

The determinants of capital structure across firms' sizes:  
The U.K evidence

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**Abstract**

This paper explores the leverage determinants across firms' sizes based on the two main theories behind the capital structure, the trade-off and the pecking order theories. A panel data is used to find the relationship between capital structure and the variables that proxy for benefits and costs of debt during 1990 to 2006. Our findings show that both principles help to explain the capital structure of small, medium, and large firms. However, greater emphasis should be placed on the trade-off theory. In addition, small firms differ from large companies in level of growth opportunities, structure of assets, and probability of bankruptcy and agency costs. Therefore, different firms' characteristics are important to affect the power of leverage determinants and thus leverage determinants are likely to be size dependant. These results support the existing differences between small and large firms considering the agency costs and the bankruptcy costs.

**Keywords:** Capital structure, trade-off theory, pecking order theory, agency costs, bankruptcy costs, panel data.

### **Introduction**

In 1958 Modigliani and Miller (MM) show that the firm value is independent from its capital structure in a perfect capital market where all participants have access to all relevant information. They use arbitrage argument to show that any profit for the firms and the investors would be eliminated when there are no transaction, bankruptcy, asymmetric information costs and taxes. The irrelevance proposition provides conditions under which the value of a firm is independent of its leverage. The question is if capital structure is irrelevant in a real market? If not, which factors make the leverage matter? Different studies have relaxed the critical assumptions of MM model focusing on the important question for companies whether to raise equity or debt when they need external financing. Modigliani and Miller (1963) argue that the firm value becomes an increasing function of debt when the corporate tax has been taken into account. However, despite the tax shields benefits, Warner (1977) points out firms cannot rely only on debt when there are costs of financial distress. Moreover, Jensen and Meckling (1976) and Jensen (1986) argue that bankruptcy cost are not the only costs of debt, the conflicts between managers, debt-holders and share-holder are also relevant to a firm's capital structure. Consequently, the market imperfections put forward a relevant theory, the trade-off theory, which highlights the benefits and the costs of debt. This theory argues that firms optimise their capital structure by trading their tax deductibility of interests, bankruptcy costs, and agency costs. Moreover, Myers (1984) proposes an alternative capital structure theory, the pecking order theory, originally introduced by Donaldson (1961). Firms prefer internal to external financing, safe debt being favoured compared to risky debt and equity issues rank at the lowest end of the pecking order theory.

Previous empirical studies use different proxies to measure the theoretical effects. Moreover, different firm's characteristics led them to carry on their investigations based on large and small companies. However, the proxies have received mixed support in studies based on both large and small firms (e.g. Baskin, 1989; Allen, 1993; Rajan and Zingales, 1995; Adedeji, 1998; Ozkan, 2001; Booth et al, 2001; Fama and French, 2002; Watson and Wilson, 2002; Adedeji, 2002; Frank and Goyal, 2003a, 2007; Lopez-Gracia and Sogorb-Mira, 2008).

More especially, the size effect is controversial and mixed. Rajan and Zingales (1995), and Booth et al. (2001) use size as proxies for bankruptcy costs, asymmetric information costs, and agency costs. They

argue that large firms are more diversified, having better reputation in the market and thus more likely to rely on debt financing supporting the trade-off theory. However, they do not find a positive relationship between size and leverage for all observed countries. For example, Rajan and Zingales (1995) find a negative relationship between size and leverage based on market and book values in Germany and a positive effect for Japan, France, U.K, U.S., and Canada. Rajan and Zingales (1995) and Frank and Goyal (2007) argue that size may be a proxy for asymmetric information between firms and capital markets thus large firms can issue sensitive-information securities and use less debt consistent with the pecking order theory.

Additionally, previous studies provide arguments for the impact of size on leverage. Small firms are different from large firms in level of growth opportunities, asset structure, taxability, probability of bankruptcy, and asymmetric information (e.g. Ang, 1992; Pettit and Singer, 1985 and Van Auken and Holman, 1995). They agree that bankruptcy, agency and asymmetric information costs are more severe for small companies. In contrast, large firms are those companies that are trading with large market capitalisation and thus have better reputation, more significant account, and less bankruptcy and agency costs. Therefore, it seems that large companies may have opportunities to overcome the costs and get more market access. Barton and Matthews (1989), Ang (1992), Pettit and Singer (1985) and Berger and Udell (1998) mention various reasons why the capital structure of small firms is different from large companies. Some of these reasons are because of different source of capital and different market access. Small companies have larger growth opportunities and less access to formal sourced of external finance. Braton and Matthews (1989) also argue that the lack of the market assessment on the capital structure of the non-listed small and medium sized companies leading their capital structure affected mainly by managers and thus use more debt compared to large, public companies. Accordingly, we expect that small firms have different capital structure compared to large companies. Especially our small firms (small listed companies) may have different capital structure from non-listed small companies investigated in the previous studies (e.g. Jordan et al., 1998; Lopez-Gracia and Aybar, 2000; Esperanca et al., 2003; Hall et al., 2004; Daskalakis and Pisillaki, 2008).

The purpose of this study is to explore the determinants of leverage of listed small, medium, and large companies. We divide our sample into

quintiles based on market capitalisation and explore the effects of leverage determinants on small and large firms during 1990 to 2006.

Our finding based on the panel data can be summarised as follows. First, the results show that consistent with the tax hypothesis, the leverage of large companies is statistically positively related to the effective tax rate contracting to small and medium sized firms. Pettit and Singer (1985) argue that small firms tend to operate in less concentrated markets and thus greater competitive pressures making lower profits margins resulting in a lower tax rate. Therefore, those firms may not take the tax benefits of debt.

Second, the capital structure of large and small firms are consistent with the predictions of the pecking order theory where the leverage, long-term book leverage (LTBL), and long-term market leverage (LTML) are inversely related to profitability. The negative effect of profitability on leverage is also supported by Michaelas (1999) for the U.K small companies, contracting to Hall et al. (2004, the small U.K companies). Rajan and Zingales (1995) also find a negative association for international markets including the U.K large listed companies. However, the leverage of small companies in our sample is less sensitive to profitability because the profitability in those companies may be a proxy for quality of investment opportunities discussed by Rajan and Zingales (1995).

