

# The Impact of Anti-Thin Capitalization Rules on Capital Structure in Taiwan

Wen-Sheng Shieh<sup>1</sup>, Jiun-Nan Ou<sup>1</sup> & Jui-Chih Wang<sup>1</sup>

<sup>1</sup> College of Commerce, National Taipei University of Business, Taipei, Taiwan

Correspondence: Jiun-Nan Ou, Department of Public Finance and Tax Administration, College of Commerce, National Taipei University of Business, No.321, Sec. 1, Jinan Rd., Zhongzheng District, Taipei, Taiwan, R.O.C. Tel: 886-2-2322-6443. E-mail: [olio@ntub.edu.tw](mailto:olio@ntub.edu.tw)

Received: July 27, 2014

Accepted: August 25, 2014

Online Published: October 25, 2014

doi:10.5539/ijef.v6n11p142

URL: <http://dx.doi.org/10.5539/ijef.v6n11p142>

## Abstract

This paper investigates the impact of the enactment of the anti-thin capitalization rules on capital structure after the enactment of the anti-thin capitalization rules in Taiwan. According to the theoretical derivation, companies with lower shareholder imputed tax credits ratio tend to have greater debt-to-equity ratio, while companies with higher surtax on undistributed earnings ratio tend to have higher debt-to-equity ratio. This finding is consistent with the hypotheses of this study. However, the relationships between interest-bearing liability rate, marginal income tax rate and debt-to-equity ratios are uncertain.

Using 2006–2012 sample data for the empirical study, this paper finds that enterprise's total debt-to-equity ratios significantly decreases after the enactment of the anti-thin capitalization rules, and provisions preventing capital weakening have policy effectiveness. The shareholder imputed tax credits ratio and total debt-to-equity ratio are negatively correlated, while interest-bearing liability rate, marginal income tax rate, and surtax on undistributed earnings ratio, are positively correlated with total debt-to-equity ratio. This finding supports the hypotheses of this study. However, marginal income tax rate is lack of significance. Regardless of the enactment of the anti-thin capitalization rules, pledge ratios, investment growth opportunities, firm size and ownership of director and supervisor ratios are positively correlated with total debt-to-equity ratio; non-debt tax shields, R&D ratio and profitability are negatively correlated with total debt-to-equity ratio, which are also consistent with the expected results of this paper.

**Keywords:** anti-thin capitalization rules, capital structure, integrated income tax system, income tax act

## 1. Introduction

Among the various financing activities of the enterprise, the ratio of debt capital to equity capital reflects the quality of capital structure. If the debt-to-equity ratio is appropriate, it can better ensure the capital demand for business activities and prevent bankruptcy risk, that is, the optimization of capital structure. To maximize the benefits for themselves, business owners and operators tend to lower the proportion of share capital, thereby increasing the proportion of loans. As a result, the debt-to-equity ratios exceed a certain limit, causing the thinning of capitalization.

The principal impact of thin capitalization on corporate financial statements is that the interest expense incurred on the debt can be deducted before calculating income before income tax. The equity capital generated by offering pays to the shareholder after-tax dividends. Before allocation of corporate dividends, the corporate income tax should be calculated after adjusting the pre-tax financial income to taxable income. The interest incurred on the debt can be regarded as the financial costs that can be deducted from the pre-tax financial income, thereby reducing corporate income tax payable. Therefore, for businesses, debt capital debt incurred has no income tax burden. However, equity capital is subject to corporate income tax. Accordingly, corporate management authorities may reduce equity investment to increase interest expense through a high debt ratio, thereby reducing taxable income. According to the MM theorem proposed by Miller and Modigliani (1958), companies can take advantage of debt capital for tax planning in order to achieve the purpose of reducing the tax burden, which is a good tax saving motive. When debt ratio is too high, enterprise operational risk may increase, causing liquidity problems in short term and bankruptcy in the long term. Thus, such action will adversely affect investors, businesses and the economy as a whole.

When faced with multinational companies using debt finance to enhance the viability, many countries often take the company's interest expense deducted as the upper limit of operating expenses, that is, to set the limit of debt-to-equity ratios. (Note 1) In this way, in addition to maintaining the stability and robustness of the corporate capital structure, the tax income of the government can be insured. In Taiwan, The anti-thin capitalization-related tax provisions can be traced back to Article 29 of the Income Tax Act: "Interest on capital is paid out from the distribution of profit and, as such, shall not be listed as expense or loss." and Article 97 of the Rules Governing the Assessment of Corporate Income Tax regarding the standards of interest expense. (Note 2) In recent years, with rising level of internationalization, for the gradual integration with international development trends, to prevent multinational companies and Taiwanese enterprises from using interest expenses as cost to acquire the tax shield effect, and the use of thin capitalization to avoid tax by replacing equity investment with a large amount of debt financing to the detriment of tax revenue of the government and tax fairness, the Ministry of Finance developed the provisions of Article 43-2 of the Income Tax Act regarding anti-thin capitalization. The purpose is to establish an anti-thin capitalization taxation mechanism for supplementing Taiwan's anti-tax avoidance mechanism, and constructing a fair and reasonable tax environment and a sound national finance.

The anti-thin capitalization-related provisions were enacted on January 26, 2011 by a presidential order: "Since 2011, for profit-seeking enterprises with debt to equity ratio above a certain level to the related parties, the interest of the exceeding amount shall not be listed as expense or loss". (Note 3) The Ministry of Finance was authorized to draft the "Regulations Governing Assessment of the Range of Related Parties, Debt, Equity, the Debt-to-equity Ratio and Other Related Matters". On June 22, the Ministry of Finance announced the "Regulations Governing Assessment of Not Listing Interest Expense of Profit-seeking Enterprise to Related Parties as Expense or Loss" to facilitate the compliance of both parties.

This paper aims to investigate the impact of the enactment of the anti-thin capitalization rules on capital structure through theoretical analysis, and further construct an empirical model. The followings are organized into 4 sections. Section 2 reviews the related literature on the introduction of Taiwan's relevant anti-thin capitalization rules, corporate characteristics, tax, and anti-thin capitalization rules; Section 3 outlines the model derivation and proposition development of constructing a simple model for deducing the impact of the enactment of the anti-thin capitalization rules on capital structure and developing the empirical propositions accordingly; Section 4 discusses the empirical results and related interpretations; and Section 5 offers the conclusions of this study, including major findings, research limitations, and future research directions.

