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Capital structure determinants: An empirical study in Taiwan

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The purpose of this paper is to present empirical evidence on the determinants of capital structure and firm value in a newly industrialized country. The firm characteristics are analyzed as determinants of capital structure according to different explanatory theories. Previous research mainly focused on the determinants of capital structure or the impact of capital structure on company value, while this study will discuss the effect of capital structure determinants on company value, with capital structure as mediating variable. The investigation has been performed using a sample of 647 companies listed on the Taiwan Stock Exchange (TSE) from 2005 to 2009. The findings of this study suggest that firm size, profitability and asset structure can be considered explanatory variables of capital structure. The firm size, profitability and capital structure affect book value. The determinants of market value are profitability and firm size. In addition, there are some differences in the capital structure among industry types. When the dependent variable is book value, firm size and growth opportunity have a greater impact on this in the electronic industry. Meanwhile, profitability and firm size have a greater impact on capital structure in non-electronic industries. When the dependent variable is market value, larger companies can borrow more debt and create more market value in the electronic industry. The capital structure negatively affects market value in electronic firms, but does not affect market value in non-electronic ones.

Key words: Capital structure, firm value, corporate finance, trade off theory, pecking order theory.

INTRODUCTION

In the past several decades, the role of a firm's capital structure has been an important issue in corporate finance. In practice, in order to maximize firm value and shareholder welfare, one important task for managers is to decide the appropriate capital structure. Researchers have examined this issue for over half a century, attempting to find the factors which affect the choice of capital structure. For example, Modigliani and Miller (1958) first showed that a company's value does not depend on its capital structure in perfect capital markets. In addition, various financing decisions are vital for firms' financial welfare. A number of theories have attempted to explain the variations in debt ratios across firms, and these suggest that the selection of capital structure

depends on attributes that determine the various costs and benefits associated with debt and equity financing. Researchers have emphasized the determinants of capital structure (Rajan and Zingales, 1995; Demircuc-Kunt and Maksimovic, 2002; Vasiliou and Daskalakis, 2009). For instance, Rajan and Zingales (1995) investigated how different country backgrounds affect capital structure. They found that among G-7 countries, country factors such as bankruptcy laws, the development of bond markets, and patterns of ownership would cause such differences. Demircuc-Kunt and Maksimovic (2002) also investigated whether the development of banks and stock markets affects capital structure. Finally, Vasiliou and Daskalakis (2009) examined whether differences in institutional characteristics result in different capital structure choices among various countries.

Large numbers of empirical studies on capital structure appeared in the 1980s, but these mainly focused on

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Table 1. The basic economic statistics of Taiwan.

Year	2005	2006	2007	2008	2009
GDP per capita (US\$)	16,449	16,911	17,596	17,833	16,895
GDP (billion US\$)	365	376	393	400	377
M ₂ (billion US\$)	746	791	803	848	920
NT\$/US\$ Exchange rate	32.85	32.60	32.44	32.86	32.03

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developed countries (Titman and Wessels, 1988; Rajan and Zingales, 1995; Bevan and Danbolt, 2002; Gaud et al., 2005). It was not until the last ten years that some researchers turned their attention to developing economies (Booth et al., 2001; Pandey, 2001; Chen, 2004; Chakraborty, 2010). However, since the securities efficiency and information transparency of developed countries are superior to those of developing ones, it is reasonable to assume that some differences exist between the two groups with regard to capital structure. This research focuses on the companies listed on the Taiwan Stock Exchange. Since Taiwan is categorized as a newly industrialized country, the results of this study may be valuable for use in making comparisons with those derived from other countries at different stages of development. Most importantly, previous research mainly focused on the determinants of capital structure or the impact of capital structure on company value, while this study will discuss the effect of capital structure determinants on company value, with capital structure as the mediating variable. Consequently, the relationships among these factors may be better understood.

Taiwan's economic growth rate was maintained at over 9% from the early 1970s to late 1990s, until the arrival of Asian financial crisis. It is one of the so-called Four Dragons in Asia, and in 2010, was the 16th largest economy in the world. In 1980, Taiwan government strongly supported greater investment in the electronics industry via tax relief methods, therefore, attracting considerable resources into this sector, including money and people. Now, Taiwan's electronics industry plays a crucial role in the world economy, as most computer and electronic components are made in Taiwan, where they earn a large amount of foreign exchange for the country.

Foreign trade is the economic lifeline of Taiwan. For many years, Japan and the USA were its two major trading partners, but because of the rise in trade with China, they have been in second and third place, respectively, since 2005. The financial crisis that began in 2008 led the world economy into a serious recession, and Taiwan was affected due to its reliance on foreign trade. In 2009, its imports and exports, both declined substantially, and the country's unemployment rate increased very rapidly. How to adjust to these difficult industrial and economic conditions thus became a very important issue for the Taiwanese government. Taiwan's GDP was US\$

377 billion in 2009, 5.67% lower than in 2008, and the GDP per capita in 2009 was US\$ 16,895, 5.25% lower than that in 2008. The basic macro economic statistics of Taiwan are listed in Table 1.

