

## THE FIRM-SPECIFIC DETERMINANTS OF CORPORATE CAPITAL STRUCTURE: EVIDENCE FROM TURKISH PANEL DATA

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### Abstract

The purpose of this study is to carry out an empirical testing, using dynamic panel data methodology, to analyze the impact of firm specific characteristics on the corporate capital structure decisions of Turkish firms. The sample covers 123 Turkish manufacturing firms listed on the Istanbul Stock Exchange (ISE) and the analysis is based on the year-end observations of ten consecutive years running from 1993-2002. In this study, the panel data methodology is used and six variables – size, profitability and growth opportunities in plant, property and equipment, growth opportunities in total assets, non-debt tax shields and tangibility – are analyzed as the firm specific determinants of the corporate capital structure. This work contributes to the existing body of literature in the way that all of the independent variables of the study are significant determinants for the capital structure decisions of Turkish firms. Our analysis shows that variables of size and growth opportunity in total assets reveal a positive association with the leverage ratio, however, profitability, growth opportunities in plant, property and equipment, non-debt tax shields and tangibility reveal inverse relation with debt level.

**Key words:** Panel Data, Corporate Capital Structure, Istanbul Stock Exchange, Pecking Order Theory, Trade-off Theory.

**JEL Classification:** C33, G32.

### 1. Introduction

Capital structure has aroused intense debate in the financial management arena for nearly half-century. Since the seminal work of Modigliani and Miller (1958), the basic question of whether a unique combination of debt and equity capital maximizes the firm value, and if so, what factors could influence a firm's optimal capital structure have been the subject of frequent debate in the capital structure literature.

However, the capital structure research has been accompanied by some general criticisms and findings. For instance, numerous attempts to explain capital structure have proved to be inconclusive (Harris and Raviv, 1991); empirical work in this area has lagged behind the theoretical research, perhaps because the relevant firm attributes are expressed in terms of fairly abstract concepts that are not directly observable (Titman and Wessels, 1988); and furthermore capital structure decision-making is even more complicated when it is examined in an international context, particularly in developing countries where markets are characterized by controls and institutional constraints (Boateng, 2004). Truly, most of the literature seeking an association between the capital structure and the firm specific or industry characteristics has focused on the experience of developed economies (mainly US-based), where they have many institutional similarities. However, emerging markets, with many institutional differences, have rarely been the subject of research in this field (amongst them are Schulman et al. (1996) for New Zealand, Wiwattanakantang (1999) for Taiwan, Chen (2003) for China, Boateng (2004) for Ghana).

Turkish firms' capital structure decision has also received scant attention. As alleged by Rajan and Zingales (1995), a good understanding of the relevant institutional context is required

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when identifying the fundamental determinants of capital structure and in this context, it is worthwhile to note that Turkey has many special features as an emerging market. The economic growth strategy of Turkey underwent a great transformation in the early 1980s. With the significant decisions taken in this period, many radical changes and structural reforms were materialized to increase the economic efficiency and competitiveness. Since then, Turkey has adopted a liberal economic policy with free market operations within the rules of demand and supply, free competition, and a liberalized foreign trade. However, growth rate resulting from these reforms could not be sustained due to the sharp recessions and financial crises in 1994 and 2001. Signing another standby agreement with the International Monetary Fund (IMF), structural reforms have restarted and the economic reforms have begun to show results in subsequent years. Inflation and interest rates have fallen significantly and the currency stabilization program has been achieved. Growth rate in 2004 was realized as 9.9 percent and interestingly, high growth rates were accompanied with the reduction in inflation rates which were reduced to single-digit figures in 2004 after almost 30 years. On the other side, following the European Council decision in Helsinki (in December 1999), the negotiation process with the European Union (EU) started in October 2005. EU membership perspective contributes to economic predictability and supports Turkey's ongoing reform process in the economic field. Additionally, taking into consideration, the positive developments in the economy, foreign direct investment in Turkey is expected to increase in the near future.

The aim of this study is to carry out an empirical testing, using panel data methodology, to determine the firm-specific factors affecting the capital structure decisions of Turkish firms. The remainder of this paper is organized as follows: The next section provides a review of prior concepts and theories about the capital structure decisions of the firms; Section 3 presents the research methodology and models, describes the sample and data collection, and introduces the firm-specific characteristics which serve as independent variables, with the specification of the hypothesis; Section 4 reports the statistical analysis and empirical results. The findings and conclusions are presented in the last section.

## 2. Review of Capital Structure Debate

Modigliani and Miller (1958) (hereafter, MM) illustrated that corporate financial decisions are irrelevant in a perfect, frictionless world otherwise the valuation of a company will be independent from its financial structure under certain key assumptions (where there are no corporate and personnel taxes, no transaction costs, symmetric information, complete contracting, complete markets). Under these assumptions, internal and external funds may be regarded as perfect substitutes. After the seminal work of the MM, capital structure research has focused on whether financial decisions become relevant if these assumptions are relaxed. As noted by Bevan and Danbolt (2002), under market imperfections such as restrictions to access to external financing and differentiations in the costs of alternative forms of external finance, firms will attempt to select levels of debt and equity in order to reach an optimal capital structure. On the other hand, Groth and Anderson (1997) suggested that aside from deciding on a target capital structure, a firm must manage its own capital structure. Imperfections in capital markets, taxes, and other practical factors influence the management of capital structure. Almost 20 years later, Miller (1977) incorporated personal taxes in addition to corporate taxes into the MM model (the synthesis of personal and corporate tax effects), while he still assumes that all firms have identical effective tax rates.