Third, we find that consistent with the trade-off theory, leverage, LTBL and LTML are positively related to tangibility in small, medium, and large sized companies. It also indicates how sensitive small and medium firms are to mitigate the bankruptcy probability by using tangible assets as collateral. Because, the ratio of tangibility effect on three different measures of leverage is more important for small companies compared to large companies. This result indicates that small companies suffer from a higher loss of value when firms go into distress. Therefore, lenders require greater collateral from small companies because it is difficult for them to assess the risk of those companies. This result is also consistent with Berger and Udell (2006) who argue that asset-based lending has a significant affect on small and medium sized company in U.K.

Fourth, size is positively related to all different measures of leverage in small, medium, and large companies supporting bankruptcy hypothesis. Greater bankruptcy costs for smaller firms indicate a positive relation between debt financing and size providing the evidence that

larger firms are likely to borrow at cheaper rates. It is more special for small companies because they are financially constrained.

Finally, our results also indicate a negative significant relationship between growth opportunities, leverage, LTBL, and LTML across firms' sizes in line with the trade-off, agency hypothesis. It predicts that firms with few growth opportunities use more debt.

In sum, our findings show that both theoretical principles help to explain the capital structure of small, medium and large firms. However, greater trust should be placed in the trade-off theory. In addition, small firms differ from large companies in level of growth opportunities, structure of assets, and probability of bankruptcy and agency costs. Therefore different firms' characteristics are important to affect the sensitivity of small and large companies to their leverage determinants, in other words, leverage determinants are likely to be size dependant. More especially, bankruptcy costs and agency cost of debt are the fundamental determinants of their capital structure.

The rest of the paper proceeds as follows. In Section 2, we present the hypotheses that capital structure theories predict with respect to the expected differences between the financial decisions of small and large firms. It also presents our research questions and hypotheses. Section 3 describes the data sources and defines the sample. In Section 4, we discuss the empirical results and finally section 5, summarises our findings and concludes the paper.

## **2. Theoretical Background and Hypotheses**

The theory of corporate finance has been set up by analysing how a firm could combine the securities to maximise the firm value. The proposition of Modigliani and Miller (MM model, 1958) introduced under a number of critical assumptions, namely, a perfect capital market. It refers to a perfect market where there are no taxes at both corporate and personal level, no transaction cost, and managers are rational, thus no agency costs, investors and companies can borrow at the same rate, and all participants have access to all relevant information. However, it does not reject the possible preference of a firm's owner to a certain type of financing over others and particularly, it provides conditions under which the capital structure of a firm is irrelevant to total firm value. Previous studies focus on the extent to which each of the assumptions in the MM model contributes to the determination of a firm's capital structure and

two main theories, the trade-off and the pecking order theories, have been developed.

## **2.1. Trade-off Theory**

The trade-off theory refers when firms determine their leverage level by trading the tax benefits of debt and the costs of debt. The benefits of debt include tax shields, and mitigating the agency costs. The costs of debt usually refer to the bankruptcy costs and the costs of financial flexibility.

### **2.1.1. Tax Effects**

Modigliani and Miller (1963) started by relaxing the assumption of corporation tax, *ceteris paribus*. They show that firm value becomes an increasing function of debt because the tax deductibility of interest payments decrease the expected tax liability resulting in increase the after tax profits. Therefore, using debt would be preferred over issuing equity because of expected reduction in tax liability. However, the analysis is limited to corporation tax. In practice, this effect should also include personal taxes. Miller (1977) introduces such effects into the analysis of leverage. He shows that, since the income tax on dividend is likely to be zero, the optimal level of debt becomes irrelevant at the firms level. Later DeAngelo and Masulis (1980) extend Miller's (1977) study with the impacts of tax-shield items in the balance sheet other than interest expenses. Depreciation and investment tax credits are example of balance sheet items, which are not cash charges, so can provide non-debt tax shields as substitutes for the interest expenses.

For small firms, the tax advantages of debt may be negligible. Pettit and Singer (1985) argue that small firms tend to operate in less concentrated markets and thus greater competitive pressures making lower profits margins resulting in a lower tax rate. Therefore, those firms may not take the tax benefits of debt. In addition, Tamari (1980) and Osteryoung et al. (1995) argue that small firms have greater variability in profits and thus they are more likely to make or lose large amount of funds. Accordingly, it is expected that small and large firms are different considerably in tax effect because small firms may not have tax incentives when they have higher income volatility. While, large firms are those firms with diversified business lines and thus higher profits margins resulting in greater tax incentives.

Despite the fundamental problem of measuring the tax effects, the empirical studies have lead to contradictory results. For instance, some studies use effective corporate tax rate as a proxy for tax effects. The studies based on small and medium sized companies find mixed results. Lopez-Gracia and Sogorb-Mira (2008) for Spanish small and medium sized companies and Liu and Tian (2009) for Chinese small and medium sized companies do support the tax effects. In contrast, Michaleas et al. (1999) and Jordan et al. (1998) using U.K small and medium sized companies do not support the tax effects. The studies of large companies also provide contracting results, Lasfer (1995) examines the determination of debt-equity choice in the U.K, where the results do not demonstrate the significant tax effect in short run. Bennett and Donnelly (1993) find the significant tax effect based on the U.K larger sample in line with survey of Graham (2000) using U.S. large listed companies.

In general, to date, the empirical studies provide controversial findings with respect to tax effects, mainly based on small and medium sized companies. Our first hypothesis is:

*(H<sub>1</sub>) Tax is positively related to leverage. Following by previous empirical studies, we use effective tax rate as a proxy for tax impact*

### **2.1.2. Bankruptcy Costs**

An additional relaxed assumption of MM model is bankruptcy costs, which include direct and indirect costs. Warner (1977) distinguishes between direct costs, lawyers' and accountants' fees and indirect costs, lost sales, lost profits, and credit rating problems. He finds the direct bankruptcy costs (with a range of 0.4% to 5.9% of the market value) are explicitly lower than the tax benefits of debt, however, the costs are not too small to be ignored. Indirect costs are likely to be much larger but they are difficult to measure, and thus the foregone sales and profit could be the proxies of the indirect bankruptcy costs.