A poor decision on capital structure policy may lead a firm to severe financial distress. There are a number of factors, such as taxes, which favor a company's use of debt, but others, such as the cost of bankruptcy, limit the tax advantages. The capital structure of a firm thus becomes an information signal and can mitigate conflicts between management and shareholders. It is hypothesized that firms in Taiwan may exhibit a different capital structure with limited access to external finance due to the developing nature of the local financial market. Consequently, the purpose of this paper is to investigate the determinants of capital structure and firm value. We then compare the results for different types of industry in Taiwan.

LITERATURE REVIEW

Modigliani and Miller (1958) were the first to study the relationship between capital structure and firm value. They argued that, under certain conditions, the ratio of debt and equity does not affect firm value. These conditions include the absence of taxes and transaction costs in the capital market, and a lack of information asymmetry between various market players. They concluded that a company's greater or lesser value depends on the ability to generate value by its assets, and that it is irrelevant whether funds come from internal or external sources. However, these assumptions are inconsistent with what we observe in reality, because capital structure does matter and banks are unwilling to finance a project entirely with debt, and this has been supported by numerous researchers, such as Hamada (1969) and Stiglitz (1974).

In response to this viewpoint, Modigliani and Miller (1963) admitted that the existence of taxes would impact firm value. For example, companies gain some advantages when using debt rather than internal capital, as they can benefit from tax shields, and therefore, are encouraged to use debt. Specifically, this benefit is because the interest payments associated with debt are tax deductible. In contrast, payments associated with

equity, such as dividends, are appropriated from profits. This viewpoint is consistent with the trade off theory, which mainly describes the benefit (tax shield) and the costs of debt (agency and bankruptcy costs) (Jensen and Meckling, 1976; Myers, 1977; Harris and Raviv, 1990). It suggests that firms choose the optimal capital structure by trading off tax benefits against costs, and both Taggart (1977) and Marsh (1982) provided evidence that firms adjust their capital structures toward a target debt to value ratio. The trade off choice encompasses several aspects, including the exposure of the firm to bankruptcy and agency costs, set against the tax benefits associated with debt use. The use of debt financing, increases a firm's bankruptcy risk when it is unable to fulfill its debt obligations. Bankruptcy costs are directly incurred when the perceived probability that the firm will default on financing is greater than zero. One of the bankruptcy costs is the liquidation cost, which represents the loss of value as a result of liquidating the net assets of the firm. This liquidation cost reduces the proceeds to the lender, should the firm default on finance payments and become insolvent. Consequently, firms will incur higher finance costs because of the potential liquidation cost (Cassar and Holmes, 2003).

Agency theory, advanced by Jensen and Meckling (1976), is based on the conflict between corporate managers, outside shareholders and bondholders. The theoretical principles underlying the capital structure, financing and lending choices of firms can be described either in terms of a static trade off choice or pecking order framework. Jensen and Meckling (1976) identified two types of conflict; those between bondholders and shareholders, and those between shareholders and managers. The conflict between shareholders and bondholders is due to the issue of moral hazard, as both have different claims on the firm. The conflict between shareholders and managers arises because managers are often in the position to use the firm's resources to their advantage, and thus, negatively affect shareholder wealth. For example, managers may invest in projects that reduce the value of the firm but enhance their control over its resources (Harris and Raviv, 1990). Myers (1984) referred to the pecking order hypothesis - which was originally proposed by Donaldson (1961) as a description of financing practice - as a way of describing the priority of different options in choosing means of financing. According to pecking order theory, the relationship between capital structure and firm value is due to information asymmetry - managers have information that investors do not (Myers, 1984; Shyam-Sunder and Myers, 1999; Frank and Goyal, 2003). Managers as insiders, knowing more about the value of the firm than outsiders such as general investors, would avoid issuing equity when their companies are undervalued. This suggests that firms will initially rely on internally generated funds, that is, undistributed earnings, when there is no information asymmetry, and will then turn to debt if additional funds are needed. Finally, they will issue equity

to cover any remaining capital requirements. Myers and Majluf (1984) argued that if a firm issues no new securities and resorts only to its available retained earnings to finance an investment opportunity, the issue information asymmetry can be totally resolved. The theory suggests there is no optimal ratio of debt which can predict when firms will prefer internal to external finance.

Although empirical studies have been conducted worldwide, the results are still mixed. On the basis of the trade off theory, Taggart (1977) and Bradley et al. (1984) found that companies tend to keep to an optimal level of debt. On the other hand, other researchers found a strong relationship between debt ratio and profitability, consistent with the pecking-order theory (Titman and Wessels, 1993; Rajan and Zingales, 1995; Shyam-Sunder and Myers, 1999; Mazur, 2007). Moreover, Gaud et al. (2005) and Hann and Hinloopen (2003) found empirical evidence that supports both theories.

METHODOLOGY AND HYPOTHESES

In this study, we select the explanatory variables based on the alternative capital structure theories and previous empirical work. The variables include firm characteristics, such as profitability, growth rate, assets structure, firm size and industry characteristics.