On the other hand, pecking order and trade-off theories of capital structure lay down the work for most of the studies concentrating on the determinants of capital structure decisions. As discussed in Myers (1984), static trade-off theory is based on a trade off between the tax advantages of debt financing and the costs of financial distress (i.e. the legal and administrative costs of bankruptcy, as well as the agency, moral hazard, monitoring and contracting costs). This theory usually regards a firm's optimal debt ratio as determined by a trade-off of the costs and benefits of borrowing, holding the firm's assets and investment plans constant. The firm is portrayed as balancing the value of interest tax shields against various costs of bankruptcy or financial embarrassment. The firm is supposed to substitute debt for equity, or equity for debt, until the value of the firm is maximized. Thus, as noted by Beattie et al. (2004), in the trade-off theory, companies are said to operate with a target

debt/equity ratio at which the costs and benefits of issuing debt are balanced. Graham et al. (1998) differentiate financial distress as *ex ante* and *ex post*. As in the context of trade off theory, firms will *ex ante* balance the tax benefits of debt against the expected cost of financial distress. This implies that, *ceteris paribus*, firms with higher *ex ante* expected cost of financial distress should use less debt. Bradley et al. (1984) also found that the debt ratio is inversely related to the cost of financial distress which includes bankruptcy costs and agency costs of debt. Thus, the trade-off theory established a theoretical foundation for understanding the optimal capital structure of the firms. However, according to Chen (2003) the trade-off theory has failed to explain the observed corporate behavior particularly witnessed with the stock market reaction to leverage-increasing and leverage-decreasing transactions, which consistently yield stock price increases and decreases, respectively.

As an alternative to the trade-off model, the pecking order hypothesis of corporate leverage emerged based on asymmetric information problems. Myers and Majluf (1984) presented a model of the issue – invest decision under the assumption of the information asymmetry between managers and investors (that is managers have information that investors do not have). Informational asymmetry between corporate insiders and investors can affect a company's financing choice. De Miguel and Pindado (2001) also noted that a very important characteristic of debt is that its owners have priority in reclaiming it over the shareholders' rights. This circumstance creates problems in those credit markets with asymmetric information, as a consequence of the conflict of interests between shareholders and bondholders.

Pecking order theory of capital structure suggests that firms prefer internal financing. Beattie et al. (2004) noted that in the pecking order theory of capital structure, companies are said to relate profit and growth opportunities to their long-term target dividend payout ratios in order to minimize the need for external funds. The preference for internal equity implies that firms will use less debt than suggested by the trade-off theory. According to pecking order theory, firms adapt their target dividend payout ratios to their investment opportunities, but the ratios are adjusted slowly and if firms have cash requirements for investments, they will run down cash balances or sell marketable securities first. If they have to resort to external financing, they will issue the safest security first: debt, followed by hybrids such as convertibles, and finally equity as the last resort (Allen, 1991).

As noted by Beattie et al. (2004), under this model, there is no well-defined target mix of debt and equity finance. Each firm's observed debt ratio reflects its cumulative requirements for external finance. Myers (1984) also indicated that the recent work in this area produced predictions, which are roughly in line with the pecking order theory, which is usually attributed to the earlier empirical work of Donaldson (1961). However, the critics of the pecking order hypothesis include its shortcoming to explain how taxes, bankruptcy costs, security issuance costs, as well as other factors such as the firm's investment opportunity set have impacts on the capital choice. The hypothesis is also thought to have ignored agency problems – those created by conflicts of interests held by various claimants to the firm's value (Quan, 2002).

Jensen and Meckling (1976) have added another imperfection, agency costs, to the MM framework. The existence of agency costs provides stronger reasons for arguing that the probability distribution of future cash flows is not independent of the capital or ownership structure (on the contrary that MM Theorem is based on the assumption that the probability distribution of the cash flows to the firm is independent of the capital structure). According to this new approach, firms are expected to set their capital structure in such a way that the potential conflicts of interest between managers, shareholders and debt holders are minimized. Jensen (1986) also proposed that certain agency costs are also determinants of capital structure and the use of debt finance can reduce agency costs between managers and shareholders by reducing the 'free' cash available for managers' personal benefits.

Jensen and Meckling (1976) argue that an optimal capital structure can be obtained by trading off the agency costs of debt against the benefit of debt, which might be called an extended trade-off model. Various new managerial theories of the firm have evolved in the context of agency theory. These new views bring more realism to the theory of capital structure by addressing agency problems in the context of the firm which is viewed as a nexus of contracts among various parties, where the contractual relationship involves incentive conflicts arising from the pursuit of self-interest (Chung, 1993). Incentive-signalling model developed by Ross (1977), pro-

vides a theory for the determination of the financial structure of the firm. The manager of a firm maximizes his incentive return by choosing a financial package that trades off the current value of the signal given to the market against the incentive consequences on that return. In equilibrium, firms are correctly distinguished by their financial choices. What matters, though, is not the particular package chosen, but rather the essential characteristics of the financial package, i.e., its implications for incentives. One empirical implication of this theory is that in a cross section, the values of firms will rise with leverage, since increasing leverage increases the market's perception of value. Padron et al. (2005) noted that it may be said that agency and signal theories offer considerable help in understanding a company's use of debt.