Altman (1984), Tamari (1980), and Osteryoung et al. (1995) argue that bankruptcy costs are considerably relevant to small firms, which show a higher probability of failure. This may due to higher economic risk resulting from a lower degree of diversification and higher volatility of sales from competitive markers.

The empirical studies use different proxies for bankruptcy costs. Titman and Wessels (1988), and Booth et al. (2001) use volatility of earnings as an alternative proxy for business risk. With respect to small firms, Tamari (1980) and Osteryoung et al. (1995) show that small firms

have greater variability in their profits and earnings and it is expected to have a greater impact of capital structure. Michaelas et al. (1999) and Jordan et al. (1998) for U.K small and medium sized companies (SMEs), Liu and Tian (2009) for Chinese SMEs, have found a positive relation between leverage and volatility of earnings in contrast to Lopez-Gracia and Sogorb-Mira (2008) using Spanish SMEs. The empirical results for impact of business risk based on large companies are also mixed. Booth et al. (2001) argue that leverage is negatively related to volatility in some developing countries. However, they do not find such evidence for other developing countries such as Mexico, Malaysia and India.

Alternatively, Ang et al. (1982) and Castanias (1983) find that the bankruptcy costs are decreasing function of firm size. Therefore, they have lower bankruptcy risk as a result of higher diversification. The empirical evidence on the impact of size as a proxy for bankruptcy costs is mixed and controversial. Marsh (1982) find a positive relationship between size and bankruptcy default, while Titman and Wessels (1988) do not report a significant result of size effects in line with Rajan and Zingales (1995) do not support such evidence in Germany. Because, firms tend to be liquidated more easily in Germany and large firms have considerably less debt than small firms in Germany. Therefore, size does not simply reflect the bankruptcy effect.

Moreover, some studies (e.g. Frank and Goyal, 2003a) use tangibility as proxy for bankruptcy cost as tangible assets can be used as collateral to reduce the bankruptcy risk, and thus it is positively related to leverage. However, the existence of a positive relationship between the asset structure and the level of debt has been suggested by literature. Esperanca et al. (2003) argue that the greater probability of bankruptcy for small firms leads lenders to require greater level of compensation compared to large companies. Berger and Udell (2006) also argue that asset-based lending has a significant affect on small and medium sized company especially in U.K. Thus we expect that the asset structure has more significant effects for small firms than large companies. The empirical studies using small and large firms agree that leverage increased with tangibility (Titman and Wessels, 1988; Rajan and Zingales, 1995; Booth et al., 2001; Michaelas et al., 1999; Lopez-Gracia; Sogorb-Mira, 2008). Our second hypothesis is:

*(H<sub>2</sub>) We expect a negative relationship between leverage and bankruptcy costs. Following by previous studies, we use three proxies for the effect of bankruptcy, tangible assets, and income volatility.*



### **2.1.3. Agency Costs**

The argument of the agency costs have been tracked back last three decades by Jensen and Meckling (1976), and Jensen (1986). The conflict between managers and shareholders is indicated as free cash flow generating conflicts when agents invest in risky projects (Jensen and Meckling, 1976). Debt financing reduces the free cash flow available since debt commits the firm to pay their obligations. Additionally, there are conflicts between debt-holders and share-holder leading asset substitutions and underinvestment problems. Share-holders are more likely to invest in risky projects when there is high possibility of asset substitution, replacement riskier assets for the firm's existing assets.

Pettit and Singer (1985) argue that smaller firms have a greater ability and incentive to expropriate wealth from lenders, their credit terms will include more stringent limitations. They also argue that small firms have greater growth opportunities due to higher flexibility to changes their assets and take advantages of profitable opportunities. Thus, it is likely that the agency costs of small firms' debt will be larger than large firms.

The empirical studies using small and medium sized companies apply assets or sales growth as proxy variables because the market values of those companies are not accessible. However, they find mixed evidence, Lopez-Gracia and Sogorb-Mira (2008) report a negative relationship between leverage and growth opportunities contracting to Michaleas et al. (1999) and Jordan et al. (1998) who do not find such an evidence. A positive relationship between growth opportunities and leverage is in line with the pecking order theory. It argues that firms with high growth opportunities need more finance which might be debt because of limiting access to equity is financing. The empirical evidence based on large companies use market value of assets over book value of assets and profitability as common proxy variables for the asset substitution problem, and underinvestment problem (Rajan and Zingelas, 1995; Goyal et al., 2002; Barclay and Smith, 1999). They find an inverse relationship between leverage and growth opportunities supporting the agency conflicts between share-holders and debt-holders contracting to Titman and Wessles (1988).

Our further hypotheses are:

*(H<sub>3</sub>): According to agency discussion by Jensen and Meckling (1976) and Jensen (1986), the conflicts between share-holders and managers,*

*leverage is positively related to undistributed cash flow. Profitability is used as a proxy for free cash flow problem.*

*(H<sub>4</sub>): However, debt aggravates the conflicts between debt-holders and share-holders therefore, growth opportunities is negatively related to leverage. Market-to-book ratio is used as a proxy for growth opportunities.*

## **2.2. Pecking order Theory**

Myers (1984) puts forward an alternative capital structure theory, the pecking order theory, originally introduced by Donaldson (1961). According to Myers (1984), firms prefer retained earning as internal equity, and then debt and external equity should be the last resort to mitigate asymmetric information and transaction costs.