Profitability and capital structure

Corporate performance has been identified as a potential determinant of capital structure. The trade off model shows that profitable firms will employ more debt, since they are more likely to have a high tax burden and low bankruptcy risk (Ooi, 1999). In contrast, the pecking order or asymmetric information hypothesis postulates that companies prefer internal financing. Myers (1984) claimed that there is a negative relationship between debt and profitability, because successful companies do not rely on much external funding. Barton et al. (1989) agreed that firms with a high profit rate, all things being equal, will maintain a lower debt ratio, since they are able to generate the required funds from internal sources. This is because a firm would prefer internal finance to other sources of funding. Moreover, as profitable firms are likely to have more retained earnings, a negative relationship is expected between capital structure and past profitability (Myers and Majluf, 1984), and the majority of empirical evidence has shown that profitability is negatively correlated with debt ratios (Bevan and Danbolt, 2002; Mazur, 2007; Ezeoha, 2008). Accordingly, we propose the first hypothesis as; H1: Profitability is negatively related to capital structure.

Growth and capital structure

According to trade off theory, if companies with greater growth opportunities have more retained earnings, then, they issue more debt to maintain the target debt ratio, and thus, they will tend to have a higher capital structure. However, Auerbach (1985) argues that capital structure is inversely related to growth rate, because the tax deductibility of interest payments is less valuable to fast growing firms, since they usually have non-debt tax shields. Some empirical evidence in support of this negative relationship can be found in Rajan and Zingales (1995), and Barclay and Smith (1996).

According to the pecking order theory, high growth firms have a greater need for funds, are more likely to exhaust internal funds, and so can be expected to borrow more. In support of this, some reports found that future growth is positively related to capital structure (Michawlas et al., 1999; Bevan and Danbolt, 2002). Based on this, we present the following hypothesis; H2: Growth is positively related to capital structure.

Asset structure and capital structure

Asset structure is an important determinant of the capital structure of a firm, and is closely related to the notion of financial distress costs. Myers (1977) argued that tangible assets can support a higher debt level as compared to intangible ones. The more a firm's assets are tangible and generic, the greater its liquidation value (Harris and Raviv, 1991). According to the trade off theory, tangible assets act as collateral and provide security to lenders in the event of financial distress. Studies have also revealed that capital structure is positively associated with a firm's assets, because these can be used as collateral to reduce the potential agency cost associated with debt usage according to static trade off theory (Stulz and Johnson, 1985). On the other hand, the pecking order theory predicts that firms holding more tangible assets will be less prone to asymmetric information problems, and thus, less likely to issue debt. Sogorb-Mira (2005) provided empirical evidence of a positive relationship between debt and tangible assets, but Mazur (2007) and Ezeoha (2008) provided empirical evidence of a negative relationship between debt and asset structure. Consequently, the following hypothesis is proposed; H3: The asset structure is negatively related to capital structure.

Firm size and capital structure

Size plays an important role in determining the capital structure of a firm. Rajan and Zingales (1995) reported that larger firms tend to be more diversified and have lower probability of failure. Lower expected bankruptcy costs enable large firms to take on more debts, as they have easier access to the market, and can borrow at better conditions. Following the trade off models of capital structure, larger firms should accordingly employ more debt than smaller ones. A positive relationship is thus expected between a firm's size and its capital structure (Harris and Raviv, 1990; Berger et al., 1997; Barelay and Smith, 1996; Bhaduri, 2002; Bevan and Danbolt, 2002).

However, Myers and Majluf (1984) suggested that information asymmetries are smaller in big companies, and thus, they would have more incentives to issue equity instead of debt. Titman and Wessels (1988) reported a negative relationship between debt ratio and firm size, and found that small firms rely less on equity issues because they face a higher per unit issue cost. Ezeoha (2008) also found that the relationship is negative. There is considerable evidence that the size of a firm plays an important role in capital structure decisions, and sales quantity is used to measure firm size in this study. Accordingly, we present the next hypothesis; H4: The size of the firm is positively related to capital structure.

Profitability and firm value

According to the conclusions of Haugen and Baker (1996) and Yang et al. (2010) the higher the corporate profitability the greater the surplus attributable to shareholders. So, it can be expected that the value of the company will be higher. Based on this, we present the fifth hypothesis; H5: Profitability is positively related to firm value.

Growth and firm value

Myers (1977) pointed out that high-growth companies will give up investment programs with a positive net present value to increase corporate value and shareholder wealth. Therefore, the company's growth opportunities have a significantly positive impact on corporate value (Claessens et al., 2002; Maury, 2006; King and Santor, 2008), and so, the next hypothesis is; H6: Growth is positively related to firm value.

Asset structure and firm value

A firm's tangible assets can be considered as the guarantees that are offered to its creditors', and tangible asset structure increases the warranties of debt and influences firm value (Rajan and Zingales, 1995). Based on this, we present the seventh hypothesis; H7: The tangible asset structure is positively related to firm value.