### 3. Data and Research Methodology

#### 3.1. Sample Set

The sample of this study covers 123 Turkish manufacturing firms listed on the Istanbul Stock Exchange (ISE) and the analysis is based on the year-end observations of ten consecutive years running from 1993-2002. For the analysis, the basic data consisting of a total of 1194 observations were taken from the balance sheets of every firm. The financial statements of the firms are obtained from the Istanbul Stock Exchange. Since the balance sheets of the firms in the financial sector (i.e. banks, insurance companies) have a different structure from those of non-financial companies, we excluded the financial firms from the sample. Thus, the final sample set only consists of manufacturing firms similar to the methodology in previous studies such as Rajan and Zingales (1995), Padron et al. (2005).

#### 3.2. Variables and Hypothesis

The dependent variable of this study is the financial leverage. In literature, several definitions of leverage were used to investigate its associations with firm-specific characteristics. Rajan and Zingales (1995) used the leverage as the ratio of total debt to net assets, where net assets are total assets less accounts payable and other liabilities instead of the ratio of total liabilities to total assets or the ratio of debt (short term and long term) to total assets. Some of the studies used two different debt-equity ratios as a dependent variable in the regression analysis. For instance, Allen and Mizuno (1989), Ooi (1999), Hatfield et al. (1994) and Gaud et al. (2005) expressed debt ratio in both book-and market-value terms. Book value of the ratio is derived by dividing the book value of debt by the sum of the book value of debt and the book value of equity. The market value based ratio is derived by dividing the book value of debt by the sum of the book value of debt and market value of equity. Padron et al. (2005) also used the market value based measure and defined the ratio of leverage as the ratio of total debt to the sum of total debt and the market value of equity. We measured the financial leverage as the ratio of total debt to total equity.

$$TD/TE = \text{Total Debt/Total Equity}$$

When measuring the financial leverage, we used book values instead of market values. The first reason was the data limitations, discussed also in Titman and Wessels (1988) which forced them to measure debt in terms of book values rather than market values. The second reason was the conceptual simplicity and the variables' ability to reflect a firm's total reliance on borrowed funds, which is also brought by Ferri and Jones (1979) who measured the financial leverage as the ratio of total debt to total assets at book value for reasons of. As stated by Titman and Wessels (1988), with a reference to the Bowman (1980), the cross sectional correlation between the book value and market value of debt is very high, so the misspecification due to using book value measures is probably fairly small. Additionally, Almazan and Molina (2005) noted that equity book values can be important if firms base their decisions on accounting, rather than market information.

Literature suggests a number of factors, which are likely to have an impact on a company's capital structure decision. This study investigates the influence of six firm specific characteristics – size, profitability, growth opportunities in plant property and equipment, growth opportunities in total assets, non-debt tax shields and tangibility – on the capital structure decisions or specifically, on the

financial leverage ratios of the Turkish listed companies. The above-mentioned independent variables are separately examined in the following sub-sections referring to the relevant literature. As reflected in the literature, many studies have been carried out in the US, while different countries such as Spain, Switzerland, UK, and China have also been the subject of the capital structure policy.

### *3.2.1. Size*

Firm size has been one of the most common variables used in explaining a company's level of debt. According to the trade-off model, larger firms are expected to have a higher debt capacity and are able to be more highly geared. Literature offers some reasons regarding the positive relationship between firm size and financial leverage ratio. For example, large companies have more stable or less volatile cash flows and may be able to exploit the economies of scale in issuing securities (Graham et al., 1998; Gaud et al. 2005). They may have an advantage over smaller firms in accessing credit markets and can borrow under better conditions (Ferri and Jones, 1979; Wiwattanakantang, 1999) and may have a more dilute ownership, and thus have less control over individual managers. Managers may then issue debt to reduce the risk of personal loss resulting from bankruptcy (Chen, 2003). The larger the firm is, the more information is expected to be available about it, which reduces the level of information asymmetries in the market, making it possible to obtain financial resources from lenders. Because of information asymmetries, smaller firms are also likely to face higher costs for obtaining external funds (Graham et al., 1998; Graham, 2000; Padron et al., 2005).

However, there are conflicting results on the relationship between firm's size and leverage. In consistent with the view of trade-off model, some of the studies have made it clear that the size of a firm is positively related to its use of debt as a source of financing (i.e. Rajan and Zingales, 1995; Schulman et al., 1996; Wiwattanakantang, 1999; Boetang, 2004; Padron et al., 2005; Gaud et al., 2005). However, Marsh (1982), Titman and Wessels (1988), Ooi (1999) and Chen (2003) report a contrary negative relationship between debt ratios and firm size. Rajan and Zingales (1995) also find that a negative relationship exists for Germany. Marsh (1982) argues that small companies, due to their limited access to the equity capital market, tend to rely heavily on bank loans for their funding requirements. Consequently, they become more heavily indebted than larger companies. On the other hand, some of the studies found no systematic association between firm size and total debt ratio (i.e. Ferri and Jones, 1989; Chung, 1993; Ozkan, 2001). Rajan and Zingales (1995) argue that the effect of size on equilibrium leverage is ambiguous. Larger firms tend to be more diversified and fail less often, so size may be an inverse proxy for the probability of bankruptcy. If so, size should have a positive impact on the supply of debt. However, size may also be a proxy for the information outside investors have, which should increase their preference for equity relative to debt.

