The mean of long-term debt is just 16 %. The standard deviation of TDTA is 0.078, indicating capital structure decisions are changing among subsectors. It may be that some subsectors have limitations in accessing debt finance. The other control variables used in the models are in logarithmic form and range from 8% to 15%. All control variables have high figures for standard deviation, since subsectors of the Turkish manufacturing industry have different features in terms of total asset, R&D capacity, and net sales volume.

Table 3. Descriptive statistics

Variables	*N*	*Mean*	*Std.Dev.*	*Min*	*Max*
STTA	330	0.450	0.077	0.207	0.601
LTTA	330	0.164	0.058	0	0.358
TDTA	330	0.615	0.078	0.359	0.791
ROA	330	0.038	0.032	-0.123	0.160
ROE	330	0.098	0.073	-0.183	0.331
LNTA	330	15.69	1.089	13.37	18.18
LNRD	330	7.812	4.368	0	15.02
LNNS	330	15.61	1.031	13.44	18.10
Number of groups	22	22	22	22	22

Table 4 represents the correlation coefficient between variables, used in the models. As expected, the correlation is high (0.84) between performance indicators, ROE, and ROA respectively. However, we use only one performance indicator as a dependent variable in the regression models, this problem does not affect the robustness of the models. On the other hand, negative correlations can be observed between debt ratios and ROA, while positive correlations occur between ROE and debt ratios, except for short-term debt.

Table 4. Correlation matrix

Variables	*ROA*	*ROE*	*STTA*	*LTTA*	*TDTA*	*LNTA*	*LNRD*	*LNNS*
ROA	1							
ROE	0.840	1						
STTA	-0.165	-0.047	1					
LTTA	-0.007	0.192	-0.372	1				
TDTA	-0.170	0.096	0.718	0.377	1			
LNTA	0.322	0.430	-0.537	0.667	-0.035	1		
LNRD	0.245	0.389	-0.094	0.361	0.176	0.466	1	
LNNS	0.370	0.465	-0.480	0.539	-0.075	0.957	0.496	1

Control variables indicate positive correlations with ROA and ROE, therefore it is expected that asset size, net sales, and R&D expenditures have a positive impact on performance in the Turkish manufacturing sector. The figures in Table 4 show that the size, net sales, and R&D expenditures are positively correlated with the performance indicators. This means that those figures move in the same direction. To avoid the multicollinearity problem, it was checked by VIF (Variance İnflation Factor). As panel data is used in our analysis, it is important to consider whether cross-section dependency exists between panel units. Cross-section dependency (CD) is the fact that cross-section units are affected by each other in case of a shock

to which the series is exposed. Additionally, following the related literature, it determines the unit root test which is applied to the series. In the case of CD, it is recommended to apply second-generation unit root tests. Thereby, we started our empirical approach by researching the existence of CD and employed the CD test, recommended by Pesaran (2004) to test CD. Pesaran (2004) proposed an alternative version of the Breausch-Pagan LM test in the case of $t < n$. It uses the formula in Equation 2.

$$CD = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{j=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right) \quad (2)$$

Table 5 illustrates the results of the CD test for variables. We reject the null hypothesis for all variables, stating that there is no CD, that is, it provides strong evidence of the existence of CD. As a result, we accept the existence of CD. In other words, a shock that occurred in one of the sub-sectors seems to affect other sub-sectors.

Table 5. Cross-section dependency test

Variables	*CD-Test*	*Probability*
ROA	13.70***	0.000
ROE	26.52 ***	0.000
STTA	15.16***	0.000
LTTA	28.95***	0.000
TDTA	37.86 ***	0.000
LNTA	56.97 ***	0.000
LNRD	25.03 ***	0.000
LNNS	56.20***	0.000

As we have the CD in our models, we continued with the second-generation unit root test, taking into account the cross-section dependency developed by Pesaran (2007). According to the results illustrated in Table 6, we reject the null hypothesis for all variables except for TDTA, LNTA, and LNNS. However, considering the results of the Harris-Tzavalis (HT) and Levin, Lin, and Chu (LLC) tests which can also be used under CD by adjusting first-generation unit root tests, it is supposed that all variables have stability in I(0).