Firm size and firm value

Large companies possess the ability to undertake diversification, attain economies of scale and a lower cost of bankruptcy, and so, usually, their credit ratings are higher. Therefore, they can get lower borrowing costs and higher stock issue prices, and so the value of large companies is higher (Himmelberg et al., 1999). In contrast, Michaelas et al. (1999) found that fewer small businesses can benefit from the interest tax shield, and instead, face a relatively high potential bankruptcy cost. Bankruptcy costs will reduce the company's value, and so, company size will positively affect its value, and thus we present the following hypothesis; H8: The size of a firm is positively related to firm value.

Capital structure and firm value

Modigliani and Miller (1958) originally asserted that there is no relationship between capital structure and firm value. In 1963, they modified this conclusion, and stated that an optimal level of debt would maximize firm value. However, at least, one study (Myers, 1984) claims that there is no optimal level of debt. Capital structure can influence firm value by encouraging shareholders to monitor management's actions (Shleifer and Vishny, 1986), and encouraging the firm to make specific investments in human capital and promoting efficiency (Zingales, 2000). In addition, the company's level of debt will affect its market value, since the changes in its capital structure transmit information about the future of the firm. Finally, an announcement of a reduction in the number of stocks being offered in exchange for a debt has a positive effect on the market (Cornett and Travlos, 1989; Copeland and Lee, 1991), and so, we propose the ninth hypothesis; H9: The capital structure is negatively related to firm value.

Industry type

Taiwan's electronic industry, including its information technology, telecommunication equipment, consumer electronics, semiconductor, display panel and printed circuit board companies, has formed a complete industrial supply chain, from upstream to downstream, over the past few years. Such firms have thus acquired a competitive advantage by their superior management and manufacturing capabilities, and gained market share by achieving relatively low costs. Many firms in Taiwan's electronic industry are now the main OEMs (original equipment manufacturers) for major IT companies in Europe and America. The electronic industry in Taiwan pays special attention to stock-based pay, and gives employees shares

Table 2. The basic statistics of the Taiwanese security market.

Year	2005	2006	2007	2008	2009
No. of listed companies	691	688	698	718	741
Total market value at year-end (billion US\$)	474	587	652	356	657
Market trading value (billion US\$)	570	724	1,001	791	899
Security turnover rate (%)	127	134	160	138	188

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Table 3. Variables and measurements.

Variable	Proxies
DEBT	Total debt / Total assets
ROA	Benefit before tax / Total assets
GROW	Sales - Sales _{t-1} / Sales _{t-1}
FIX	Fixed assets / Total assets
SIZE	Log(Assets)
BVALUE	(Total assets- Total debt) / Stock shares
MVALUE	Market price of per share in the end of year

at no cost or well below the market price to motivate them. This key difference in the wage structure between the electronics and non-electronics sectors may have an impact on their capital structures. Moreover, past empirical efforts on factors influencing capital structure have included industry classification (Errunza, 1979; Aggarwal, 1981; Murphy, 2003), and it is therefore hypothesized that: H10: Capital structure will vary with the type of industry.

EMPIRICAL RESULTS

Taiwan's security exchange began in 1962. At first, the exchange was very small, but the number of listed companies and trading volume gradually increased along with the country's economic development. Enterprises need to be established for at least five years to be listed on the exchange, with capital of at least US\$ 18 million. In 2005, there were 691 companies listed on the exchange, and this number has continued to increase year by year, reaching 741 in 2009. The total amount of securities traded was US\$ 570 billion in 2005, and although this fell due to the financial crisis in 2008, it rose again to US\$ 899 billion in 2009. The total end-of-period market value has also risen consistently, only falling in 2008, while the stock turnover rate rose from 127% in 2005 to 188% in 2009. Because there are new companies listed every year, and some listed companies are forced off the market due to serious losses, the number of firms on the exchange is not the same in each year. In this study, companies that are listed on the stock market for five consecutive years (in this case, 2005 to 2009) with complete data are adopted for the survey, giving this study a high degree of reliability. Each variable is averaged for the five-period data. A total of 647

companies are chosen according to these criteria, including 302 electronic and 345 non-electronic companies. The basic statistics of the Taiwanese securities market are listed in Table 2.

The dependent variable is defined as firm value, and there are two measurements of this, book and market value. Book value is the net assets per share at the end of the year, while market value is the stock price per share at the end of the year. The mediating variable, which is capital structure, is defined in terms of debt ratio, which is given as debt divided by total assets. The independent variables are profitability, asset structure, growth and firm size. The moderating variable is industry type. The definitions of the variables are presented in Table 3, and they follow those used in previous studies (Cassar and Holmes, 2003; Esperanca et al., 2004; Hall et al., 2004; Sogorb-Mira, 2005; Abor and Biekpe, 2009).