### **2.2.1. Asymmetric Information and Signalling Effects**

Myers and Majluf (1984) and Myers (1984) apply the asymmetric information to observe the pecking order theory under which leverage increases with the extent of information asymmetry. They argue that the signaling effects are based on the premise that there is an information asymmetry between managers and outside investors, managers might have more information about the firm's assets in place and its future investment opportunities, but this is not reflected in the stock price since outside investors have only access to public information. Based on this notation, undervalued firms tend to avoid issuing equity and the equity which is offered to the markets is likely to be overpriced. As a result, the issuer's stock price will drop to hedge the investors to compensate for their insufficient information. Consequently, companies prefer to finance their investments with the least information-sensitive securities thus common stock should be the last resort because it is highly sensitive to information asymmetries.

Pettit and Singer (1985) and Ang (1982) argue that asymmetric information is typically significant for smaller firms. It is more costly for small firms to provide audited information and thus outsiders do not have sufficient information about firm's value.

The empirical studies investigate the information asymmetric under the pecking order theory assumptions. However, the studies based on small and large companies provide contracting evidence. For large companies, Shyam-Sunder and Myers (1984) find that debt issued is tracking financing deficit but Fama and French (2002) and Frank and

Goyal (2003a) do not find the same result. With respect to small and medium companies, Lopez-Gracia and Aybar (2000), Watson and Wilson (2002), and Sanchez-Vidal and Martin-Ugedo (2005) agree that this theory plays an important role in financing decision of the small and medium sized firms and thus use debt when their internal funds are not sufficient.

Despite, the empirical studies, the survey conducted by Graham and Harvey (2001) for U.S. large companies and Hamilton and Fox (1998) for small businesses New Zealand also show that firms issue debt when recent profit is insufficient.

Previous studies also use profitability in order to find the impact of the pecking order theory on firms' capital structure. Because, the higher the firm generates internal funds, the less it needs to use debt financing and thus they use profitability as a proxy for internal funds (E.g. Allen, 1993 for Australia; Baskin, 1989 for U.S.; Benito, 2003 for U.K and Spain, and Sen and Oruc, 2008 for Turkey find a negative relation between profitability in line with the pecking order theory). Their results are not consistent with the trade-off theory which predicts that leverage is positively related to profitability.

Moreover, size is used as a proxy for asymmetric information, the relationship between firm size and leverage is controversy in the previous empirical studies. On the one hand, larger firms have lower asymmetric information problems as a result of better reputation in the market and they prefer to issue equity hence, negative relation between firm size and leverage could be predicted. On the other hand, higher assets in place in larger firms might along with more adverse selection problems so higher debt issues would be predicted to reduce the adverse selection costs (Rajan and Zingales, 1995, and Frank and Goyal, 2007).

Our additional hypotheses based on the pecking order theories are:

*(H<sub>5</sub>): We expect that when firms generate more internal resources, they need less external finance since internal resources have the lowest information costs and thus profitability should be negatively related to leverage. This case is important for small firms who are in greater suffer of asymmetric information problems.*

*(H<sub>6</sub>): Moreover, Cassar and Holmes (2003) argue that under the pecking order assumptions, the firms with higher growth opportunities need external finance to cover their investments when they do not generate enough internal funds. This premise can be a landmark phenomenon for small firms, which are financially constraint relative to*

large companies, and thus debt can be the simplicity way of financing for small companies. Therefore, under pecking order theory, we presume that the leverage should be positively related to the growth opportunities.

(H<sub>7</sub>): According to information asymmetric argument, larger firms are more diversified, and have more reputation in the capital markets resulting in lower costs to mitigate informational asymmetries. Thus, they might be able to issue equity with lower asymmetric information costs (Rajabn and Zingales, 1995). Consequently, size can be a proxy for asymmetric information problems and negatively related to leverage.

### **3. Data and Methodology**

#### **3.1. Sample**

Data for this study is from 2,548 firms which originally drawn from the Company Analysis database providing the information of balance sheet, income statement and cash flow statements for the period 1990 to 2006. For the purposes of this investigation, we have utilised this database to obtain the required variables, where available, for all non-financial companies in the U.K. Our sample includes dead companies to avoid survivorship bias. We also control for outliers (mean+3×standard deviation) and industry effects.

Since many firm-specific variables are needed, the sample tended to trim down significantly due to non-availability of data. Subsequently, there are 2,548 firms, for which we have completed accounting data for 17 year period, resulting in 16,254 observations. We include listed companies in non-financial firms and our sample also covers all firms' sizes, small, medium, and large. Financial firms such as banks, life and non-life insurance, and real state companies are excluded. These companies are operating differently and thus their capital structure is different.

Table 1 describes the sample, broken down into quintile using market capitalisation therefore, in each year, firms are allocated to quintile based on their market capitalisation.

**Table 1 Size distribution and number of companies in size categories**

Size	Company	Size Distribution (£m Market Value of Equity)		
Quintile	Number of Companies	Average	Min	Max
Small	3,252	4.92	0.03	9.42
2	3,251	17.56	9.42	28.54
3	3,250	52.25	28.54	89.50
4	3,250	190.96	89.55	382.48
Large	3,251	4,090.53	382.51	213,696
Total	16,254	871.10	9.42	382.50

### 3.2. Variables

The variables are selected by considering the trade-off theory and the pecking order theory. Table 2 summaries the explanatory variables and their expected sign for the panel regression.

**Table 2: The variables used as a proxy for the determinants of the leverage and expected sign observed from the hypotheses**

Variables	Description	Hypothesis	Sign
Taxes/EBIT	Effective tax rate	Tax/ Trade-off theory	+
SD of ROA	Business risk	Bankruptcy/ Trade-off theory	-
Tangible assets/TA	Tangibility	Bankruptcy/ Trade-off theory	+
ROA	Profitability	Agency costs (Free cash flow problem)/ Trade-off theory	+
ROA	Profitability	Asymmetric information/ Pecking order theory	-
MB	Growth opportunities	Agency costs (Shareholders and debt-holders conflicts)/ Trade-off theory	-
MB	Growth Opportunities	Pecking order theory	+
Ln total assets	Size	Bankruptcy/ agency costs of debt	+
Ln total assets	Size	Asymmetric information/ Pecking order theory	-