Table 6. Unit root tests

Variables	*CADF test ist*	*Probability*	*HT Test*	*Probability*	*LLC*	*Probability*
ROA	-2.945***	0.000	0.093***	0.000	-8,37***	0.000
ROE	-2.866***	0.000	0.174***	0.000	-8.99***	0.000
STTA	-2.041***	0.000	0.621***	0.000	-5.37***	0.000
LTTA	-2.615***	0.000	0.499***	0.000	-4.59***	0.000
TDTA	-2.020*	0.100	0.684***	0.000	-3.51***	0.000
LNTA	-1.847	0.294	0.673***	0.000	-1.458*	0.073
LNRD	-3.332***	0.000	0.166***	0.000	-23.3***	0.000
LNNS	-1.770	0.415	0.747**	0.050	-2.61***	0.004

***, p<0.01; **, p<0.05; *, p<0.1

Note: HT and LLC tests are implemented to the series created by taking the difference from the cross-sectional averages. In this way, the effect of CD is decreased (Tatoğlu, 2017).

To determine whether an individual effect occurs in the models, the F test (all u_i=0) (given Table 8 and Table 9) was employed and since the prob value is less than 1%, the null hypothesis has been rejected, stating that all models have a cross-section effect. Subsequently, the Hausman test (Table 7) was used to decide between fixed and random effect methods. As the prob. value is less than 1% significance level for all models, we apply one-way fixed effect model estimation in our analysis.

Table 7. Hausman Test

Model	*Chi-Square Statistics*	*Probability*
1	20.27	0.0004
2	24.41	0.0001
3	49.81	0.0000
4	61.85	0.0000
5	63.97	0.0000
6	77.29	0.0000

Tables 8 and Table 9 reveal the results of regressions aiming to investigate the relationship between performance and capital structure, as well as control variables, size, sales, and R&D expenditure. In both tables, the prob value of the F test statistic is less than 1% and significant. These results show the validity of the models. The value of the R-square illustrates the percent of the variation explained by independent

variables. The figures for R-square are 0.12, 0.19, and 0.21 respectively for the first three models. The following models have the value of 0.34, 0.35, and 0.40 respectively. As one can see from the tables, model 6 has the biggest magnitude for R-squared among all models, proving that 0.40 variation in ROE is explained by independent variables.

The results of Table 8 illustrate the models when the return on asset is the dependent variable. In Model 1, it has been found that short-term debt has a negative relationship with ROA, but the coefficient of STTA is insignificant. This is the only coefficient that we have found insignificant at 10% significance level. As for long-term debt (model 2), it is significantly and negatively correlated with the dependent variable at the 1% significance level, indicating that an increase of 1 unit in long-term debt led to a decrease of 0.31 units in the performance proxy. Similarly, the total debt ratio (TDTA) is also significantly and negatively correlated with ROA, but the coefficient value is slightly different from that of Model 2.

Table 8. Regression Results with DK Standard Errors (Dependent Variable: ROA)

Variable	*Model 1*	*Model 2*	*Model 3*
STTA	-0.124		
	(0.078)		
LNTA	-0.057***	-0.024*	-0.051***
	(0.014)	(0.012)	(0.014)
LNRD	-0.001	0.000	0.000
	(0.000)	(0.001)	(0.001)
LNNS	0.083***	0.055***	0.089***
	(0.015)	(0.012)	(0.016)
LTTA		-0.314***	
		(0.057)	
TDTA			-0.262***
			(0.030)
Constant	-0.293***	-0.387***	-0.394***
	(0.065)	(0.082)	(0.053)
Prob > F	0.0000	0.000	0.000
R-squared	0.1280	0.1929	0.2118
Observations	330	330	330
Number of groups	22	22	22
F-ind(all u_i=0)	3.38***	3.47***	4.76***
Cd Test (Pesaran, 2004)	33.77(0.000)	21.31(0.000)	28.57(0.000)
Autocorrelation			
Modified Bhargava et al. DW	1,736	1,782	1,798
Baltagi-Wu LBI	1,850	1,908	1,904
Heteroskedasticity			
chi2 (22)	1911,88***	1601,4***	3470,86***
Multicollinearity			
VIF	7,17	10,09	6,93

Robust standard errors in parentheses.
***, p<0.01; **, p<0.05; * p<0.1

Similar to Table 8, Table 9 illustrates the figures for other models, however, they have ROE as the independent variable. There is a negative relationship between all capital structure ratios and ROE. The coefficients of the variables are significant at 5% and 1% significance levels. This can be justified by the fact that debt financing is more expensive than equity financing.