Several indicators such as logarithm of net sales (Titman and Wessels, 1988; Rajan and Zingales, 1995; Wiwattanakantang, 1999; Graham, 2000; Ozkan, 2001; Gaud et al., 2005), natural logarithm of total assets (Padron et al., 2005), average value of total assets (Chung, 1993), total assets at book value (Scott and Martin, 1975), the market value of the firm (Graham, 2000) were used in the literature to measure size. Size is also an indicator of borrowing capacity for firms. Larger firms have higher borrowing capacity and lower cost of borrowing with better access to capital markets. As a general rule, governments are more prone to protect larger firms and banks lend more capital to these firms than smaller firms. As in the case of Turkey, it is important to show whether larger firms tend to borrow larger amounts of money than the smaller ones.

In this study, we used the natural logarithm of sales in real terms as a proxy for size [SIZE].

### *3.2.2. Profitability*

Regarding the effects of profitability on the financial leverage ratio of the firms, there are conflicting theoretical predictions. The trade-off models predict that profitable companies will employ more debt since they are more likely to have a high tax burden and low bankruptcy risk. Additionally, Gaud et al. (2005) noted that if past profitability is a good proxy for future profitability, profitable firms could borrow more, as the likelihood of paying back the loans is greater. On the other hand, the pecking order theory proposed by Myers (1984) and Myers and Majluf (1984) predicts a negative relationship between profitability and debt on the basis that successful compa-

nies do not need to depend so much on external funding. They can, instead, prefer to finance with internal funds accumulated from past profits.

There is also strong empirical evidence on the negative association between profitability and leverage ratio in Donaldson's (1961) pecking order description of how firms make their financial decisions. The results of Allen (1991), Rajan and Zingales (1995), Wiwattanakantang (1999), Chen (2003) and Gaud et al. (2005) support the pecking order theory that high profit firms use internal financing, while low profit firms use more debt because their internal funds are not adequate. Ozkan (2001) found that current profitability of UK firms has a negative impact on their borrowing decisions whereas there is a positive relation between past profitability and debt ratio. Hovakimian et al. (2001) also found that past profits are an important predictor of debt ratios. On the other hand, Ooi (1999) indicates that corporate profitability is not a significant determinant of capital structure of UK property companies.

In literature, various proxies such as ratios of operating income over sales and operating income over total assets (Titman and Wessels, 1988), the return on assets (ROA) (Wiwattanakantang, 1999), the return on total assets, which is calculated as the ratio of EBIT to total assets (Rajan and Zingales, 1995; Ooi, 1999; Ozkan, 2001; Gaud et al., 2005) were used as indicators of profitability to measure profitability. In this study, we used the ratio of earnings before interest, tax and depreciation to total assets as a proxy for profitability [PROF]. Using this variable as a proxy, we aim to show whether Turkish firms with large profits use internal financing and firms generating smaller profits use external financing.

### 3.2.3. Growth Opportunities

Myers (1977) describes growth opportunity as a call option on a real asset. The part of a firm value is accounted for its present value of a call option (future growth opportunities) on further investments in favorable projects. Firms financed with risky debt will pass up valuable investment opportunities (opportunities that could make a positive net contribution to the market value of the firm) and they will eventually reduce the present market value of their real options by inducing a sub-optimal investment strategy. Myers (1977) predicted that the corporate borrowing is inversely related to the proportion of the market value accounted for by real options (or growth opportunities). Bradley et al. (1984) included the bankruptcy costs into the analysis and noted that growth opportunities are capital assets that add value to a firm. However, bankruptcy costs will be greater for firms with larger growth opportunities. Titman and Wessels (1988) expected a negative relation between growth rates and leverage. In their point of view, equity-controlled firms have a tendency to invest sub-optimally to expropriate wealth from the firm's bondholders. The cost associated with this agency relationship is likely to be higher for firms in growing industries, which have more flexibility in their choice of future investments. Thus, expected future growth should be negatively related to the long-term debt levels.

Consistent with the above-mentioned theoretical arguments, the results of Titman and Wessels (1988), Chung (1993), Allen (1995), Rajan and Zingales (1995), Lasfer (1995), Ooi (1999), Ozkan (2001), Gaud et al. (2005) and Padron et al. (2005) indicate a negative relationship between growth opportunities and financial leverage. On the other hand, Chen (2003) found a positive relationship between growth opportunities and debt in China.

Several indicators such as the ratio of the market value of common stocks to total liabilities (Padron et al., 2005), the firm's annual growth rate in total assets (Titman and Wessels, 1988; Ooi, 1999; Chen, 2003), ratio of capital expenditures over total assets (Titman and Wessels, 1988; Almazan and Molina, 2005), the ratio of advertising expenses to sales (Graham, 2000), research and development expenses to sales (Graham, 2000), the ratio of market value of assets to book value of assets (Myers, 1977; Rajan and Zingales, 1995; Wiwattanakantang, 1999; Ozkan, 2001; Gaud et al., 2005) were considered appropriate to measure growth opportunities. In this study, we defined growth opportunities in two forms: the annual growth rate in plant, property and equipment [GROWppe] and the annual growth rate in total assets [GROWta] and measured these variables as percentage change in plant, property and equipment and percentage change in total assets respectively.

The variable of growth opportunity in plant, property and equipment are considered to be more realistic and a pure indicator of production capacity especially in industrial firms when com-

pared to fixed assets. In other words, considering the increase in plant, property and equipment as the proxy of the increase in production capacity forms a justification of using this variable in this study.