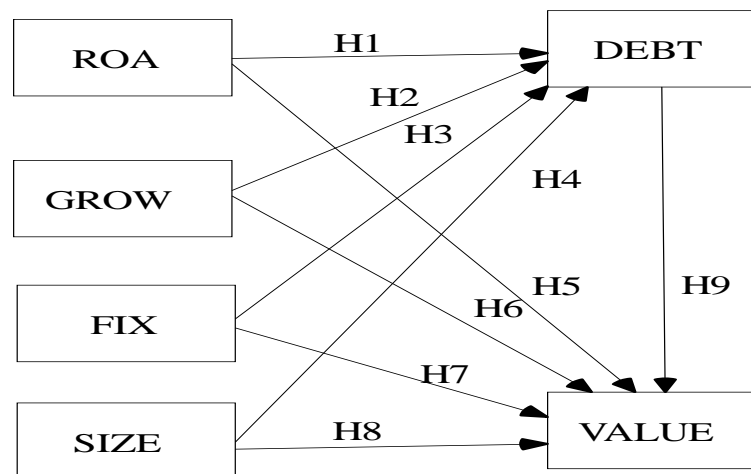
The capital structure of listed companies in Taiwan was 38.08% on average from 2005 to 2009. In the same period, the average return on assets was 5.79%, the average revenue growth rate was 9.44%, the average tangible assets to total assets ratio was 22.30%, and the average total assets was US\$ 35 million. In addition, the average stock end-of-period book value per share was US\$ 0.53, and the average end-of-market price of the stock was US\$ 0.91 per share. The related statistics and correlation matrix of the variables are given in Table 4. The variable of DEBT has significantly positive correlations with the FIX and negative correlations with ROA, BVALUE and MVALUE. In addition, BVALUE has significantly positive correlations with SIZE, FIX and ROA. The relationship of BVALUE and MVALUE is 0.802.

Structural equation modeling (SEM) was used to

Table 4. Descriptive statistics and correlation matrix.

	Mean	S.D.	DEBT	ROA	GROW	FIX	SIZE	BVALUE	MVALUE
DEBT	38.08	15.01	1						
ROA	5.79	6.61	-0.373**	1					
GROW	9.44	27.98	-0.005	0.211**	1				
FIX	22.30	15.01	-0.011	-0.197**	-0.167**	1			
SIZE	9.76	0.51	0.265**	0.093**	0.249**	-0.051	1		
BVALUE	0.53	0.24	-0.329**	0.615**	0.211**	-0.154**	0.284**	1	
MVVALUE	0.91	1.05	-0.194**	0.582**	0.157**	-0.189**	0.150**	0.802**	1

** if $P < 0.01$, * if $P < 0.05$.

**Figure 1.** The relationships of variables.

develop and test the model in this study. The SEM program estimates unknown coefficients in the set of linear structural equations by the maximum likelihood method using the correlation/variance-covariance matrix of observed variance. Decomposition of effects based on the standardized solution was computed, and all significant direct, indirect, and total effects ($p < 0.05$) were reported. The hypotheses are presented in Figure 1.

In this study, we investigate all listed firms on the TSE and discuss the influence of industry type. We separate the observations into non-electronic firms ($n = 345$) and electronic firms ($n = 302$). There are two measurement of firm value. First, we use the book value of the firm as the dependent variable to examine the determinants of capital structure and firm value. To perform a group comparison, we have to choose a pair of free regression coefficients in the model and set up a single path regression weight. When the value of $CMIN/DF$ is smaller than 2, then the coefficients are no different in both industries.

The results are presented in Figure 2 and Table 5. Book value explains 47% of the total variance in reducing the financial perspective. The ROA negatively affects the

capital structure in all listed firms, and therefore, H_1 is supported. There is a negative relationship between profitability and capital structure, which shows that successful companies do not need to depend so much on external funding. The path coefficient of non-electronic firms is greater than that of electronic firms, and pecking order theory is able to explain this. Firm growth does not affect the capital structure in all listed firms, and therefore, H_2 is not supported in all listed firms, as the relationship between growth and capital structure is not significant. However, when the sample is divided into two groups, the path coefficients are significantly positive in electronic firms, which supports with the hypothesis. In contrast, the path coefficients are significantly negative in non-electronic firms. In Taiwan, the electronic industry is mainly export-oriented, with many firms acting as component suppliers to major international IT companies. To grow fast in this context requires more working capital, which needs more external debt.

The fixed assets ratio negatively affects the capital structure in all listed firms, and so, H_3 is supported. Firms holding more fixed assets will be less prone to asymmetric information, and this is consistent with trade