## 2. Literature Review

The thin capitalization determination standards in Taiwan are based on the Fixed Ratio Approach, which is generally known as the safe harbor rule. It means that when the debt-to-equity financing ratio of a profit-seeking enterprise to its direct or indirect related parties exceeds 3, the excessive interest expense cannot be listed as an expense or loss. The related parties refer to those other than affiliates and related enterprises. The debt of the related parties means that the profit-seeking enterprise directly or indirectly acquire from the related parties the due principal and interest or compensated capital paid in other ways of the nature of interest. The proprietary equity of the profit-seeking enterprises headquartered in Taiwan refers to the net total sum of its balance sheet. Those headquartered outside of Taiwan do not have to pay the actual operating capital for interest payment.

In addition to the introduction of Taiwan's relevant anti-thin capitalization rules, the relationships between the company characteristics, tax, and anti-thin capitalization rules with capital structure are described in the following sections.

### 2.1 Enterprise Characteristics and Capital Structure

The characteristics and objective conditions of the enterprise can affect its capital structure, such as interest-bearing liability rate, the percentage of collateral against the total asset, non-debt tax shields, investment growth opportunities, shareholder imputed tax credits, surtax on undistributed earnings, industry sector, firm size, profitability, shareholdings of directors and supervisors, and R&D degree.

According to Titman and Wessels (1988), and Omer and Terando (1999), at a high percentage of assets available for pledge against the total asset, capital can be borrowed at a lower interest rate to lower capital cost. DeAngelo and Masulis (1980) suggested that for optimal capital structure, individual income tax, corporate income tax and non-debt tax shield should be taken into consideration. If the company's non-debt tax shield is greater than the expected cash flow, it will lower debt ratio. Titman and Wessels (1988), Allen (1989), Chang and Rhee (1990), Omer and Terando (1999) reached the same conclusions.

Wald (1999) studied companies in France, Germany, Japan, the U.K., and the U.S., and found that companies of

rapid growth have lower debt ratio. This is finding is contradictory to the general belief that companies of rapid growth tend to have higher debt ratios due to the high demand for capital, and are expected to have sufficient capital to pay off principal and interest.

Wang and Chen (2007) empirically found that under the integrated income tax system, imputed tax credits ratio and surtax on undistributed earnings ratio have a negative and positive relationship, respectively, with the debt-to-equity ratio. Titman (1984), Allen (1989), Omer and Terando (1999) argued that industry sector can affect capital structure. For example, the debt ratio of the financial industry is often higher than that of the manufacturing or service industry.

According to Marsh (1982), Titman and Wessels (1988), Chang and Rhee (1990), and Omer and Terando (1999), companies of larger size are more unlikely to go bankrupt due to diversified business activities, and thus, the level of leverage is often higher. Wald (1999) found that, for companies in Japan, the U.K., and the U.S, firm size and debt ratio are positively correlated. Smith (1977) suggested that smaller companies have costs for equity financing, and thus, are more likely to finance by debt.

Myers (1977), Titman and Wessels (1988), Allen (1989), Chang and Rhee (1990), Booth et al. (2001), Wang and Gu (2003), and Tong and Green (2005) argued that profitability affects capital structure. Industries, whose revenues are significantly influenced by economic cycle (with higher profitability), tend to use internal capital of profitability (cash capital increase). Moreover, firm size, profitability, and R&D expense ratio have a significant impact on debt ratio.

Rutterford (1996) found that the relationship between banks and companies is closer in Japan and Germany, as compared to that in the U.K. and the U.S. Higher shareholding ratio of directors and supervisors can result in lower debt financing costs, hence, debt financing is preferred. Titman (1984) argued that a higher level of corporate uniqueness, as well as better relationship with supplier and customer, can lead to more sufficient sources of funds, hence, debt financing is preferred.

## 2.2 Tax and Capital Structure (Note 4)

It is inconclusive whether tax may affect the company's capital structure. Miller and Modigliani (1958) proposed the M&M theory, arguing that firm value and capital cost are not affected by capital structure when there is no corporate or individual income tax. However, they modified their conclusions in 1963, proposing that interest expenses can reduce tax payable, increase firm value to provide the interest of tax shield if there is corporate income tax. In other words, when there is income tax, the firm will finance entirely by debt. However, Miller (1977) argued that the tax shield benefits of debt interest can be traded off by higher individual income tax during the arbitrage process if corporate income tax and individual income tax coexist. Therefore, in equilibrium, capital structure does not affect the firm value.

However, when considering the cost of bankruptcy and agency cost, expense has financial cost, despite of its tax shield benefits. For example, Stiglitz (1972) pointed out that the loss arising from the bankruptcy proceedings and the disposal of assets (cost of bankruptcy) will reduce the firm value. In other words, the optimal capital structure is determined when the marginal tax shield benefits equal to the marginal bankruptcy (or agent) costs.

The empirical studies on whether tax may affect the company's capital structure have inconsistent results. Bradley et al. (1984), and Titman and Wessels (1988) argued that there is no impact. However, DeAngelo and Masulis (1980), Allen (1989), Chang and Rhee (1990), Newberry (1998), Omer and Terando (1999), Farrar and Mawani (2008), Jong et al. (2008), suggested that tax affects the company's capital structure.

According to the empirical findings of Wang and Chen (2007), in an integrated income tax system, the relationships between imputed tax credits ratio and surtax on undistributed earnings ratio with debt-to-equity ratio are negative and positive, respectively. Since the implementation of the integrated income tax system in 1998 in Taiwan, as shareholder imputed tax credits has effectively reduced the double taxation on dividend income, the benefits of tax shield from shareholder debt financing have greatly reduced. However, the earnings undistributed to shareholders will be levied with 10% surtax of income, thus increasing the tax benefits of debt interest expenses, as well as the incentive for the company's debt financing.

Regarding studies on the marginal income tax rate on capital structure, it is generally argued that multinational companies will finance in countries of low tax rate for the affiliates in countries of high tax rate to gain the tax saving benefits. In other words, if the corporate income tax rate of the host country of the multinational company is high, the company is more likely to finance its affiliates in countries with a low tax rate. As a result, the debt ratio of companies with high tax rates will be higher to result in thin capitalization, and further erode the basis of tax of the host country. Desai et al. (2004), and Mintz and Weichenrieder (2005) found that multinational

companies in the U.S. and Germany may transfer earnings from regions of high tax rates to regions of low tax rates. Buettner et al. (2012) argued that multinational companies with affiliation are more likely to benefit from a lowering tax burden by debt financing. Desai et al. (2004) and Huizinga et al. (2007) also found that the difference between the domestic and foreign tax rates has a significant impact on the choice of internal financing or external financing by multinational companies. Mills and Newberry (2004) suggested that non-American multinational companies from countries of low tax rate extensively avoid tax by debt financing in the U.S.