In this respect, firm managers, with positive expectations, will increase their production capacities by increasing their investments in plant, property and equipment, and this type of investment will need internal and/or external financing. As the literature presents some findings on the fact that the positive expectations mostly create a ground for debt financing, we expect that possible growth opportunities in plant, property and equipment and total assets will have some important indications for the capital structure policy of Turkish manufacturing firms. However, in Turkey, the crowding-out effect is relatively high for the sample period, creating debt-financing opportunities to private sector companies. Thus, if the analysis indicates a debt financing despite crowding-out effect, this result can be interpreted as, firms concentrating on debt financing facilities other than credit markets.

#### *3.2.4. Non-Debt Tax Shields*

Interest tax shields are not the only method of reducing corporate tax burdens. The existence of non-debt tax shields provides an alternative (and perhaps less costly) means of reducing income taxes and may serve to mitigate the benefit of debt tax shields (Cloyd, 1997). Indeed there are various non-debt tax shields, such as accelerated depreciation and investment tax credits (Allen and Mizuno, 1989).

DeAngelo and Masulis (1980) argue that tax deductions for depreciation and investment tax credits are substitutes for the tax benefits of debt financing. Firms with large non-debt tax shields will employ less debt in their capital structure due to a positive relation between investment-related tax shields and the probability of losing the deductibility of debt tax shields. In line with the proposition of DeAngelo and Masulis (1980), Bowen et al. (1982), MacKie-Mason (1990), Dhaliwal et al. (1992), Givoly et al. (1992), Allen (1995), Cloyd et al. (1997) and Ayers et al. (2001) have also found evidence about the tax substitution hypothesis. Similarly, Schulman et al. (1996) note that if a firm uses sufficient tax shields from depreciation to reduce taxable income to zero, debt may yield no additional tax benefit, and capital structure decisions will be based on non-tax considerations.

Contrary to the predictions of DeAngelo and Masulis (1980), some of the literature found an inverse relationship between non-debt tax shields and debt (Givoly et al., 1992; Allen, 1995; Wiwattanakantang, 1999; De Miguel and Pindado, 2001; Ozkan, 2001). However, the results of Titman and Wessels (1988) do not provide support for an effect on debt ratios arising from non-debt tax shields. On the other hand, Bradley et al. (1984) found a significant positive relation between firm leverage and the amount of non-debt tax shields suggesting that firms that invest heavily in tangible assets, generate relatively high levels of depreciation and tax credits, tend to have higher financial leverage. The lack of negative relation between non-debt tax shields and leverage ratios contradicts the theory that focuses on the substitutability between non-debt and debt tax shields (interest tax shields) as argued by De Angelo and Masulis (1980). An explanation for the positive relation between debt and non-debt tax shields was brought by Graham (2005) who notes that one problem with using non-debt tax shields, in the form of depreciation and investment tax credits, is that they are positively correlated with profitability and investment. If profitable firms invest heavily and also borrow to fund this investment, this can induce a positive relation between debt and non-debt tax shields and overwhelm the tax substitution between interest and non-debt tax shields.

Following the definition used by Titman and Wessels (1988), Ozkan (2001) and Chen (2003), we used the ratio of annual depreciation expense to total assets as a proxy of non-debt tax shields [NDTS]. This is due to the fact that depreciation is the most significant element among non-debt tax shields. Using NDTS, we try to find out whether Turkish firms use high levels of debt financing to invest heavily in tangible assets and generate high levels of depreciation for tax purposes.

#### *3.2.5. Tangibility*

The tangible assets of a firm can be considered as the representatives of the real guarantees to its creditors. Therefore, the importance of those assets among total assets influences its level of debt (Padron et al., 2005). As noted by Gaud et al. (2005), tangible assets are likely to have an impact on the borrowing decisions of a firm because they are less subject to informational asymmetries and they have a greater value than intangible assets in case of bankruptcy. Addition-

ally, the moral hazard risks are reduced when the firm offers tangible assets as collateral, because this constitutes a positive signal to the creditors who can request the selling of these assets in the case of default. As such, tangible assets constitute sound collateral for loans. Therefore, the greater the proportion of tangible assets on the balance sheet (fixed assets divided by total assets) is, the more willing lenders should be to supply loans, and leverage should be higher (Rajan and Zingales, 1995, Harris and Raviv, 1991). Firms with higher proportion of tangible assets more likely belong to an industry with lower risks, where they can afford higher financial leverages and higher proportions of tangible assets. These tangible assets will eventually have an impact on the borrowing decisions of these firms, and in the case of a bankruptcy tangible assets create more value than firms with greater dependence on intangibles.

Consistent with this prediction, many studies indicated a positive relationship between the tangibility and leverage (Ferri and Jones, 1979; Marsh, 1982; Bradley et al., 1984; Titman and Wessels, 1988; Rajan and Zingales, 1995; Allen, 1995; Ooi, 1999; Gaud et al., 2005). The results of Chen (2003) confirm the positive relationship between a firm's leverage, particular long-term debt, and the tangibility of its assets. Similarly, Chung (1993) indicates that the firm with a higher asset diversification and a larger fixed asset ratio tends to use more long-term debt and use less short-term debt. The effect of fixed asset ratio on total debt ratio is inverse, indicating that the effect on short-term debt dominates the effect on long-term debt.