### 3.2.1. Dependant variables

**Leverage:** for the purpose of this study, the dependent variable is capital structure. The most commonly used measure is the total debt ratio as total debt divided by total assets. Moreover, leverage is calculated as the ratio of long-term debt to the sum of long-term debt and book value of equity in different studies such as the U.K study of Panno (2003). Panno (2003) considers long-term debt as subtracting current liabilities and share-holders' fund from total liabilities and Booth et al. (2001) define long term debt as total liabilities minus current liabilities. However, we consider the interest bearing issue of long-term debt and thus provisions and long term accounts payable should be excluded. In sum, we use three different measures of leverage:

- 1) Leverage is total debt divided by total assets.

$$\text{leverage} = \frac{\text{Book value of total debt}}{\text{Book value of total assets}}$$

- 2) Long-term leverage is the ratio of long-term debt over the sum of long-term debt and book value of equity.

$$\text{LTBL} = \frac{\text{Book value of long term debt}}{\text{Book value of long term debt} + \text{Book value of equity}}$$

- 3) The leverage based on market value is estimated by long-term debt over the sum of long-term debt and market value of equity.

$$\text{LTML} = \frac{\text{Book value of long term debt}}{\text{Book value of long term debt} + \text{Market value of equity}}$$

### 3.2.2. Independent variables

**Effective tax rate (EFTR):** DeAngelo and Masulis (1980) and Fama and French (2002) estimate the effective tax rate to show the role played by interest payments, which is deductible from corporate income. It is the ratio between tax paid and earning before interest and tax.

**Growth opportunities (GO):** Rajan and Zingales (1995, p 1453) measure the market-to-book ratio "as the ratio of the book value of assets less the book value of equity plus the market value of equity all divided by the book value of assets".

**Profitability (ROA):** Consider as return on assets so it is measured as EBIT divided by the total assets (Fama and French, 2002; Titman and Wessels, 1998).

*Volatility of earnings ( $\sigma ROA$ ):* It is the standard deviation of return on assets (Rajan and Titman and Wesseles, 1988; Michaelas et al., 1999; Booth et al., 2001).

*Size:* The firm size variable is obtained by using the natural logarithm of total assets (Rajan and Titman and Wesseles, 1988 and Michaelas et al., 1999).

*Tangibility ( $Tg$ ):* it is measured as tangible assets divided by total assets of the firm (Rajan and Zingales, 1995; Frank and Goyal, 2003a,b).

*Dummy Variable:* our data covers 9 different industries of the U.K categorised according to SIC codes in Company Analysis database to control for industry effects. Therefore, eight industry dummy variables are included to control the industry effects.<sup>1</sup>

### **3.3. The Model**

We use panel model, which has some advantages in comparison to the other models. However, the panel data is unbalance because some firms do not provide their information in the observation period. It has been developed to treat the correlation between explanatory variables (Daskalakis and Psillaki, 2008). An additional advantage of combining cross-sectional and time series data is the possibility of considering the dependant and explanatory variables of each firm over the span time. We follow Booth et al. (2001) to examine the leverage determinants across firms' sizes, Equation 1:

#### **Equation (1)**

Where:

$Lev_{i,t}$ : One of the three measures of leverage for firm  $i$  at time  $t$

$EFTR_{i,t}$ : Effective tax rate of firm  $i$  at time  $t$

$\sigma ROA_{i,t}$ : Volatility of firm  $i$  at time  $t$

$Size_{i,t}$ : The size of firm  $i$  at time  $t$

$Tg_{i,t}$ : Tangibility of firm  $i$  at time  $t$

$ROA_{i,t}$ : Return on assets of firm  $i$  at time  $t$

$GO_{i,t}$ : Growth opportunities of firm  $i$  at time  $t$

*Dummy Variables:* Industry Classes

$\varepsilon_{i,t}$ : The error term

Our mode includes eight dummy variables to control for industry effects and thus Least Square Dummy Variables (LSDV) model is used based on fixed-effects assumptions. Booth et al. (2001) argues that the

insufficient direct proxies for factors like industry effects or bankruptcy costs imply that the capital structure models are not fully specified.

#### **4. Results and Discussions**

##### **4.1. Descriptive statistics**

Table 3 demonstrates a summary of the descriptive statistics of the different dependant and explanatory variables. Panel A, reports the mean of the sample variables. The dependant variables of the study are leverage, long-term book value of leverage (LTBL), and long-term market value of leverage (LTML). The firm characteristics using as determinants of different measures of leverage include size, profitability, effective tax-rate (EFTR), growth opportunities (MB) and tangibility. Table 3 provides evidence on affect of size on long-term debt ratio. Large companies apply more long-term debt in their capital structure, the mean of long-term leverage for those companies is 0.32 compared to small firms 0.10. Therefore, as firms become larger, their portion of long-term debt in their capital structure becomes larger. Small firms are financing constraints; they use more debt as short-term debt. The results are consistent when we consider total debt ratio as well as long-term debt ratio based on book value.

The table also shows a clear pattern of higher profitability for larger firms. In fact, mean return on assets is negative for the smallest quintile over the observation period. In addition, it shows as companies become larger, the level of tangibility increase while, their volatility and growth opportunities decrease. Moreover, larger firms have greater effective tax rate relative to smaller companies.

Panel B, table 3 provides the t-statistics of the differences in means of each variable between the smallest and the largest companies. All differences in means are statically significant at the 0.05 level.

In sum, the results show that small firms and large firms are different significantly in profitability, tangibility, effective tax rate, and risk. Small companies are those with greater default risk, growth opportunities and less profitability and tangibility. While, large companies are those companies with higher profitability, tangibility and less volatility and growth opportunities.



**Table 3: Means of dependant and independent variables**

Leverage is total debt over total assets. Long term book leverage (LTBL) is long-term debt to book value of capital employed (long-term debt plus book value of equity) and long-term market leverage (LTML) is long-term debt over market value of capital employed (long-term debt plus market value of equity). Tangibly is total tangible fixes assets over total assets. Size is natural logarithm of total assets. Profitability is the ratio between earning before interest and tax with total assets. Market to book assets ratio is the ratio of the book value of assets less the book value of equity plus the market value of equity all divided by the book value of assets. Effective tax rate is corporate tax over earning before interest and tax. Volatility is the standard deviation of return on assets. All the explanatory variables are 17 year average (1990-2006).