### *2.3 Anti-thin Capitalization Rules and Capital Structure*

There are scanty studies concerning the impact of anti-thin capitalization on capital structure. Haufler and Runkel (2008) empirically found that the anti-thin capitalization rules have a greater impact on the international investment strategy of multinational companies as compared to corporate income tax. According to Brocke and Perez (2009), in late 1990s, most developed countries introduced the anti-thin capitalization rules in an attempt to solve the problem of abusive use of high financial leverage in financing, and to prevent multinational companies from lowering their tax burden in countries of higher tax rate by high level of debt capital investment.

According to Overesch and Wamser (2006), after the enactment of the anti-thin capitalization rules, German multinational companies reduced internal debt financing, proving the effectiveness on limiting the tax planning of firms by internal debt financing. Buettner and Wamser (2007) found that subsidiaries of German multinational companies in 79 countries adjusted their internal financing behaviors under the influence of tax rate differences to achieve the purpose of profit transfer of multinational companies. Buettner et al. (2012) examined foreign multinational companies in Germany during the period of 1996 to 2004 concerning the effectiveness of the impact of anti-thin capitalization rules on capital structure. They empirically found that the leverage operations of multinational companies considerably reduced after the practice of anti-thin capitalization, and excessive debt financing has been effectively prevented. In addition to the effective reduction of the internal debt financing of affiliated enterprises, the level of external debt financing is also increased.

Chao et al. (2012) studied the relationship between thin capitalization, tax burden, and capital structure, with the samples of 400 listed companies in Taiwan during the period of 2001-2010. They employed the ordinary least square method, and found that current corporate income tax, valid tax rate, firm size, and purchase of related parties have a negative correlation with debt ratio. Moreover, company growth and sales to the related parties have a positive relationship with debt ratio.

## **3. Model Derivation and Hypothesis Development**

### *3.1 Model Derivation*

Companies can raise long-term funds by equity finance or debt finance. The debt financing's tax saving effect and the tendency of debt financing of companies for tax saving may result in unhealthy capital structure and thin capitalization. For offering or debt financing options, in addition to transaction costs, the most important consideration is whether the tax shield effect of debt is greater than the cost of shareholder fundraising. By referring to Wang (2013), this paper uses the mathematical model to analyze the relationship between profit-seeking enterprise debt finance and equity finance, and further establish research hypotheses and empirical models.

#### *3.1.1 Basic Settings*

It is assumed that a multinational company has established companies A and B respectively in countries of A and B. A company provides funds for B company, (Note 5) and can choose to satisfy the funding demand of B company by loans or increasing capital amount. If the debt financing and equity financing will be taxed differently according to the taxation provisions of B country, then A company must choose for themselves the most beneficial way to provide funds needed to B company, in order to maximize after-tax rewards .

First, for equity finance, B company's pre-tax earnings per dollar from equity capital must be taxed with the corporate income tax before distributing parts of the after-tax earnings (the proportion is  $\alpha$ ) to shareholders (A company), while retaining the remainder  $(1-\alpha)$  for B company. If all the dividends distributed to A company are distributed to natural person shareholders of A company to be taxed with the consolidated income tax along with other income. In the integrated income tax system of Taiwan, the undistributed portion  $(1-\alpha)$  retained by B company will be taxed with the 10% income surtax of the undistributed earnings. This tax system is very different from those of the other counties.

Based on the above assumptions, for every dollar earned from the equity capital provided by A company to B company, the after-tax income can be expressed by Eq. (1) as follow:

$$\alpha(1 - T_c - T_e + kT_c) + (1 - \alpha)(1 - T_c)(1 - T_u) \quad (1)$$

where  $T_c$  is corporate income tax rate,  $T_e$  is shareholder's consolidated income tax rate,  $T_u$  is the rate of tax levied on undistributed earnings. (Note 6) All the above tax rates are marginal tax rates.

In Eq. (1),  $\alpha(1 - T_c - T_e + kT_c)$  refers to the after-tax income of each dollar of dividend. In other words, after paying the corporate income tax and distributing  $\alpha$  percentage of earnings to A company, if A company has distributed all dividends to natural person shareholders to be taxed with the consolidated income tax of shareholders, under the integrated income tax system, the corporate income tax paid by the company can be deducted in the individual income tax. The level of shareholder imputed tax credits ratio can affect the effective tax rate of the corporate income tax. When the company distributes the dividends in the following year, if shareholder imputed tax credit ratios is  $k$ ,  $k=1$  indicates that corporate income tax can be the imputed individual income tax credit;  $k=T_e$  indicates that it cannot fully offset.  $(1-\alpha)(1-T_c)(1-T_u)$  refers to the undistributed after-tax earnings  $(1-\alpha)$ , under the integrated income tax system, to prevent the tax evasion of shareholders through the company. Hence, income tax is levied.

Secondly, if B company finances by borrowing from A company, for the earnings from the debt, interest expense  $r$  should be paid for the earnings per dollar. The pre-tax earnings  $(1-r)$  should be levied with the corporate income tax and consolidated income tax to obtain the after-tax income of A company. To compare the relative benefits of debt and equity financing, it is assumed that A company is the capital provider. Therefore, besides the above mentioned after-tax dividend income, in debt financing, A company also has interest income. With this assumption, for each dollar of pre-tax earnings earned by debt financing, the after-tax income can be expressed as Eq. (2):

$$(1 - r)[\alpha(1 - T_c - T_e + kT_c) + (1 - \alpha)(1 - T_c)(1 - T_u)] + r(1 - T_d) \quad (2)$$

where,  $T_d$  is the creditor's marginal tax rate of consolidated income. A comparison of Eq. (1) and (2) indicates that the funding sources of the company are different. With the same operating conditions, B company and A company may have different returns due to different objective conditions, such as the taxation regime.

Based on the above conditions, the following section explains the influencing factors of debt finance and equity finance on tax benefits before and after the enactment of the anti-thin capitalization rules.

### 3.1.2 Before the Enactment of the Anti-Thin Capitalization Rules

Eqs. (1) and (2) indicate the after-tax returns of A company earned by raising the required capital for B company through equity capital and debt capital financing. The net marginal benefit of debt capital to equity capital  $\delta_B$  is defined as Eq. (2) minus Eq. (1), that is, Eq. (3):

$$\delta_B = r(1 - T_d) - r[\alpha(1 - T_c - T_e + kT_c) + (1 - \alpha)(1 - T_c)(1 - T_u)] \quad (3)$$

According to the marginal conditional equation, Eq. (3), the debt financing's marginal benefit  $r(1 - T_d)$  is A company's after-tax interest income of the loan. Its marginal cost is the opportunity cost of earning the above interest revenue:  $r[\alpha(1 - T_c - T_e + kT_c) + (1 - \alpha)(1 - T_c)(1 - T_u)]$ .