As a result of this, an increase in both short and long-term debt leads to a decrease in profitability. Different from Model 1, the coefficient of STTA is significant at 5% level and negatively correlated with ROE in that case. In other words, it can be stated that an increase of 1 unit in short-term debt results in a 0.4 decrease in profit. Likewise, other leverage ratios have the value of 0.50 and 0.56 respectively. Those figures are negatively and significantly correlated with ROE.

As we used control variables consistent with the literature in order to reflect sub-sector characteristics and to capture more reliable results in the regression models, we can measure the effect of those control variables net sales, total assets, and R&D on the performance variables.

In all models, it can be observed that as a proxy of size, net sales, have a positive and significant correlation with the dependent variables used. Depending on the net sales of sub-sectors, an increase in net sales leads to an increase in performance proxies. However, both ROA and ROE decline with increasing Total assets. This result indicates that total assets affect performance in the Turkish manufacturing sector

negatively. Therefore, we could not find any significant effect of R&D on performance, which may be due to a lack of data.

Table 9. Regression results with Driscoll-Kraay standard errors (Dependent Variable: ROE)

Variable	*Model 4*	*Model 5*	*Model 6*
STTA	-0.397**		
	(0.155)		
LNTA	-0.137***	-0.066*	-0.111***
	(0.034)	(0.033)	(0.026)
LNRD	0.000	0.001	0.001
	(0.001)	(0.001)	(0.001)
LNNS	0.229***	0.160***	0.227***
	(0.036)	(0.030)	(0.028)
LTTA		-0.505***	
		(0.147)	
TDTA			-0.558***
			(0.074)
Constant	-1.158***	-1.291***	-1.362***
	(0.172)	(0.236)	(0.148)
Prob > F	0.000	0.000	0.000
R-squared	0.346	0.355	0.401
Observations	330	330	330
Number of groups	22	22	22
F-ind(all u_i=0)	5.59***	6.44***	7.96***
Cd Test (Pesaran, 2004)	46.31(0.000)	41.58(0.000)	39.96(0.000)
Autocorrelation			
Modified Bhargava et al. DW	1,705	1,677	1,687
Baltagi-Wu LBI	1,887	1,910	1,892
Heteroskedasticity			
chi2 (22)	864,77***	1273,17***	1206,12***
Multicollinearity			
VIF	7,17	10,09	6,93

Robust Standard errors in parentheses
***, p<0.01; **, p<0.05; *, p<0.1

Lastly, we checked the robustness of the models. To test autocorrelation, we used Durbin-Watson and Baltagı-Wu. İt is stated that if Durbin-Watson factors are close to 2 we can assume that there is no autocorrelation problem. Therefore, the Modified Wald test was applied to Models, and due to the fact, that for all models we have the prob. value below 1% we do not reject H0 and accept that models suffer from heteroskedasticity. Another diagnostic test that one needs to consider to avoid biases in regression model estimations is the Multicollinearity problem which occurs if the independent variables in the model are correlated. As seen in Table-8 and Tablo-9, the values of VIF (Variance Inflation Factor) are less than 10, assuming that the models do not have severe multicollinearity (Midi et al.,2010; O'brien, 2007).

4. CONCLUSION

The correct selection and efficient use of financial resources of any company may have a positive impact on its profit, by ensuring financial efficiency. Some assets belonging to the company can be financed by the short-term, while others can be financed by long-term financing sources. Similarly, some assets may be financed by long-term external sources of financing, while some assets may be financed by long-term internal sources of financing. All the financial decisions mentioned here have the potential to directly affect profitability, which is one of the most important indicators of company efficiency. In this context, the reflection of financial decisions on efficiency can be measured over profit. In a different way, "financial efficiency and effectiveness" can be monitored through the impact of alternative financing sources on profit.