**Panel A: Means of dependant and independent variables**

Size	Leverage	LTBL	LTML	Tangibility	Size	Profitability	MB	EFTR	Volatility
Smallest	0.20	0.10	0.14	0.30	2.26	-0.11	0.72	0.09	1.52
2	0.22	0.13	0.15	0.34	3.23	0.00	0.48	0.11	0.48
3	0.25	0.16	0.18	0.37	4.05	0.05	0.21	0.15	0.39
4	0.30	0.20	0.20	0.36	5.13	0.08	0.18	0.19	0.28
Largest	0.38	0.32	0.28	0.40	7.37	0.10	0.18	0.26	0.19
Total	0.26	0.23	0.20	0.37	4.40	0.022	0.22	0.16	0.57

**Panel B: T-statistics of the differences in Means between smallest and largest companies**

t-test	-4.65	-23.06	-6.84	-8.76	-172.17	-20.19	21.417	-2.56	4.45
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01

#### 4.2. Results and Discussion

Table 4 presents a matrix of the Pearson Correlations between all variables. Table 4 reports the results for the smallest (quintile 1), medium (quintile 3), and largest (quintile 5) companies. The table shows that there is a significant negative relationship between leverage at three different measures and risk for small and large companies in line with bankruptcy hypothesis. Moreover, all level of leverage is significantly related to size and tangibility across firms' sizes. The positive association between leverage, size and tangibility support the bankruptcy and agency hypotheses. In contrast, the relationship between the three different

measures of leverage and firms' effective tax rates is not significant for all firms' sizes. It shows that tax effects are not important factors to affect their capital structure and thus firms choose their optimal capital structure to mitigate the bankruptcy and agency costs.

Table 4 also shows that leverage decreases significantly with market-to-book ratio and this result is consistent with the trade-off theory considering agency costs. It suggests that firms with high growth opportunities use less debt to mitigate the underinvestment and asset substitution problems.

**Table 4: Pearson Correlation Matrix**

Leverage is total debt over total assets. Long term book leverage (LTBL) is long-term debt to book value of capital employed (long-term debt plus book value of equity) and long-term market leverage (LTML) is long-term debt over market value of capital employed (long-term debt plus market value of equity). Tangibly is total tangible fixed assets over total assets. Size is natural logarithm of total assets. Profitability is the ratio between earning before interest and tax with total assets. Volatility is the standard deviation of return on assets. Effective tax rate is corporate tax over earning before interest and tax. Market to book assets ratio is the ratio of the book value of assets less the book value of equity plus the market value of equity all divided by the book value of assets.

Size 1 (Smallest companies)

Probability	Leverage	LTBL	LTML	EFTR	MB	Profitability	volatility	Size	Tangibility
Leverage	1								
LTBL	0.690***	1							
LTML	0.581***	0.695***	1						
EFTR	0.027	0.007	0.004	1					
MB	-0.042**	-0.081***	-0.297***	-0.011	1				
Profitability	-0.023	-0.054***	0.093***	0.017	-0.344***	1			
Volatility	-0.043**	-0.050***	-0.045***	0.005	-0.035**	0.012	1		
Size	0.175***	0.089***	0.477***	0.008	-0.563***	0.231**	-0.032*	1	
Tangibility	0.309***	0.225***	0.357***	0.000	-0.176***	0.089***	0.031*	0.160***	1

Size 3 (Medium sized companies)

Probability	Leverage	LTBL	LTML	EFTR	MB	Profitability	volatility	Size	Tangibility
Leverage	1								
LTBL	0.789***	1							
LTML	0.676***	0.766***	1						
EFTR	0.015	0.000	0.005	1					
MB	-0.187***	-0.136***	-0.378***	-0.018	1				
Profitability	-0.015	-0.004	-0.014	0.031*	-0.181***	1			
Volatility	0.083***	0.078***	0.026	0.004	0.013	-0.049***	1		
Size	0.345***	0.314***	0.633***	0.004	-0.750***	0.073***	-0.009	1	
Tangibility	0.282***	0.233***	0.353***	0.015	-0.196***	0.096***	-0.072***	0.198***	1

**Size 5 (Largest companies)**

Probability	Leverage	LTBL	LTML	EFTR	MB	Profitability	volatility	Size	Tangibility
Leverage	1								
LTBL	0.860***	1							
LTML	0.733***	0.723***	1						
EFTR	0.022	0.001	0.010	1					
MB	-0.188***	-0.160***	-0.431***	0.001	1				
Profitability	-0.144***	-0.135***	-0.260***	0.011	0.055***	1			
Volatility	-0.059***	-0.058***	-0.025	0.007	0.062***	-0.099***	1		
Size	0.226***	0.226***	0.340***	0.002	-0.421***	-0.042**	-0.018	1	
Tangibility	0.237***	0.105***	0.343***	-0.017	-0.233***	0.047***	-0.091***	0.194***	1

\*\*\*, \*\*, \* indicate that the estimate is significant at the 1 %, 5%, and 10% level respectively

**Table 5: Estimated Least Squares Dummy Variables for leverage determinants**

Leverage is total debt over total assets. Long term book leverage (LTBL) is long-term debt to book value of capital employed (long-term debt plus book value of equity) and long-term market leverage (LTML) is long-term debt over market value of capital employed (long-term debt plus market value of equity). Tangibly is total tangible fixes assets over total assets. Size is natural logarithm of total assets. Profitability is the ratio between earning before interest and tax with total assets. Effective tax rate is corporate tax over earning before interest and tax. Volatility is the standard deviation of return on assets. Market to book assets ratio is the ratio of the book value of assets less the book value of equity plus the market value of equity all divided by the book value of assets. The regression controls for industry effects.