We measured tangibility [TANG] as the ratio of tangible assets plus inventories to total assets using book values in consistent with the measure used by Chen (2003) and Gaud et al. (2005). As referring to Kremp et al. (1999), Gaud et al. (2005) noted that adding inventories to the tangible assets is enhanced by the fact that debts are used partly to finance inventories, and in most cases inventories maintain some value when the firm is liquidated. Also, Myers, (1984) noted that the use of book values may also have some theoretical justification since these are related to the value of assets in place rather than the value of intangibles and growth opportunities. Consequently, we try to find out whether tangible assets of the Turkish manufacturing firms have an impact on the borrowing decisions and the leverage ratios of these firms are related to the tangibility.

Taking into account the literature on capital structure debate, the hypotheses we proposed about the possible determinants of the capital structure decisions of Turkish firms are as follows:

H1: The leverage ratio of Turkish firms is positively related to the size.

H2: The leverage ratio of Turkish firms is negatively related to the profitability.

H3: The leverage ratio of Turkish firms is negatively related to the growth opportunities in plant, property and equipment.

H4: The leverage ratio of Turkish firms is negatively related to the growth opportunities in total assets.

H5: The leverage ratio of Turkish firms is negatively related to the non-debt tax shields.

H6: The leverage ratio of Turkish firms is positively related to the tangibility.

The different variables that allow us to test the stated hypotheses are: size, profitability, growth opportunities in plant property and equipment, growth opportunities in total assets, non-debt tax shields and tangibility. Table 1 presents the independent variables for the level of debt, as well as their expected signs.

Table 1

Definition of independent variables and expected signs

Variable	Definition	Expected Sign
Size	$\text{Log}_e(\text{Net Sales})$	+
Profitability	Earnings before interest, tax and depreciation/Total Assets	-
Growth rate in Plant, Property and Equipment	Percentage change in Plant, Property and Equipment	-
Growth rate in Total Assets	Percentage change in Total Assets	-
Non-debt Tax Shields	Annual Depreciation Expense / Total Assets	-
Tangibility	Tangible Assets plus Inventories / Total Assets	+

### 3.3. The Model Specification

The reasons of Gaud et al. (2005) for analyzing Swiss companies, macroeconomic shocks and changes in the institutional context occurred in recent years and different characteristics of the firms, also motivated us to use panel data analysis. As noted by Schulman et al. (1996), panel data allow economists and other social scientists to analyze, in depth, complex economic and related issues which could not be treated with equal rigor using time-series or cross-sectional data alone. Like cross-sectional data, panel data describe each of a number of individuals. Like time-series data, it describes changes through time. By blending characteristics of both cross-sectional and time-series data, more reliable research methods can be used in order to investigate phenomena that otherwise could not have been dealt with.

The panel regression equation differs from a regular time-series or cross-section regression by the double subscript attached to each variable (Ooi, 1999). The general estimating equation written as a fixed-effects regression model has the form,

$$y_{i,t} = \alpha + \beta X_{i,t} + \varepsilon_{i,t} \quad (1)$$

with the subscript  $i$  denoting the cross-sectional dimension and  $t$  representing the time series dimension. The left-hand variable  $y_{i,t}$  represents the dependent variable,  $TD_{i,t}/TE_{i,t}$  for the  $i$ th company at time  $t$ ,  $\alpha$  represents the company-specific intercepts,  $\beta$  is a  $k \times 1$  vector of parameters,  $X_{i,t}$  contains the set of explanatory variables for the  $i$ th firm in the  $t$ th period. The fixed-effects model, by allowing different company intercepts, serves as a remedy for the known flaw of the capital structure model, which is being not fully specified. The set of explanatory variables  $X_{i,t}$  includes mainly size, profitability, growth opportunities in plant, property and equipment, growth opportunities in total assets, non-debt tax shields, and tangibility.

## 4. Empirical Results and Discussion

The sample contains 123 Turkish manufacturing firms listed on the Istanbul Stock Exchange (ISE) for which we have ten consecutive years of data for the period between the years 1993-2002. Summary statistics include the mean and the standard deviation of the variables between the period covering 1993-2002. Table 2 presents the descriptive statistics for the variables used in our estimations.

Table 2

### Descriptive statistics

This table presents descriptive statistics for the variables used in our estimations. The data are from the Istanbul Stock Exchange and the sample contains 123 Turkish Manufacturing firms listed on the Istanbul Stock Exchange for which we have ten consecutive years of data for the period 1993-2002. TDTE is the ratio of total debt to total equity where total equity is measured with book values. SIZE is the natural logarithm of sales in real terms (base year 1992). PROF is the ratio EBITDA to total assets. GROWppe is the growth rate in Plant, Property and Equipment. GROWta is the growth rate in Total Assets. NDTs is the ratio of Annual Depreciation Expenses to Total Assets. TANG is the ratio of tangible assets plus inventories to total assets using book values.

	1993		1994		1995		1996		1997	
	Mean	Stdev	Mean	Stdev	Mean	Stdev	Mean	Stdev	Mean	Stdev
TD/TE	1,7995	2,4321	1,1514	4,7086	1,3913	2,1235	1,5770	1,7602	1,6723	1,8776
SIZE	5,9119	0,5330	6,2406	0,5232	6,5525	0,5185	6,8029	0,5339	7,1092	0,5322
PROF	0,4269	0,1606	0,5400	0,2130	0,4786	0,1586	0,4221	0,1457	0,4369	0,1520
GROWppe	0,8507	0,7170	1,5843	2,1779	1,3475	1,9358	1,5265	3,2910	1,2458	1,6920
GROWta	0,8679	0,4359	1,3205	0,6942	1,1521	0,7723	0,9565	0,5283	1,0709	0,4569
NDTS	0,1461	0,0905	0,1685	0,1231	0,1819	0,1228	0,1528	0,1091	0,1537	0,1166
TANG	0,3091	0,1704	0,3010	0,1570	0,3010	0,1609	0,3161	0,1684	0,3147	0,1620