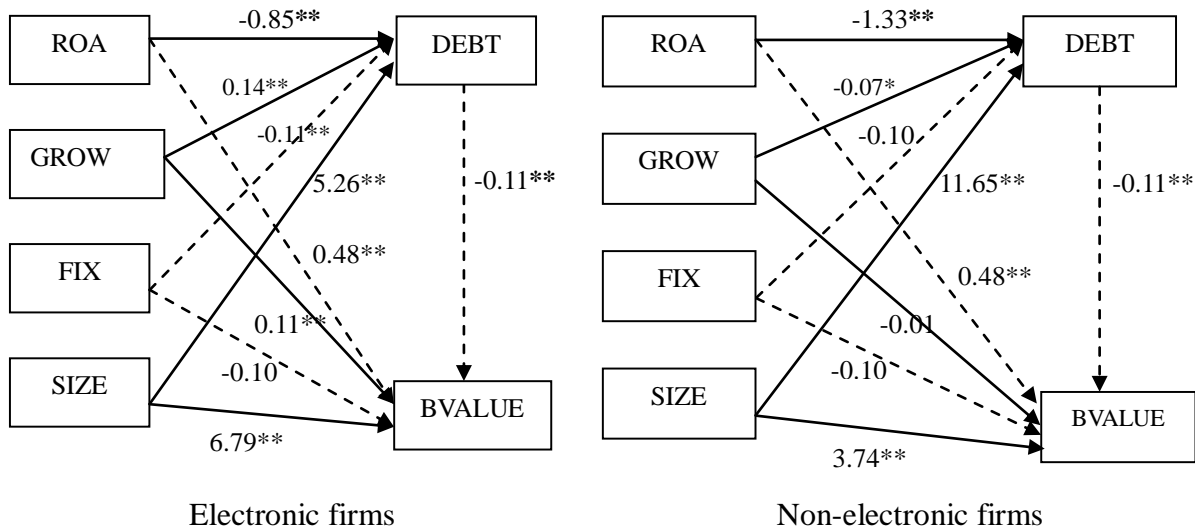


Figure 2. The paths of book value.

Table 5. The determinants of book value.

Hypotheses	Predicted	Dependent variable: book value		
		All firms (N=647)	Electronic firms (N=302)	Non-electronic firms (N=345)
H ₁ : ROA→DEBT	-	-0.97**	-0.85**	-1.33**
H ₂ : GROW→DEBT	+	0.00	0.14**	-0.07*
H ₃ : FIX→DEBT	-	-0.08**	-0.11*	-0.10
H ₄ : SIZE→DEBT	+	8.76**	5.26**	11.65**
H ₅ : ROA→BVALUE	+	0.59**	0.45**	0.50**
H ₆ : GROW→BVALUE	+	0.01	0.11**	-0.01
H ₇ : FIX→BVALUE	+	-0.02	-0.06	0.00
H ₈ : SIZE→BVALUE	+	4.30**	6.79**	3.74**
H ₉ : DEBT→BVALUE	-	-0.11**	-0.13**	-0.11**
R ²		0.47	0.48	0.49

** if P < 0.01, * if P < 0.05.

off theory. When the sample is divided into two groups, the path coefficient of the electronic firms is significantly negative, but the path coefficient of the non-electronic firms is not significant. The path from size to capital structure is positive and significant in all listed firms, and thus, H₄ is supported. This indicates that larger firms tend to be more diversified and have a lower probability of failure, and thus can borrow more debt. This is consistent with trade off theory, as well as with the empirical findings of Cooley and Quandrini (2001) and Faulkender and Petersen (2006). The phenomenon that larger companies have greater liabilities is more obvious in the non-electronic industry, as the related path coefficient of firms in the latter is greater than that of electronic firms, and pecking order theory is able to explain this. Profitability positively affects value in all listed firms, and therefore, H₅

is supported. For companies with higher profitability, the accumulated retained earnings will increase firm value, and this is true for both electronic and non-electronic firms.

Growth does not affect the firm value in all listed firms, and therefore, H₆ is not supported. Growth opportunity causes variations in firm value, and larger variations are often interpreted as greater risk. This may explain why firms with greater growth opportunity will not create higher firm value. However, in the electronic industry, the growth rate has a significant positive effect on firm value. Giving employees free or subsidized shares is one way that firms in the electronic industry use to attract talented people. However, this method will increase the share capital, thereby diluting the company's earnings per share. Companies in this situation thus need to continue

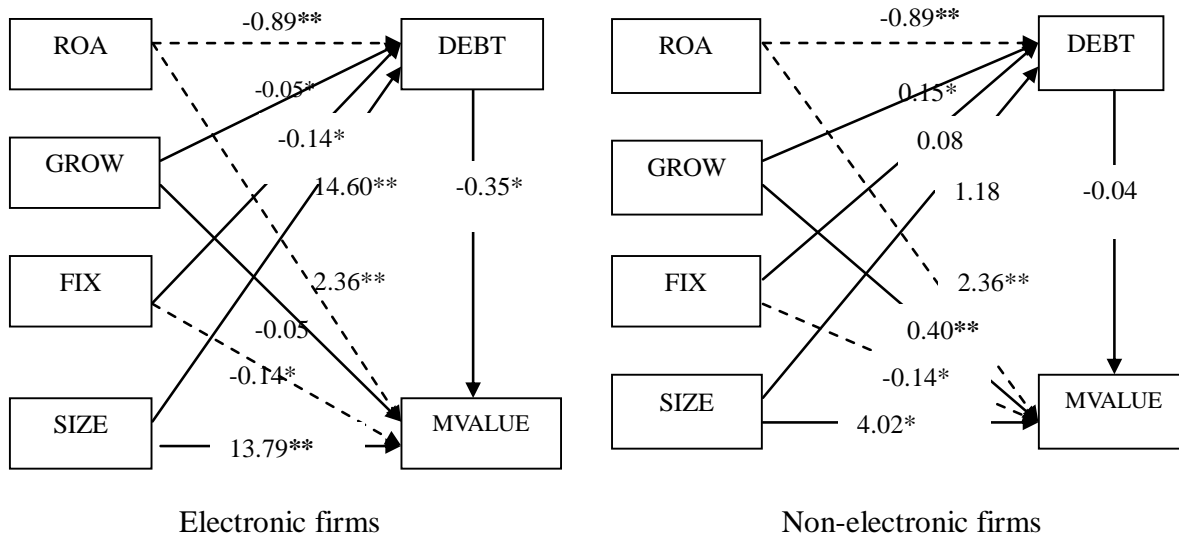


Figure 3. The paths of market value.