The capital structure decisions of the companies are one of the decisions that are emphasized in financial management, and their reflection on the operating results should be followed in terms of resource efficiency. It is a matter of deciding on a combination of debt and equity, taking into account capital structure, maturity, and cost. It may be possible to increase profitability by making effective financial structure decisions. For financial efficiency, finance managers need to decide on the optimum mix of resources because the optimum capital structure (or mix of resources) can positively affect the company's financial efficiency and increase its profitability.

In this paper, a panel data set covering the years 2006-2020 has been analyzed to investigate the nexus between capital structure decisions and the performance of manufacturing industry companies operating in Türkiye, by applying the Driscoll-Kraay panel data model. The results show that the debt level, and the maturity of the debt (long-short term) affect the profitability level of the companies significantly. All debt ratios (short, long, and total debt) included in models negatively affect a company's ROA and ROE. Except for H1, the results provided from this panel data analysis reject the other (h2, h3, h4, h5, h6) hypothesis, that is, we accept the alternative hypothesis stating that there is a negative and significant relationship between debt ratios and profitability for both performance proxies, ROA, and ROE. As we were unable to find any significant relationship between the short-term debt ratio and ROA, H1 cannot be rejected. Regarding the control variables, we concluded that net sales have a positive and significant correlation with profitability, whereas total assets were negatively significantly affected by the increase in leverage ratios. R&D variable has no significant effect on performance. The results are consistent with the studies of Shubita and Alsawalhah (2012), Çöllü (2021), and Yat Hung et al. (2002); but inconsistent with the paper of Gill et al. (2011). Also, Eriotis et al. (2002), who found that companies operating with more debt will be less profitable. Revathy and Santhi (2016), who concluded that a high debt-equity ratio will have a negative effect on profitability, produced results parallel to their studies.

On the one hand, debt financing provides companies with tax advantages as the interest on debt can be tax deductible, on the other hand, using excessive debt leads to the possibility of default risk for financial institutions. In case of default risk, using debt can be more expensive for companies. So, it is in favor of companies to use debt until they reach the optimal financial structure. In the Turkish manufacturing sector, inefficient use of funds or more expensive loan conditions may explain the negative relationship between capital structure and profitability. Based on this research paper's results, it is recommended that Turkish firms in the manufacturing sector should use more equity rather than debt to increase profitability and financial efficiency. Additionally, the companies should focus on increasing net sales to contribute to profitability. Overall, we can infer from this study that both the maturity of debt, and the capital structure have a significant impact on profitability. In that sense, the correct management of capital structure will also increase financial efficiency.

This study is limited in that it considers just Turkish manufacturing companies. The findings of the study cannot be generalized for other developing countries, or sectors. This study can be extended using different samples, sectors, or countries as well as different control variables. It is thought that the research findings will provide useful information to the owners and finance managers of financial institutions and manufacturing industry companies.

Author Contributions
Batuhan Özdemir: Methodology, Modeling, Analysis, Article Writing-original draft, Modelling *Özgür Özel*: Literature Review, Conceptualization, Data Curation, Article Writing-review and editing.

Conflict of Interest
No potential conflict of interest was declared by the authors.

Funding
Any specific grant has not been received from funding agencies in the public, commercial, or not-for-profit sectors.

Compliance with Ethical Standards
It was declared by the authors that the tools and methods used in the study do not require the permission of the Ethics Committee.

Ethical Statement
It was declared by the author(s) that scientific and ethical principles have been followed in this study and all the sources used have been properly cited.

REFERENCES

Abor, J. (2005). "The Effect of Capital Structure on Profitability: an Empirical Analysis of Listed Firms in Ghana", *The Journal of Risk Finance*, 6(5), 438 - 445.

Avcı, E. (2016). "Capital Structure and Firm Performance: An Application on Manufacturing Industry", *Marmara Üniversitesi İktisadi ve İdari Bilimler Dergisi,* 38(1), 15-30.

Azhagaiah, R. and Gavoury, C. (2011). "The Impact of Capital Structure on Profitability with Special Reference to IT Industry in India", *Managing Global Transitions: International Research Journal,* 9(4), 371-392.

Baker, M. and Wurgler, J. (2002). "Market Timing and Capital Structure", *The Journal of Finance,* 57(1), 1-32.