For all companies, even if there are tax-saving benefits, they do not acquire all capitals by debt financing. Hence, this paper adopts the assumption of debt agency cost proposed by Overesch et al. (2006). It is assumed that there is agency cost arising from the thin capitalization with rising amount of debts, in addition to the opportunity cost.

If the agency cost of every dollar earned from debt financing is  $c(\theta)$ ,  $c' \equiv \frac{\partial c}{\partial \theta} > 0$ ,  $c'' \equiv \frac{\partial^2 c}{\partial \theta^2} > 0$ , where  $\theta$

is the company debt-to-equity ratio. When the financial leverage ratio is high, the agency cost of the company for debt financing increases accordingly.

For the optimal consideration, the debt and equity configuration of B company should satisfy  $r(1 - T_d) - r[\alpha(1 - T_c - T_e + kT_c) + (1 - \alpha)(1 - T_c)(1 - T_u)] = c(\theta)$ . If the gap between  $r(1 - T_d)$  and  $r[\alpha(1 - T_c - T_e + kT_c) + (1 - \alpha)(1 - T_c)(1 - T_u)]$  is small, the tax benefits of debt financing by B company is also small, and the agency cost decreases accordingly. This suggests that B company will lower debt or increase equity to decrease the company debt-to-equity ratio. On the contrary, if the gap between  $r(1 - T_d)$  and  $r[\alpha(1 - T_c - T_e + kT_c) + (1 - \alpha)(1 - T_c)(1 - T_u)]$  is large, B company is more willing to increase the debt-to-equity ratio, and thus, tends to finance by debts.

The differentiation of the relative marginal benefits  $\delta_B$  against the interest rate is  $\frac{\partial \delta_B}{\partial r} = (1 - T_d) - [\alpha(1 - T_c - T_e + kT_c) + (1 - \alpha)(1 - T_c)(1 - T_u)]$ .

As the shareholder imputed tax credits ratio of debt financing is generally lower than the company or individual marginal tax rate, it is inferred that creditor after-tax income is greater than the shareholder individual after-tax income  $(1 - T_c)[\alpha(1 - T_c - T_e + kT_c) + (1 - \alpha)(1 - T_c)(1 - T_u)]$ . If the gap between the two is large, the tax benefit of debt financing is also high. Therefore, the company prefers debt financing. Based on the above, H1-1 is proposed as follows:

**H1-1: *Ceteris Paribus*, when enterprises have a high interest-bearing liability rate, the debt-to-equity ratio is also higher.**

The key factors influencing the net marginal benefits of debt financing can be found from Eq. (3). First, the tax rates include corporate income tax and shareholder or creditor income tax. Tax rates can directly affect benefits and cost of financing. Second, taxation provisions, including expense recognition and tax burden on distributed earnings, may have different results for different financing approaches. In other words, even if the tax rates are the same, the net benefits are not zero. Finally, the tax burden of the dividends paid by B company to A company should be the weighted average of corporate income tax and undistributed earnings' tax. The weight is the company dividends policy variable  $\alpha$ . A high dividend distribution rate denotes that the tax rate is closer to corporate income tax and tax burden is heavier. This also indicates that the tax benefits of debt financing are greater.

Regarding the comparative static analysis, Eq. (3) indicates the differentiation results of the tax regime exogenous parameters  $T_c, T_d, T_e, T_u$  as follows:

1) The effect of changes in enterprise income tax rate  $T_c$ ,

$$\frac{\partial \delta_B}{\partial T_c} = r[\alpha(1 - k) + (1 - \alpha)] > 0,$$

When the corporate income tax rate is high, the after-tax earnings that A company shareholder can distribute will be less, and the debt financing tax benefits will be higher.

2) The effect of changes in shareholder imputed tax credits ratio  $k$ .

$$\frac{\partial \delta_B}{\partial k} = -r\alpha k T_c < 0,$$

When shareholder imputed tax credits ratio is high, the after-tax earnings that A company shareholder can distribute will be more, and the debt financing tax benefits will be low.

3) The effect of changes in creditor marginal tax rate  $T_d$  (Note 7).

$$\frac{\partial \delta_B}{\partial T_d} = -r < 0,$$

When the enterprise creditor is faced with a high marginal tax rate, tax benefits of debt financing will be low.

4) The effect of changes in shareholder marginal tax rate  $T_e$ .

$$\frac{\partial \delta_B}{\partial T_e} = \alpha r > 0,$$

When A company's shareholder marginal tax rate of consolidated income is high, tax benefits of debt financing will be significant.

5) The effect of changes in the surtax on undistributed earnings  $T_u$ .

$$\frac{\partial \delta_B}{\partial T_u} = r(1 - \alpha)(1 - T_c) > 0,$$

When the company's 10% income tax levied on undistributed earnings is high, tax benefits of debt financing will be great.

It is inferred that before the enactment of the anti-thin capitalization rules in Taiwan, regardless of debt or equity financing of the company, corporate income tax rate, shareholder imputed tax credits ratio, and the rate of tax levied on undistributed earnings should be taken into consideration. Regarding the marginal income tax rates of the shareholder and the creditor, as the empirical data are limited, H1-2 to H1-4 are proposed according to the

decision making of the company:

**H1-2: *Ceteris Paribus*, when enterprises have a high marginal income tax rate, the debt-to-equity ratio is also high.**

**H1-3: *Ceteris Paribus*, when shareholders have a high imputed tax credits ratio, the debt-to-equity ratio is low.**

**H1-4: *Ceteris Paribus*, when enterprises have a high surtax on undistributed earnings, the debt-to-equity ratio is also high.**

### 3.1.3 After the Enactment of the Anti-Thin Capitalization Rules

After the enactment of the anti-thin capitalization rules, interest expenses are deducted before pre-tax income, but dividends are distributed by after-tax earnings. For most companies, debt financing can result in tax benefits; hence, they tend to finance by debts, leading to thin capitalization of the company's capital structure. The anti-thin capitalization rules are enacted to reduce such detriments to the development of the enterprise. The portion exceeding the deductible interest expense limit of the interest expenses of debt financing ( $\bar{D}$ ) is required to be included into the taxable income. After the deduction of the corporate income tax, the earnings can then be distributed to shareholders as dividends. The tax cost of the company by offering to shareholders remains unchanged.