to grow in order to create corporate value. The fixed assets ratio does not affect the firm value in all listed firms, and so, H_7 is not supported, as a higher fixed assets ratio cannot guarantee higher firm value. When the sample is divided into two groups, the path coefficients are both insignificant for electronic and non-electronic industries, and we can thus conclude that asset structure does not affect firm value.

The path from size to firm value is positive and significant in all listed firms, and thus, H_8 is supported. This indicates that larger firms find it easier to obtain financial resources from lenders and then create more value. When the sample is divided into two groups, the path coefficients are both significant for the electronic and non-electronic industries, and the coefficient of the former is bigger. This shows that as company size grows in the electronic industry, the range of the increase in firm value is bigger than in the non-electronic industry. Greater firm size will generate increased economies of scale, thus, boosting firm value.

Finally, the capital structure negatively affects firm value, and thus, H_9 is supported, and this result is not consistent with the theory of an optimal capital structure, which structure maintains that a company has a target capital structure. Under this target level, the margin benefit of tax shield is the same as the marginal cost of funding, at which point, the firm value will be maximized, which means that the relationship between capital structure and firm value is nonlinear. However, in our empirical study, the relationship between capital structure and corporate value is negatively linear. When separating the samples into two groups, both path coefficients of the electronic and non-electronic industries are still significantly negative.

We use market value as the dependent variable to

examine the determinants of capital structure and firm value, and the results are listed in Figure 3 and Table 6. The factors that have an impact on capital structure are profitability and size, which are the same factors that have impact on market value. The regression coefficient from capital structure to market value is not significant, so we conclude that the capital structure does not have any mediating effects in this model. We then continue to divide the samples into electronic and non-electronic companies to compare the differences between them. Comparing the path coefficients between the electronic and non-electronic firms, the results show that profitability has a negative impact on capital structure in both groups, and this supports pecking order theory, in that, it shows that more profitable companies with sufficient funds are able to rely less on external funds.

Therefore, profitable companies have a low capital structure, and profitability has a positive impact on market value in both industries. This result also supports our hypothesis that the more profitable a company is, the more confident about its future investors are, and thus, its stock price will rise.

The asset structure has a significant negative impact on market value in the electronic industry, but not in the non-electronic industry. This result shows that a higher ratio of tangible assets will not create higher value for a company, but rather, it's a firm's intangible intellectual capital that is more able to enhance its value. In addition, firm size has a significant positive impact on capital structure for the electronic industry but not for the non-electronic industry.

In the non-electronic industry, growth has a positive impact on capital structure, but the impact is negative for the electronic industry. In the electronic industry, the capital structure has a negative impact on market value,

Table 6. The determinants of market value.

Hypotheses	Predicted	Dependent variable: market value		
		all firms (N=647)	electronic firms (N=302)	non-electronic firms (N=345)
H ₁ : ROA→DEBT	-	-0.82**	-0.89**	-0.89**
H ₂ : GROW→DEBT	+	0.02	-0.05*	0.15*
H ₃ : FIX→DEBT	-	-0.03	-0.14*	0.08
H ₄ : SIZE→DEBT	+	7.86**	14.60**	1.18
H ₅ : ROA→MVALUE	+	2.79**	2.36**	2.36**
H ₆ : GROW→MVALUE	+	0.02	-0.05	0.40**
H ₇ : FIX→MVALUE	+	-0.12	-0.14*	-0.14*
H ₈ : SIZE→MVALUE	+	6.19**	13.79**	4.02*
H ₉ : DEBT→MVALUE	-	-0.13	-0.35*	-0.04
R ²		0.35	0.33	0.50

** if $P < 0.01$, * if $P < 0.05$.

but this path coefficient is not significant in the non-electronic industry.

The electronic industry is mainly export oriented, and the gross profit margin for such firms is usually not high. Since debt interest costs will erode a company's earnings, it is important to strictly control the capital structure, so as not to significantly reduce market value. Although the impact of firm size on market value is significant in both industries, the coefficient of the electronic model is much bigger than that of the non-electronic one. The larger the size of an electronics company, the higher its technical level. Therefore, the better visibility of the company and its market value is also higher.

These differences may occur because of the following characteristics of these two different industries. First, most electronic firms are export-oriented, and such companies, benefiting from government export incentives, have a non-debt tax shield of depreciation costs for automated production equipment. Second, electronic industry P/E ratios (price / earnings per share) are generally higher than those of the non-electronic industry. Finally, foreign institutional investment in the electronic sector is higher than that in non-electronic industry, and because such investors can more effectively oversee companies, they can also reduce the agency costs of these firms.