Smallest companies	Leverage	LTBL	LTML
EFTR	0.003 (1.54)	0.001 (0.21)	0.000 (0.19)
MB	-0.016*** (-4.82)	-0.042*** (-9.79)	-0.034** (-2.09)
Profitability	-0.016*** (-3.14)	-0.015*** (-2.30)	-0.012*** (-2.30)
Volatility	-0.010** (-2.53)	-0.023*** (-2.20)	-0.018*** (-2.89)
Size	0.032*** (10.64)	0.036*** (9.56)	0.077*** (24.35)
Tangibility	0.188*** (17.31)	0.189*** (13.59)	0.219*** (18.90)
Industry effects	Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.535	0.510	0.417
F-Statistic	87.00	76.85	108.23
P-value	0.000	0.000	0.000

Medium companies	Leverage	LTBL	LTML
EFTR	0.001 (1.03)	0.000 (0.02)	0.000 (0.34)
MB	-0.018*** (-7.48)	-0.033*** (-9.95)	-0.026*** (-11.99)
Profitability	-0.017* (-1.62)	-0.001** (-2.07)	-0.034*** (-3.57)
Volatility	-0.008*** (-6.02)	-0.010*** (-5.39)	-0.004*** (-3.33)
Size	0.072*** (18.74)	0.100*** (19.46)	0.136*** (39.82)
Tangibility	0.117*** (13.12)	0.124*** (10.35)	0.100*** (17.99)
Industry effects	Yes	Yes	Yes

Adjusted R <sup>2</sup>	0.61	0.47	0.50
F-Statistic	90.42	79.86	223.78
P-value	0.000	0.000	0.000

#### **4.2.1. Leverage determinants across firm's size**

To consider the joint effect of the variables considering the costs and the benefits, we report the regression results in table 5. It represents the results of the Least Squares Dummy Variables based on the panel data analysis after controlling for industry effects. As Table 5 shows, the regression coefficients are estimated for the quintiles, however, our main focus is to study small, medium and large companies (quintiles, 1, 3, 5, respectively)<sup>2</sup>.

#### **Tax hypothesis**

The results show that the regression coefficients of the effective tax rate for leverage, long-term book (LTBL) value of leverage and long-term market value of leverage (LTML) in the three quintiles are not significant. The effective tax rate is not significant for small and medium companies are inconsistent with trade-off theory. This result is in line with Jordan et al (1998) who do not support the positive effects of the effective tax rate for the U.K small and medium sized companies. However, this coefficient is statistically significant for large companies. Pettit and Singer (1985) argue that small firms tend to operate in less concentrated markets and thus greater competitive pressures making lower profits margins resulting in a lower tax rate. Therefore, those firms may not take the tax benefits of debt.

Our results also show that the impact of tax effect is also economically insignificant for all firms and hence it indicates that the effective tax rate does not have a significant effect on the capital structure of all companies.

#### **Agency costs**

According to Jensen and Meckling (1976) the agency problem between share-holders and debt-holders are particular to firms with growth opportunities. The underinvestment and asset substitution problems can explain the negative relationship between growth opportunities and debt based on the trade-off theory. Moreover, the previous studies (e.g. Rajan and Zingales, 1995) use market-to-book

ratio as a proxy for growth opportunities and they show that the negative relation between leverage and market-to-book ratios exists in all G7 countries. In contrast, the pecking order theory predicts a positive association when firms have greater debt issued when they undertake higher growth opportunities.

Our results indicate a negative and significant relationship between leverage, LTBL, and LTML across firms' sizes. It predicts that firms with few growth opportunities have more leverage and hence a significant negative coefficient is reported in table 5 for those companies. In addition, the results imply that growth opportunities have more effect on the capital structure of small and medium companies relative to large companies. Small companies are more likely to suffer from the agency conflict between share-holders and debt-holders because they have higher growth opportunities than large companies.

With respect to the agency conflicts between managers and share-holders, we use profitability as a proxy for free cash flow problem. Table 5 reports that profitability is inversely related to three different measures of leverage for small, medium, and large companies in line with the pecking order theory. Myers (1984) argue that under the asymmetric information problem, managers assumed to have prior information while outside investors suffer from insufficient information about firms' characteristics. Therefore, firms prefer internal finance to external finance to mitigate the asymmetric information problems. In addition, a unit increase in profitability decrease leverage by -0.016 for smallest companies and 0.194 for largest firms. It shows that the economic effect of earnings on leverage is significantly more important for large companies and this finding is also consistent with Rajan and Zingales (1995) who argue that the negative effect of earnings is more important for large firms. They also argue that profitability for small firms may be a proxy for both internal fund and investment opportunities, which have conflicting effects on leverage. Based on this premise, we expect that profitability for our small companies is a proxy for investment opportunities and thus the effect of profitability is less significant. In this case, investment opportunities are more important than asymmetric information for small companies.

A negative relationship between leverage and profitability is supported by Rajan and Zingales (1995) and Panno (2003) for U.K large companies. They use different estimation models (panel and logit-probit models respectively) and provide similar evidence. Their result is also

consistent with Beattie et al. (2006), who surveyed the U.K listed companies. Accordingly, this provides strong support for the pecking order theory in contrast to the trade-off theory.

### **Bankruptcy costs**

Our findings suggest that when companies have higher volatility, they tend to have less leverage, LTBL and LTML. Our results for medium sized firms show a negative effect is not in line with Michaelas et al. (1999). They argue that default risk is not significant enough to compose a negative relationship between default risk and leverage for small and medium sized companies.

Moreover, we use natural logarithm of total assets (size) as an additional proxy for bankruptcy costs. As table 5 shows, size is positively related to all different measures of leverage in small, medium, and large companies. Greater bankruptcy costs for smaller firms indicate a positive relation between debt financing and size providing the evidence that larger firms are likely to borrow at cheaper rates.