Regarding the impact of Taiwan's anti-thin capitalization provisions on the company's financing, we can find that if B company's interest expenses have reached the upper limit of the rules, in the case of offering to meet the capital demand, the pre-tax earnings of every dollar after tax is:

$$(1-r)[\alpha(1-T_c-T_e+kT_c)+(1-\alpha)(1-T_c)(1-T_u)]+r(1-T_c-T_d-kT_c) \quad (4)$$

Under the anti-thin capitalization rules, compare to equity finance, the debt finance marginal benefit  $\delta_B'$  is:

$$\delta_B' = r(1-T_c-T_d+kT_c) - r[\alpha(1-T_c-T_e+kT_c)+(1-\alpha)(1-T_c)(1-T_u)] \quad (5)$$

According to Eq. (5), for the company with interest expenses reaching the upper limit, the decision on whether using debt finance to replace equity finance to acquire the required capital depends on the percentage of dividends distribution, as well as exogenous factors, including shareholder marginal tax rate, creditor marginal tax rate and interest rate.

By comparing with Eq. (3), it can be found that the major difference in the net marginal benefits before and after the enactment of the anti-thin capitalization rules is the after-tax interest income of the fund provider in Eqs. (3) and (5). The former is levied with the consolidated income tax, while the latter is levied with the corporate income tax before being taxed with the consolidated income tax. Furthermore, under the condition of the net marginal benefits in Eq. (5), due to decreasing debt financing benefits, the agency cost of the company is reduced. In other words, the enactment of the anti-thin capitalization rules can make the debt financing in an unfavorable situation.

After the enactment of the anti-thin capitalization rules, if the sources of the debt financing and equity financing are the same, then a high weighted average of the interest income levied with the corporate income tax and consolidate income tax or the dividend income tax rate and the rate of tax levied on undistributed earnings will determine the impact of interest rate on the financing measures. Hence, H2 is proposed as follows:

**H2: *Ceteris Paribus*, after the enactment of the anti-thin capitalization rules, the debt-to-equity ratio is reduced.**

Similarly, by the comparative static analysis, the differentiation of  $\delta_B'$  against exogenous parameters is as express in Eq. (5):

1) The effect of changes in interest-bearing liability rate  $r$ .

$$\frac{\partial \delta_B'}{\partial r} = (1-T_c-T_d+kT_c) - [\alpha(1-T_c-T_e+kT_c)+(1-\alpha)(1-T_c)(1-T_u)] > (<) 0.$$

If  $2kT_c + \alpha T_e + T_u + T_c T_u > (<) T_d$ , then,  $\frac{\partial \delta_B'}{\partial r} > (<) 0$ , it means that, when the tax rate of debts' interest rate is higher than the weighted tax rate of dividends, it will erode tax benefits from debt financing. As a result, the interest rate of debts with interest and the relative benefits of debt financing are negatively correlated. On the contrary, if the tax rate for the interested debt is lower than the weighted tax rate of dividends, then the tax rate of the interested debt and the relative benefits of debt financing are positively correlated. Therefore, the impact of interest-bearing liability rate on the relative benefits of debt financing is uncertain.

2) The effect of changes in enterprise income tax rate  $T_c$ .

$$\frac{\partial \delta_B'}{\partial T_c} = r(1 - \alpha)(k - T_u) > (<) 0.$$

The impact of corporate income tax on the tax benefits of debt financing is not certain, and is mainly subject to the influence of shareholder imputed tax credits ratio and the tax rate of undistributed earnings ( $T_u$ ). If shareholder imputed tax credits ratio ( $k$ ) is greater than  $T_u$ , then rising corporate income tax rate can make the debt financing more favorable, and vice versa. As integrated income tax system is currently implemented in Taiwan, the corporate income tax rate of the undistributed earnings is 10%, shareholder imputed tax credits ratio may be higher or lower than the enterprise income tax rate. Therefore, the relationship between the tax benefits of debt financing and corporate income tax rate is uncertain.

3) The effect of changes in shareholder imputed tax credits ratio  $k$ .

$$\frac{\partial \delta_B'}{\partial k} = rT_c(1 - \alpha) < 0.$$

When shareholder imputed tax credits ratio is high, shareholders of A company have more distributable after-tax earnings. The duplication tax of dividend income can be reduced, and thus the tax benefits from debt financing are less.

4) The effect of changes in creditors' consolidated income tax rate  $T_d$ .

$$\frac{\partial \delta_B'}{\partial T_d} = -r < 0.$$

When enterprise creditor faces a high consolidated income tax rate, debt financing tax benefits are less.

5) The effect of changes in shareholders' consolidated income tax rate  $T_e$ .

$$\frac{\partial \delta_B'}{\partial T_e} = r\alpha > 0.$$

When company shareholders' consolidated income tax rate is high, there is more debt financing tax benefits.

6) The effect of changes in the rate of tax levied on undistributed earnings  $T_u$ .

$$\frac{\partial \delta_B'}{\partial T_u} = r(1 - \alpha)(1 - T_c) > 0.$$

When undistributed earnings tax ratio is high, there is more debt financing tax benefits.

From the above static analysis, H3-1 to H3-4 of company decision-making can be inferred as follows:

**H3-1: *Ceteris Paribus*, after the enactment of the anti-thin capitalization rules, the influence of a high interest-bearing liability rate on the debt-to-equity ratio is uncertain.**

**H3-2: *Ceteris Paribus*, after the enactment of the anti-thin capitalization rule and the influence of a high marginal income tax rate on the debt-to-equity ratio is uncertain.**

**H3-3: *Ceteris Paribus*, after the enactment of the anti-thin capitalization rules, the influence of a high imputed tax credits ratio on the debt-to-equity ratio is low.**

**H3-4: *Ceteris Paribus*, after the enactment of the anti-thin capitalization rules, the influence of a high surtax for undistributed earnings ratio on the debt-to-equity ratio is high.**

### 3.2 Empirical Model

The multivariate regression models (6) and (7) of the debt-to-equity ratio before and after the enactment of the anti-thin capitalization rules are constructed.