Table 2 (continuous)

	1998		1999		2000		2001		2002	
	Mean	Stdev	Mean	Stdev	Mean	Stdev	Mean	Stdev	Mean	Stdev
TD/TE	1,9403	3,4443	2,7937	9,2713	3,5262	21,6928	3,7139	27,2846	0,8156	4,4963
SIZE	7,3093	0,5449	7,4759	0,5704	7,6421	0,6811	7,8055	0,7348	7,9529	0,6854
PROF	0,3979	0,1411	0,3306	0,1743	0,2923	0,1724	0,2924	0,6435	0,3037	0,4009
GROWppe	0,9564	1,1481	0,6097	0,5226	0,4694	0,4140	0,4993	0,5138	0,5517	0,8163
GROWta	0,7796	0,4343	0,6127	0,3776	0,5013	0,3803	0,6079	0,8239	0,4310	0,5316
NDTS	0,1639	0,1506	0,1554	0,1097	0,1607	0,1271	0,1373	0,1181	0,1316	0,1384
TANG	0,3317	0,1727	0,3354	0,1868	0,3229	0,1809	0,3136	0,1845	0,3282	0,1822

According to the correlation matrix in Table 3, it is obvious that there is a relatively high correlation among some of the variables, particularly between non-debt tax shields and tangibility or profitability, and between growth measurements. The positive correlation between non-debt tax shields and profitability is also noted by Graham (2005). The correlation level between the variables of non-debt tax shields, tangibility and profitability can be explained by using total assets value in the proxies of these variables. In our study, non-debt tax shields (NDTS) is measured as the ratio of annual depreciation expenses to total assets, tangibility (TANG) is measured as the ratio of tangible assets plus inventories to total assets using book values and we used the ratio of earnings before interest, tax and depreciation to total assets as a proxy for profitability [PROF]. Similarly, the relatively high correlation between the growth measurements is based on the use of similar proxies for both of the variables.

Table 3

## Pearson correlation coefficients between variables

This table presents the Pearson correlation coefficients for the variables used in our estimations. The data are from the Istanbul Stock Exchange and the sample contains 123 Turkish Manufacturing firms listed on the Istanbul Stock Exchange for which we have ten consecutive years of data for the period of 1993-2002. SIZE is the of natural logarithm of sales in real terms (base year 1992). PROF is the ratio EBITDA to total assets. GROWppe is the growth rate in Plant, Property and Equipment. GROWta is the growth rate in Total Assets. NDTS is the ratio of Annual Depreciation Expenses to Total Assets. TANG is the ratio of tangible assets plus inventories to total assets using book values.

	SIZE	PROF	GROWppe	GROWta	NDTS	TANG
SIZE	1					
PROF	-0,1112	1				
GROWppe	-0,1007	0,0109	1			
GROWta	-0,2290	0,1023	0,4402	1		
NDTS	-0,0890	0,3899	-0,1016	-0,1222	1	
TANG	-0,0094	-0,0326	0,0275	-0,1052	0,4363	1

The empirical evidence obtained suggests that the coefficients of size, profitability and growth opportunities in plant, property and equipment, growth opportunities in total assets, non-debt tax shields, tangibility and lagged dependent variable TD/TE(-1) are significant for the fixed-effects panel estimation results as indicated in Table 4.

Table 4

## Fixed-effects panel estimation results

Fixed-Effects Panel Estimation Results	
Variables	Coefficients
SIZE	0.2217 (19.632)
PROF	-1.1517 (-23.625)
GROWppe	-0.0805 (-10.603)
GROWta	0.4238 (37.352)
NDTS(-1)	-0.4017 (-4.452)
TANG	-0.7287 (-15.276)
Lagged dependent variable TD/TE(-1)	0.2727 (5.514)
Weighted statistics	
R <sup>2</sup>	0.699
F	412.37
SER	8.9444
SSR	85116.51
DW	1.937
Observations (period)	1194 (1993-2002)

Notes: t-statistics in parentheses are White's Heteroskedastic-consistent.

All variables are significant at  $\alpha=0.05$  level.

Variable definitions:

TD/TE is the ratio of total debt to total equity where total equity is measured with book values.

SIZE is the natural logarithm of sales in real terms (base year 1992).

PROF is the ratio EBITDA to total assets.

GROWppe is the Growth Rate in Plant, Property and Equipment.

GROWta is the Growth Rate in Total Assets.

NDTS is the ratio of Annual Depreciation Expenses to Total Assets.

TANG is the ratio of Tangible Assets plus Inventories to Total Assets using Book Values.

Lagged dependent variable is the one period lagged value ( $X_{t-1}$ ) of TD/TE.

According to regression analysis, R-Squared is 0.699. That means 69.9 per cent of variations in leverage ratio could be explained by this model. The coefficients of size and growth opportunity in total assets are approximately found as 0.22 and 0.42 respectively. There is a positive relationship between the leverage ratio and the variables of size and growth opportunity in total assets. The existence of positive relationship between the leverage ratio and size supports Hypothesis 1. However the positive relationship between the leverage ratio and growth opportunity in total assets is not consistent with Hypothesis 4 which proposes a negative relationship between these variables. Also, fixed-effects panel estimation results indicate that the coefficients of the variables of profitability, growth opportunities in plant, property and equipment, non-debt tax shields and tangibility are -1.15, -0.08, -0.40 and -0.72 respectively. Having corroborated the relationships between the significant explanatory variables and the dependent variables, we have found a negative relationship between the leverage ratio and these variables. This result is in harmony with Hypotheses 1, 3 and 4 but incompatible with Hypothesis 6 which proposes a positive relationship between the leverage ratio and tangibility. This table also indicates a positive relationship between lagged dependent variable TD/TE(-1).