Chinaemerem, O.C. and Anthony, O. (2012). "Impact of Capital Structure on the Financial Performance of Nigerian firms", *Oman Chapter of Arabian Journal of Business and Management Review,* 34(969), 1-19.

Coyle, B. (2006). "Capital Structuring: Glenlake Publishing Company", Ltd and Fitzroy Dearborn Publishers, Taylor&Francis e-Library.

Çöllü, D.A. (2021). "Sermaye Yapısının Karlılık üzerindeki Etkisi: TCMB Sektör Bilançoları Üzerine Bir Araştırma", *Fiscaoeconomia,* 5(3), 957-977.

De Mesquita, J.M.C. and Lara, J.E. (2003). "Capital Structure and Profitability: The Brazilian Case", *Academy of Business and Administrative Science Conference,* Vancouver, Canada.

Driscoll, J.C. and Kraay, A.C. (1998). "Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data", *Review of Economics and Statistics,* 80(4), 549-560.

Durand, D. (1952). "Costs of Debt and Equity Funds for Business: Trends and Problems of Measurement"*, Conference on Research in Business Finance,* 215-262*.*

El-Sayed Ebaid, I. (2009). "The Impact of Capital-Structure Choice on Firm Performance: Empirical Evidence from Egypt". *The Journal of Risk Finance,* 10(5), 477-487.

EIS (Entrepreneur Information System) (2023). Republic of Türkiye, Ministry of Industry and Technology, https://gbs.sanayi.gov.tr/, (Accessed: 10.02.2023).

Eriotis, N.P., Frangouli, Z. and Ventoura-Neokosmides, Z. (2002). "Profit Margin and Capital Structure: An Empirical Relationship", *Journal of Applied Business Research (JABR),* 18(2), DOI: 10.19030/jabr.v18i2.2118.

Eun, C. and Resnick, B. (2018). "International Financial Management", McGraw-Hill Education.

Fabozzi, F.J. and Drake, P.P. (2009). "Finance: Capital Markets, Financial Management and Investment Management", John Wiley & Sons, Inc.

Frank, M.Z. and Goyal, V.K. (2008). "Trade-off and Pecking Order Theories of Debt", H*andbook of Corporate Finance: Empirical Corporate Finance*, (Editor: Eckbo, B.E.), Vol:2, Handbook of Finance Series, Amsterdam, Elsevier/North-Holland.

Gill, A., Biger, N. and Mathur, N. (2011). "The Effect of Capital Structure on Profitability: Evidence from the United States", *International Journal of Management,* 28, 3-15.

González, V.M. and González, F. (2012). "Firm Size And Capital Structure: Evidence Using Dynamic Panel Data", *Applied Economics,* 44(36), 4745-4754.

Herciu, M. and Ogrean, C. (2017). "Does Capital Structure Influence Company Profitability?", *Studies in Business and Economics,* 12(3), 50-62.

Hoechle, D. (2007). "Robust Standard Errors for Panel Regressions with Cross-Sectional Dependence", *The Stata Journal,* 7(3), 281-312.

İleri, H. (1999). "Verimlilik, Verimlilik ile İlgili Kavramlar ve İşletmeler Açısından Verimliliğin Önemi", *Selçuk Üniversitesi Sosyal Bilimler Meslek Yüksekokulu Dergisi,* 1(2), 9-24.

İskenderoğlu, Ö., Karadeniz, E. and Atioğlu, E. (2012). "Türk Bankacılık Sektöründe Büyüme, Büyüklük ve Sermaye Yapısı Kararlarının Karlılığa Etkisinin Analizi", *Eskişehir Osmangazi Üniversitesi İktisadi ve İdari Bilimler Dergisi,* 7(1), 291-311.

Midi, H., Sarkar, S.K. and Rana, S. (2010). "Collinearity Diagnostics of Binary Logistic Regression Model", *Journal of Interdisciplinary Mathematics*, 13(3), 253-267.

Modigliani, F. and Miller, M.H. (1958). "The Cost of Capital, Corporation Finance and the Theory of Investment", *The American Economic Review,* 48(3), 261-297.

Myers, S.C. (1984). "The Capital Structure Puzzle", *Journal of Finance*, 39, 575-592.