A positive relation between size and leverage is consistent with Panno (2003) who studies the U.K large listed companies, Michaelas et al. (1999) based on small and medium sized firms, using logit and probit and panel models respectively and Lafer (1995), supporting the trade-off theory. However, Frank and Goyal (2007) argue that the prediction of the pecking order theory in relation with size is not clear. Large firms have better reputation in the markets composed them to mitigate the asymmetric information problems and thus are able to issue equity. Simultaneously, greater level of assets for large firms makes the adverse selection problem more important resulting in higher debt issued. Rajan and Zingales (1995) also do not find a positive relationship between leverage and size for all G-7 countries. For example, in Germany, leverage is significantly inversely related to size.

We also use tangibility to find the effects of bankruptcy costs. The empirical studies have suggested that firms with more tangible assets lose less their firm value when they go into bankruptcy and thus firms with higher collateral are expected to get more external finance. Marsh (1982), Titman and Wessles (1988), Michaelas (1999) and Frank and Goyal (2003, a, b) support the notation of a positive association between leverage and tangible fixed assets. The collateral effect on leverage is more special for long-term financing when the higher tangible assets, the higher the long-term debt ratio would expect to be (Panno, 2003). Our

findings provide strong evidence for concerning the significant positive relationship between leverage, LTBL, LTML, and tangibility across firms' sizes.

Our results also indicate how sensitive small and medium firms are to mitigate the bankruptcy probability by using tangible assets as collateral. Because, table 5 shows that the impact of collateral on leverage is 0.18 for small companies relative to 0.10 for large companies. Consequently, when small firms are able to insure lenders that their capital is secured, they can get more access to debt and thus the collateral value of assets plays an important role for capital structure of small companies.

Moreover, large firms show a very significant positive relationship between tangibility and market value of long-term leverage. The ratio of tangibility effect on the long-term leverage based on the market value for small companies is 0.22 compared to large companies 0.14. It indicates that bankruptcy costs of debt for small companies are strictly sever when they attempt to raise external funds composed them to be financing constraints. Lenders require greater collateral from small companies because it is difficult for them to assess the risk of those companies.

## 5. Conclusions

This study provides empirical results on the capital structure of the U.K listed firms including small, medium, and large firms based on a large panel data set during 1990-2006. Our analyses of 2,548 companies show that the interpretation of tax effects based on the trade-off theory does not hold for all observed companies. The results show that consistent with the tax hypothesis, the leverage of large companies is statistically positively related to the effective tax rate contracting to small and medium sized firms.

**Table 5 Cont.**

Largest companies	Leverage	LTBL	LTML
EFTR	0.000*** (2.70)	0.001** (2.32)	0.004** (2.25)
MB	-0.007*** (-4.17)	-0.009*** (-3.45)	-0.027*** (-18.35)
Profitability	-0.194** (-8.46)	-0.244*** (-7.28)	-0.032*** (-16.85)
Volatility	-0.007*** (-3.05)	-0.012*** (-3.64)	-0.001 (-0.61)



Size	0.018*** (8.85)	0.031*** (10.36)	0.018*** (10.41)
Tangibility	0.101*** (9.30)	0.038*** (2.38)	0.139*** (14.75)
Industry effects	Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.43	0.50	0.46
F-Statistic	139.43	128.82	142.37
P-value	0.000	0.000	0.000

(T-statistic) and \*\*\*, \*\*, \* indicate that the estimate is significant at the 1 %, 5% and 10% level respectively

In addition, consistent with agency conflicts, we find a strong and negative relationship between the level of debt and market-to-book ratio as a proxy for growth opportunities. The negative effect of growth opportunities and leverage is consistent with the previous studies using large companies (e.g. Rajan and Zingales, 1995, G-7 countries including U.K, and Lasfer, 1995 for U.K). However, Michaelas et al. (1999) and Jordan et al. (1998) find that leverage is positively related to growth opportunities for the U.K small and medium sized companies, they are financing constraints and thus use more debt to finance their capitals structure. In contrast to their results, we report a negative relationship between growth opportunities and leverage for small and medium listed companies in our sample showing that their capital structure affected by conflicts between share-holders and debt-holders and thus they can be similar to large companies.

With respect to bankruptcy costs, we use volatility of earnings to find the effects on bankruptcy on firms' capital structure. We find that volatility has significant and negative effects on capital structure across firms' sizes. Our results also support the role of asset tangibility across firms' sizes consistent with bankruptcy hypothesis. Moreover, size is used as an additional proxy for bankruptcy costs. We find that it is positively related to all different measures of leverage for small, medium, and large companies supporting bankruptcy costs.

Consistent with the pecking order theory, we find that profitability is inversely related to different measures of leverage for small, medium, and large companies. Myers (1984) argue that under the asymmetric information problem, managers assumed to have prior information while outside investors suffer from insufficient information about firms' characteristics. Therefore, firms prefer internal finance to external finance to mitigate the asymmetric information problems. In addition, our findings

show that the effect of earnings on leverage is significantly more important for large companies and this finding is also consistent with Rajan and Zingales (1995). They argue that profitability for small firms may be proxy for both internal fund and investment opportunities, which have conflicting effects on leverage. Based on this premise, we expect that profitability for our small companies is a proxy for investment opportunities and thus its effect of on leverage of small companies is less.

In sum, our findings show that both theoretical principles help to explain the capital structure of small, medium and large firms. However, greater trust should be placed in the trade-off theory. In addition, small firms differ from large companies in level of growth opportunities, structure of assets, and probability of bankruptcy and agency costs. Therefore different firms' characteristics are important to affect the sensitivity of leverage determinants and thus leverage determinants of large companies differ from small companies. In other words, leverage determinants are likely to be size dependant. More especially, bankruptcy costs and agency cost of debt are the fundamental determinants of firms' capital structure.

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#### End Note

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<sup>1</sup> The U.K industry classifications: Industry 0: agricultural, forestry, and fishing, Industry 1: Mining and construction, Industry 2: food, textile, paper and chemical products, Industry 3: manufacturing. Industry 4: utilities, Industry 5: Consumer goods, Industry 6, Financial services (they are excluded from our sample), Industry 7: leisure, personal services, Industry 8: health, personal and business services, Industry 9: others.