Before the enactment of the anti-thin capitalization rules:

$$\begin{aligned} DE_{it} = & \alpha_0 + \alpha_1 INT_{it} + \alpha_2 ETR_{it} + \alpha_3 ITC_{it} + \alpha_4 UDIS_{it} + \alpha_5 INV PPE_{it} + \alpha_6 RDEP_{it} \\ & + \alpha_7 GTA_{it} + \alpha_8 RRD_{it} + \alpha_9 LnSale_{it} + \alpha_{10} ROE_{it} + \alpha_{11} InsHold_{it} + \alpha_{12} ELEC_{it} \\ & + \varepsilon_{it}, \end{aligned} \quad (6)$$

After the enactment of the anti-thin capitalization rules:

$$\begin{aligned}
DE_{it} = & \alpha_0 + \alpha_1 DYear_{it} + \alpha_2 DYear_{it} \times INT_{it} + \alpha_3 DYear_{it} \times ETR_{it} + \alpha_4 DYear_{it} \times ITC_{it} \\
& + \alpha_5 DYear_{it} \times UDIS_{it} + \alpha_6 INVPE_{it} + \alpha_7 RDEP_{it} + \alpha_8 GTA_{it} + \alpha_9 RRD_{it} \\
& + \alpha_{10} LnSale_{it} + \alpha_{11} ROE_{it} + \alpha_{12} InsHold_{it} + \alpha_{13} ELEC + \varepsilon_{it},
\end{aligned} \tag{7}$$

where,

DE: total debt-to-equity ratio=total liability divided to total equity.

DYear: anti-thin capitalization enactment year; if the year is 2011 or 2012 then DYear=1; if the year is from 2006 to the year 2010 then DYear=0.

INT: interest-bearing liability rate=interest expense divided to interest-bearing liabilities.

ETR: marginal income tax rate=income tax expense divided to earnings before tax and interest.

ITC: imputed tax credits ratio.

UDIS: surtax on undistributed earnings ratio=undistributed earnings×10% divided to earnings before tax and interest.

INVPE: pledge ratio= (inventories + net of PPE) divided to total assets.

RDEP: non-debt tax shields ratio=depreciation expense divided to total assets.

GTA: investment growth opportunities=percentage of change total assets.

RRD: R&D ratio=R&D expense divided to net sale.

LnSale: firm size=log of net sale.

ROE: profitability=after tax net income divided to total common shareholders' equity.

InsHold: ratio of director and supervisor=shares of director and supervisor divided to outstanding shares.

ELEC: dummy variable of electronics industry, if the firm belongs to the electronics industry then the ELEC=1; otherwise then ELEC=0.

### 3.3 Variable Measurement

#### 3.3.1 Dependent Variables

Total debt-to-equity ratio (*DE*): measured by the total debt divided by total shareholder equity.

#### 3.3.2 Independent Variables

Anti-thin capitalization rules enactment period (*DYear*): in previous literature concerning the impact of tax reform on the dependent variables, the impact of the year dummy variable on enterprise is explored (Casey et al. 1999; Wang and Chen, 2004; Wang and Chen, 2007; Chen et al. 2007). This paper uses dummy variable (*DYear*) to measure the effect of the anti-thin capitalization. The period after the enactment of the anti-thin capitalization (2011 to 2012) is denoted 1, *DYear*=1; otherwise (2006 to 2010) *DYear*=0.

Interest-bearing liability rate (*INT*): by mathematical derivation, before the enactment of the anti-thin capitalization rules, it is expected that *INT* and total (long term) debt-to-equity ratio are positively correlated. However, after the enactment of the anti-thin capitalization rules, if the interest-bearing debt is higher than the weighted tax rate on dividends, it will erode the tax benefits from debt financing, resulting in a negative relationship between the tax rate of the interest-bearing debt and debt financing. On the contrary, if the tax rate of the interested debt is lower than the weighted tax rate on dividends, it will result in a positive relationship between the tax rate of the interest-bearing debt and debt financing. Therefore, the impact of *INT* on the relative benefits of debt financing is not certain.

Enterprise marginal income tax rate (*ETR*): by mathematical derivation, before the enactment of the anti-thin capitalization rules, it is expected that marginal income tax rate and total debt-to-equity ratio are positively correlated. However, after the enactment of the anti-thin capitalization rules, the impact of corporate income tax rate on the debt financing tax benefits is uncertain, and it is mainly affected by the comparison of the shareholder *ITC* and *UDIS*. If shareholder *ITC* is greater than *UDIS*, then increasing *ETR* will make debt financing more beneficial; otherwise, it is not beneficial.

Shareholder imputed tax credits ratio (*ITC*): shareholder *ITC* is the imputed tax credits in the following year from the current year's earnings distributed. By mathematical derivation, shareholder *ITC* can reduce tax benefits, and thus the company prefers equity financing. It is expected that shareholder *ITC* and total debt-to-equity ratio are negatively correlated.

Surtax on undistributed earnings ratio (*UDIS*): this is the 10% income tax levied on current year's undistributed earnings, which it is not listed from the income tax expenses separately. Hence, its empirical data cannot be obtained. This paper measures the current year *UDIS* by the 10% of the undistributed earnings of the current year after-tax net profit deducting payment to director and supervisor, employee cash (stocks) dividends, ordinary shares and preference shareholder cash (stocks) dividends divided by pre-tax net income. (Note 8) When the company's undistributed earnings ratio is high, it can be inferred that the income tax of the company is also high; the two are positively correlated. Hypothetical derivation suggests that the income tax on the undistributed earnings increases debt tax benefits, and thus, the company prefers debt financing. It is expected that *UDIS* and total debt-to-equity ratio are positively correlated.

### 3.3.3 Control Variables

Pledge ratio (*INVPPE*): this is measured by dividing the ratio of inventory plus net fixed assets by the total assets. It is expected that pledge ratio and total debt-to-equity ratio are positively correlated.

Non-debt tax shields ratio (*RDEP*): this is measured by dividing the ratio of the depreciation expenses by the total assets (Titman & Wessels, 1988). It is expected that non-debt tax shields and total debt-to-equity ratio are negatively correlated.

Investment growth opportunities (*GTA*): this is measured by the percentage of changes in total assets. It is expected that investment growth opportunities and total debt-to-equity ratio are positively correlated.

R&D ratio (*RRD*): this is measured by dividing the ratio of the R&D expenses by net sales, for determining the uniqueness of R&D technology (Titman & Wessels, 1988). Companies with a high degree of technological uniqueness have more sufficient R&D funds, and thus the debt financing degree is lower. Therefore, the uniqueness and the total debt-to-equity ratio are negatively correlated.

Firm size (*LnSale*): this is measured by the natural logarithm of net sales. If the firm size is large, the capability to pay off debts is high, and thus the debt financing degree is also high. Therefore, it is expected that firm size and total debt-to-equity ratio are positively correlated.

Profitability (*ROE*): this is measured by dividing the ratio of the after-tax income by the total ordinary shareholders' equity. It is expected that profitability and total debt-to-equity ratio are negatively correlated.

Ownership of director and supervisor ratio (*InsHold*): this is measured by dividing the ratio of the number of shares held by directors and supervisors by the total number of outstanding shares. When ownership of director and supervisor ratio increases, the agency cost decreases, and thus, it is expected that ownership of director and supervisor ratio and total debt-to-equity ratio are positively correlated.