Myers, S.C. and Majluf, N.S. (1984). "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have", *Journal of financial economics,* 13(2), 187-221.

Nassar, S. (2016). "The Impact of Capital Structure on Financial Performance of the Firms: Evidence from Borsa Istanbul", *Journal of Business & Financial Affairs,* 5(2), 5895560.

O'brien, R.M. (2007). "A Caution Regarding Rules of Thumb for Variance Inflation Factors", *Quality & Quantity*, 41, 673-690.

Paramasivan, C. and Subramanian, T. (2009). "Financial Management", New Age International (P) Limited, Publishers.

Pesaran, M.H. (2004). "General Diagnostic Tests for Cross Section Dependence in Panels", IZA Discussion Paper No. 1240 August 2004.

Pesaran, M.H. (2007). "A Simple Panel Unit Root Test in The Presence of Cross-Section Dependence", *Journal of applied econometrics,* 22(2), 265-312.

Rafiq, S., Salim, R. and Smyth, R. (2016). "The Moderating Role of Firm Age in The Relationship Between R&D Expenditure and Financial Performance: Evidence from Chinese and US Mining Firms", *Economic Modelling*, 56, 122-132.

Revathy, S., and Santhi, V. (2016). "Impact of Capital Structure on Profitability of Manufacturing Companies in India", I*nternational Journal of Advanced Engineering Technology*, VII(I), Jan.-March, 24-28.

Rouf, D.M.A. (2015). "Capital Structure and Firm Performance of Listed Non-Financial Companies in Bangladesh", *The International Journal of Applied Economics and Finance,* 9(1), 25-32.

Salim, M. and Yadav, R. (2012). "Capital Structure and Firm Performance: Evidence from Malaysian Listed Companies", *Procedia-Social and Behavioral Sciences,* 65, 156-166.

Sana, A.K., Biswas, B., Sarkar, S. and Das, S. (2017). "Financial Management", McGraw Hill Education (India) Private Limited.

Sayılgan, G. (2017). "İşletme Finansmanı". Siyasal Kitabevi, Ankara.

Shubita, M.F. and Alsawalhah, J.M. (2012). "The Relationship Between Capital Structure and Profitability", *International Journal of Business and Social Science,* 3(15), 105-112.

Vătavu, S. (2015). "The Impact of Capital Structure on Financial Performance in Romanian Listed Companies", *Procedia Economics and Finance,* 32, 1314-1322.

Tatoğlu, F.Y. (2017). "Panel Zaman Serileri Analizi: Stata Uygulamalı", Beta Yayınları, İstanbul.

Yat Hung, C., Ping Chuen Albert, C. and Chi Man Eddie, H. (2002). "Capital Structure and Profitability of the Property and Construction Sectors in Hong Kong", *Journal of Property Investment & Finance,* 20(6), 434-453.

APPENDIX

Table A1: Türkiye Manufacturing industry sub-sectors and the average number of companies they include

No	*Subsectors of the Manufacturing Industry*	*Average number of companies in the sector (2006-2020)*
1	Food Products	17.810
2	Beverages	595
3	Textiles	11.576
4	Wearing Apparel	16.744
5	Leather and Related Products	3.925
6	Wood and of Products of Wood and Cork, Except Furniture; Articles of Straw and Plaiting Materials	4.888
7	Paper and Paper Products	2.442
8	Printing and Reproduction of Recorded Media	6.531
9	Chemicals and Chemical Products	4.902
10	Basic Pharmaceutical Products and Pharmaceutical Preparations	444
11	Rubber and Plastic Products	9.731
12	Other Non-Metallic Mineral Products	8.283
13	Basic Metals	4.027
14	Fabricated Metal Products, Except Machinery and Equipment	19.782
15	Computer, Electronic and Optical Products	1.170
16	Electrical Equipment	4.855
17	Machinery and Equipment N.E.C.	11.298
18	Motor Vehicles, Trailers and Semi-Trailers	3.347
19	Other Transport Equipment	917
20	Furniture	10.183
21	Other Manufacturing	7.401
22	Repair and İnstallation of Machinery and Equipment	8.181

Source: www.gbs.sanayi.gov.tr (Entrepreneur Information System)