DISCUSSION

This study examined the determinants of capital structure and firm value based on the data from 647 Taiwanese firms listed on the Taiwan Stock Exchange for the period 2004 to 2009. This study contributes to the empirical literature on capital structure in three ways. Firstly, the study analyses the capital structure determinants using data from an emerging stock market, which has been neglected in earlier empirical studies. Secondly, the study investigates the relationship between the determinants,

capital structure and firm value by structural equation modeling, and previous research did not examine this. Thirdly, this study examines the differences in these elements between the electronic and non-electronic industries, as the determinants of capital structure and firm value are different for these two types of companies. It is anticipated that both investors and managers could apply the results of this work to improve firm value.

We investigate two definitions of firm value; book and market value. The determinants of book value are size, profitability and capital structure, and it is positively affected by book value. Profitability will be reflected in the net value of a firm's financial statements, and this result is consistent with previous research (Haugen and Baker, 1996; Yang et al., 2010). Firm size positively affects book value, which indicates that larger firms could more easily obtain financial resources from lenders and thus, create more value. In addition, large companies have more resources to integrate their upstream to downstream supply chains, and are also better able to exploit economies of scale. Finally, capital structure negatively affects firm value, as more debts are associated with greater bankruptcy risk and reduced firm value.

The empirical evidence obtained in this study demonstrates that the level of tangible assets, size and profitability are key determinants for listed companies with regard to their influence on capital structure. Profitability negatively affects the capital structure, as successful companies do not need to depend so much on external funding. Consistent with the predictions of the pecking order theory, we observe that low profit firms use more debt. In addition, we also find that the tangible assets ratio affects the capital structure, as firms holding more such assets will be less prone to asymmetric information. Firms with a higher tangible assets structure can borrow more debt and this is consistent with trade off theory. Finally, firm size positively affects capital structure, which indicates that larger firms tend to be more diversified and have a lower probability of failure, and

thus, can take on more debt, and this result is also consistent with trade off theory.

We separated the companies examined in this work into two groups; electronic and non-electronic firms, and some differences were found between them. For example, growth opportunities positively affect capital structure in electronic firms, but negatively affect it in non-electronic ones. In Taiwan, the electronic industry exports most of its products, and higher growth in this sector needs more working capital. Although, firm size positively affects capital structure for both types of firms, the influence is greater for non-electronic firms. In addition, larger non-electronic companies find it easier to borrow money than smaller ones. Firm size positively affects book value for both type of firms, but the impact is bigger for electronic firms. Large electronic companies are more well-known, and so they have more opportunities to win orders from international companies, which can then create higher book value. In addition, growth opportunities positively affect firm value for electronic companies, but not for non-electronic ones, which shows that growth opportunities are particularly important for the former.

The determinants of capital structure in both groups are profitability and firm size, and those of market value are profitability, capital structure, asset structure and firm size in electronic firms. In contrast, for non-electronic firms the determinants of market value are profitability, growth, asset structure and firm size.

Conclusions

There are some different characteristics between the electronic and non-electronic firms that need to be noted. First, most electronic firms are export-oriented. In addition, export firms, benefiting from government export incentives, have a non-debt tax shield for the depreciation cost of their automated production equipment. Second, electronics industry P/E ratios (price / earnings per share) generally are higher than those of non-electronic industry firms. Third, stock-based rewards are an important policy to attract talented employees in the electronic industry, and this affects the capital structure of such firms. Finally, foreign institutional investment in the electronic sector is higher than that in non-electronic sector, and such investors can more effectively oversee companies, therefore, reducing the agency costs of the firms they invest in.

The results of this study suggest that the capital structure decisions of companies listed on the Taiwanese stock market can be explained with reference to the trade off and pecking order theories, and that these companies prefer to utilize internal funds over debt and external equity.

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APPENDIX

Appendix A. The SEM results of book value.

Book value	CMIN	DF	P	CMIN/DF
a(a1=a2)	6.6852	1	0.0097	6.6852
b(b1=b2)	17.1419	1	0	17.1419
c(c1=c2)	0.0154	1	0.9011	0.0154
d(d1=d2)	9.7479	1	0.0018	9.7479
e(e1=e2)	0.2582	1	0.6114	0.2582
f(f1=f2)	15.9696	1	0.0001	15.9696
g(g1=g2)	2.827	1	0.0927	2.827
h(h1=h2)	9.8646	1	0.0017	9.8646
i(i1=i2)	0.4146	1	0.5196	0.4146

Appendix B. The SEM results of market value.

Market value	CMIN	DF	P	CMIN/DF
a(a1=a2)	1.781	1	0.182	1.781
b(b1=b2)	8.820	1	0.003	8.820
c(c1=c2)	8.695	1	0.003	8.695
d(d1=d2)	51.954	1	0.000	51.954
e(e1=e2)	2.524	1	0.112	2.524
f(f1=f2)	18.329	1	0.000	18.329
g(g1=g2)	1.208	1	0.272	1.208
h(h1=h2)	3.135	1	0.077	3.135
i(i1=i2)	3.283	1	0.070	3.283