Electronics industry (*ELEC*): the capital structure of the electronics industry is different from other industries (Omer and Terando 1999; Yang et al. 2000). According to Bradley et al. (1984), the capital structure should significantly differ in different industries. Bowen et al. (1972), Long and Malitz (1985), Kester (1986) argued that the debt ratio of the electronics industry is relatively low. Therefore, this paper uses the dummy variable of electronics industry to control its impact on debt-to-equity ratio. If the company belongs to the electronics industry, then *ELEC*=1, otherwise *ELEC*=0. However, the direction of the impact on the total debt-to-equity ratio is not predicted.

### 3.4 Research Period, Data Source and Sample Selection

The research sample period is 2006-2012, and is divided into two periods: pre-enactment (before 2011) and post-enactment (2011-2012). The financial data and equity structure are sourced from the company financial database of Taiwan Economic Journal (TEJ).

Regarding the sample screening process, this paper uses 7 years of data from 1,401 listed companies on Taiwan Securities Exchange. First, 88 companies in the financial, insurance and securities industries are excluded. There are 9,185 samples from 1,313 listed companies and 1,014 samples with data omission. Therefore, the pool data consists of 8,171 samples (firm-year).

## 4. Empirical Results

### 4.1 Descriptive Statistical Analysis

According to the total empirical sample as shown in Table 1, the total debt mean is 3,691 million, the long-term debt mean is 1,027 million, and the total shareholder equity mean is 5,265 million. According to the statistical value, the enterprises prefer equity financing by borrowing from creditors. The total debt-to-equity ratio (*DE*) mean (median) is 67.28% (47.65%), and the long term debt-to-equity ratio (*DEI*) mean (median) is 12.09%

(0.35%), indicating that the long term debt-to-equity ratio also has the extreme values.

Table 1. Descriptive statistics-total sample

Variables	Min	Mean	Std. Dev.	Median	Max
Total liabilities (thousand NT\$)	31,915	3,691,181	11,465,214	746,772	94,411,609
Long-term liabilities (thousand NT\$)	0	1,027,350	3,700,670	34,667	29,118,455
Total equity (thousand NT\$)	81,825	5,264,988	13,319,727	1,446,907	98,548,611
DE(%)	0	67.28	78.53	47.65	540.06
DE1(%)	0	12.09	22.43	0.35	140.51
INT(%)	0	2.11	2.25	1.88	16.04
ETR(%)	0	10.11	12.61	5.86	66.79
ITC(%)	0	12.91	12.45	10.56	48.15
UDIS(%)	0	10.43	26.40	2.38	206.49
INVPPE(%)	0.36	30.03	22.97	26.84	88.53
RDEP(%)	0.02	1.93	2.53	1.05	13.83
GTA(%)	-41.40	2.57	27.85	1.88	128.68
RRD(%)	0	3.41	6.64	1.03	44.26
LnSale(log)	10.47	14.13	1.93	14.28	19.09
ROE(%)	-92.49	-5.53	35.95	5.90	47.03
InsHold(%)	4.98	22.00	15.02	18.34	72.46
ELEC(0,1)	0	0.56	0.50	1	1

Note. DE1: long term liability-to-total equity; n=8,171.

Regarding the four major hypothesis variables of this paper: interest-bearing liability ratio (*INT*) mean (median) is 2.11% (1.88%). The maximum of debt financing interest rate is 16.04%. The marginal corporate income tax rate (*ETR*) mean (median) is 10.11% (5.86%), which is below the statutory tax rate of 17%, outlining that the corporate income tax rate is relatively low due to numerous tax preferences. The model derivation indicates that the corporate income tax can be used to deduct individual income tax when the dividend income is distributed to shareholders. The shareholder imputed tax credit ratio (*ITC*) mean (median) is 12.91% (10.56%); the surtax on undistributed earnings (*UDIS*) mean is 10.43%, median is 2.38%, indicating an extreme value. However, on average, *UDIS* mean 10.43% plus the current enterprise statutory income tax rate of 17% is still lower than the highest marginal tax rate of individual shareholders at 40%. Hence, enterprises still have the incentives to avoid heavy shareholder tax and not to distribute dividends to shareholders.

This paper divides the samples into two groups by the time of enactment: pre-enactment (2006 to 2010) (*DYear*=0), and post-enactment (2011 to 2012) (*DYear*=1). Table 2 and Table 3 reveal that before the enactment, the *DE* mean is 64.81%, and it increases to 77.18% after the enactment by 19.09%; the mean value of the *DE1* before and after the enactment is 11.23% and 15.54%, increasing by 38.38%. This suggests that the total debt-to-equity ratio or long term debt-to-equity ratio increases after the enactment of the anti-thin capitalization rules. The increasing level of long term debt ratio is greater than total debt ratio.

Table 2. Descriptive statistics-before enactment

Variables	Min	Mean	Std. Dev.	Median	Max
Total liabilities (thousand NT\$)	31,915	3,520,254	11,127,992	720,737	94,411,609
Long-term liabilities (thousand NT\$)	0	984,760	3,621,826	32,753	29,118,455
Total equity (thousand NT\$)	81,825	5,107,668	13,193,913	1,368,798	98,548,611
DE(%)	0	64.81	76.59	46.14	540.06
DE1(%)	0	11.23	21.14	0	140.51

INT(%)	0	2.21	2.37	2.03	16.04
ETR(%)	0	10.10	12.44	5.83	66.79
ITC(%)	0	13.95	12.76	11.46	48.15
UDIS(%)	0	9.40	25.06	1.94	206.49
INVPPE(%)	0.36	29.33	23.09	26.14	88.53
RDEP(%)	0.02	1.87	2.47	1.02	13.83
GTA(%)	-41.40	1.78	28.67	1.89	128.68
RRD(%)	0	3.15	6.15	0.91	44.26
LnSale(log)	10.47	14.05	2.00	14.26	19.09
ROE(%)	-92.49	-7.16	38.66	6.29	47.03
InsHold(%)	4.98	21.68	15.16	18.13	72.46
ELEC(0,1)	0	0.56	0.50	1	1

Note. DE1: long term liability-to-total equity;n=7,353.