The results of this study overlap with the findings of previous literature. In association between leverage ratio and firms' size, the finding of this study is consistent with the findings of Ra-

jan and Zingales (1995), Schulman et al. (1996); Boetang (2004), Padron et al. (2005) and Gaud et al. (2005), but not consistent with that of Marsh (1982) and Titman and Wessels (1988) where they report a contrary negative relationship between debt ratios and firm size. Also test results for the Turkish firms are in line with the views of trade-off theory which underlines that large firms are expected to have a higher debt capacity and are able to be more highly geared.

The empirical result of this study on the relation between leverage ratio and profitability is in compliance with the strong empirical evidence for the negative association between these variables. As in line with the results of Allen (1991), Rajan and Zingales (1995), Wiwattanakantang (1999), Chen (2003) and Gaud et al. (2005), this study supports the pecking order theory that high profit firms use internal financing (successful companies do not need to depend so much on external funding), while low profit firms use more debt because their internal funds are not adequate. Additionally, the results of this study are not in line with the predictions of the tax trade-off models which envisages that profitable companies would employ more debt since they are more likely to have a high tax burden and low bankruptcy risk.

We defined growth opportunities in two different ways. The first one is the growth opportunities in total assets and the other is the growth opportunities in plant, property and equipment. Regarding the first definition, the positive relationship revealed in this study is consistent with that of Chen (2003), but contradicts the findings of Titman and Wessels (1988) and Ooi (1999). Regarding the second definition, a negative relationship between the leverage and the growth opportunities in plant, property and equipment is in line with the theoretical arguments and empirical results in general.

Regarding the relationship between leverage ratio and non-debt tax shields, the result of this study is compatible with the prediction of DeAngelo and Masulis (1980) who argue that tax deductions for depreciation and investment tax credits are substitutes for the tax benefits of debt financing, and also consistent with the results of Bowen et al. (1982), Givoly et al. (1992), Allen (1995), Wiwattanakantang (1999), De Miguel and Pindado (2001) and Ozkan (2001) who found an inverse relationship between non-debt tax shields and debt. This result is also harmonious with the pattern of relationship between these variables envisaged by the Trade-off theory.

Additionally, the negative relationship between leverage ratio and tangibility observed in this study is not in line with the Trade-off theory's expectation and the results of many studies such as Ferri and Jones (1979), Marsh, (1982), Bradley et al. (1984), Rajan and Zingales (1995), Allen (1995), Ooi (1999), Gaud et al. (2005). This finding contradicts the proposition that serves as collateral for loans, the greater the proportion of tangible assets on the balance sheet is, the more willing lenders should be to supply loans, and leverage should be higher.

The comparison of the test results for the Turkish companies with the expectations of previous theories (trade-off and pecking order) is summarized in Table 5.

Table 5

Comparison of the test results with the expectations of theories

	Expected Relationship		Test Results for Turkish Firms
	Trade-off	Pecking Order	
Size (SIZE)	+	-	+
Profitability (PROF)	+	-	-
Growth Opportunities in Plant, Property and Equipment (GROWppe)	-	+	-
Growth Opportunities in Total Assets (GROWta)	-	+	+
Non-debt tax shields (NDTS)	-		-
Tangibility (TANG)	+		-

## 5. Conclusion

Capital structure has attracted intense debate in the financial management arena for nearly half-century. The basic question of whether a unique combination of debt and equity capital maximizes firm value, and if so, what factors determine a firm's optimal capital structure have been the subject of frequent debate in the capital structure literature. While, most of the literature seeks the nature of relations between the capital structure and the firm specific characteristics in developed economies and developing countries, unfortunately, Turkey, as an emerging market, has rarely been the subject of research in this field. In this context, using the methodology of panel data estimation we analyzed the impacts of firm specific characteristics on the corporate capital structures of Turkish firms.

The sample contains 123 Turkish manufacturing firms listed on the Istanbul Stock Exchange (ISE) with ten consecutive years of data for the period of 1993-2002. In this study, the firm-specific determinants of the corporate capital structure were examined under six different sub-sections. The empirical evidence indicated that all of the independent variables of the study – size, profitability and growth opportunities in plant, property and equipment, growth opportunities in total assets, non-debt tax shields and tangibility – are significant determinants for the capital structure decisions of Turkish firms.

Empirical evidence on the capital structure decisions of Turkish firms reveals that size and growth opportunity in total assets, have a positive association with the debt level. On the other hand, profitability, growth opportunities in plant, property and equipment, non-debt tax shields and tangibility are inversely related with the leverage ratio.

Additionally, EU membership vision contributes to economic predictability and supports Turkey's ongoing reform process in the economic field. Taking into consideration the positive developments in the economic area in the past years and the high percentage of young and educated people, the foreign investment in Turkey is expected to increase in the near future. In this respect, this study gives important ex-ante information about the determinants of corporate capital structure decisions in an emerging economy in the eve of major developments.

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