Table 3. Descriptive statistics- after enactment

Variables	Min	Mean	Std. Dev.	Median	Max
Total liabilities (thousand NT\$)	31,915	4,377,224	12,709,320	894,008	94,411,609
Long-term liabilities (thousand NT\$)	0	1,174,719	3,958,897	40,000	29,118,455
Total equity (thousand NT\$)	81,825	5,896,416	13,798,839	1,706,565	98,548,611
DE(%)	0.52	77.18	85.21	52.70	540.06
DE1*(%)	0	15.54	26.71	3.38	140.51
INT(%)	0	1.75	1.70	1.66	16.04
ETR(%)	0	10.11	13.28	5.94	66.79
ITC(%)	0	9.31	10.56	5.43	48.15
UDIS(%)	0	14.56	30.89	4.71	206.49
INVPPE(%)	0.36	32.83	22.29	29.37	88.53
RDEP(%)	0.02	2.16	2.73	1.11	13.83
GTA(%)	-41.40	5.78	24.00	1.86	128.68
RRD(%)	0	4.45	8.22	1.50	44.26
LnSale(log)	10.47	14.46	1.59	14.38	19.09
ROE(%)	-92.49	1.03	20.69	3.73	47.03
InsHold(%)	4.98	23.26	14.39	19.23	72.46
ELEC(0,1)	0	0.58	0.49	1	1

Note. DE1: long term liability-to-total equity;n=1,832.

#### 4.2 Univariate Analysis

As shown in Table 2 and Table 3, after the enactment, the mean of total debt is increased to 4,377 million, and the mean of shareholder equity also is increased to 5,896 million; however, its *DE* mean is significantly increased to 77.18%. The mean test finds that, t-value (P-value) is 5.67 (<.0001), which has reached the statistical significance. After the enactment, the long-term debt mean and the mean of *DE1* is increased. According to the mean test results, its t-value (P-value) is 6.42 (<.0001), which has reached the statistical significance. According to the univariate mean test results, after the enactment, *DE* and *DE1* are significantly increased.

#### 4.3 Multivariate Analysis

##### 4.3.1 Before the Enactment

This paper applies the regression analysis to test H1 and H2. Before the enactment, due to the debt financing's interest expenses, the sum can be deducted from the corporate income tax, resulting in more tax benefits of debt financing. And after-tax income of creditor is greater than the shareholder's after-tax income. When the gap between the two items is large, the debt financing tax benefits are great. According to the empirical results from the regression analysis of *DE* as shown in Table 4. the *INT* regression coefficient is 2.391, t-value is 6.77

(P-value <.0001), indicating a significant positively correlation. Therefore, H1-1 is accepted. When enterprise has a high *INT*, debt financing tax benefits are great and the debt-to-equity ratio is high. Because the *ETR* regression coefficient is 0.018, t-value is 0.24 (P-value =0.8123), which are positively correlated without the statistical significance. Hence, H1-2 is not accepted.

Table 4. Regression results-before the enactment

Variables	Pred. Sign	Parameter Estimate	T-Value (p-Value)
Intercept		-64.599	-6.75(<.0001)***
INT(%)	+	2.391	6.77(<.0001)***
ETR(%)	+	0.018	0.24(0.8123)
ITC(%)	-	-0.498	-6.31(<.0001)***
UDIS(%)	+	0.077	2.42(0.0158)***
INVPPE(%)	+	0.805	17.13(<.0001)***
RDEP(%)	-	-5.344	-14.09(<.0001)***
GTA(%)	+	0.603	15.86(<.0001)***
RRD(%)	-	-1.602	-11.44(<.0001)***
LnSale(log)	+	8.664	14.17(<.0001)***
ROE(%)	-	-2.044	-38.21(<.0001)***
InsHold(%)	+	0.467	8.14(<.0001)***
ELEC(0,1)	?	-0.795	-0.43(0.6704)

Note. adj R-Sq=0.2961;\*\*\*, \*\* denote significance at the 1% and 5%, respectively.

According to the *ITC* regression coefficient is -0.498, t-value is -6.31 (P-value <.0001), which are negatively correlated with statistical significance. Hence, H1-3 is accepted. And the *UDIS* regression coefficient is 0.077 and t-value is 2.42 (P-value 0.0158), which are positively correlated with statistical significance. Therefore, H1-4 is accepted.

For the remaining control variables, when *INVPPE*, *GTA*, *LnSale* and *InsHold* are high, the *DE* is also high in the expected direction with statistical significance. When *RDEP*, *RRD* and *ROE* are high, the *DE* is low, in the expected direction and with statistical significance.

#### 4.3.2 After the Enactment

As interest expenses are deducted before tax, stock dividends are distributed from after-tax earnings. For many companies, debt financing has many tax benefits, and they tend to choose debt financing, resulting in thin capitalization of company capital structure. The enactment of the anti-thin capitalization rules attempts to reduce such phenomenon detrimental to the enterprise development. It provides that the exceeding limit of interest expenses (*D*) should be added to the pre-tax income for the calculation of the income tax, and after-tax income will be distributed to shareholders. As a result, the tax burden for the company to require funds from the shareholders remains unchanged.

According to the derivation of mathematical Model (5), after the enactment, the enterprises with interest expenses reaching the upper limit should consider the stock dividends distribution share, as well as exogenous factors such as shareholder, creditor marginal tax rate and interest rate, when choosing between debt financing and equity offering. Compared to Eq. (3), it can be found that the major difference of the net marginal benefits before and after the enactment is the after-tax interest income of the fund provider, as shown in Eqs. (3) and (5). The former is levied with the consolidated income tax only and the latter needs to pay the corporate income tax, and then the consolidated income tax. It can be found that under the conditions of the net marginal benefits as shown in Eq. (5), due to decreasing debt financing benefits, the agency cost is low. In other words, the enactment of the anti-thin capitalization rules can make debt financing unfavorable.

According to *DE* regression analysis results as shown in Table 5, after the enactment (*DYear*), the regression coefficient is -12.088, and t-value is -3.95 (P-value <.0001), which are significantly negatively correlated. Hence, H2 is accepted. Moreover, the interest expenses of debt exceeding the limit should not be deducted as pre-tax income, and the tax saving benefits thus will be lower. Therefore, the debt-to-equity ratio is low.

Table 5. Regression results-after the enactment

Variables	Pred. Sign	Parameter Estimate	T-Value (p-Value)
Intercept		-75.020	-8.93(<.0001)***
DYear(0,1)	-	-12.088	-3.95(<.0001)***
DYear×INT(%)	+(-)	4.773	5.12(<.0001)***
DYear×ETR(%)	+(-)	0.106	0.82(0.4122)
DYear×ITC(%)	-	-0.372	-2.25(0.0245)**
DYear×UDIS(%)	+	0.134	2.63(0.0085)***
INVPPE(%)	+	0.766	18.37(<.0001)***
RDEP(%)	-	-4.290	-12.76(<.0001)***
GTA(%)	+	0.655	19.17(<.0001)***
RRD(%)	-	-1.581	-13.59(<.0001)***
LnSale(log)	+	9.426	17.45(<.0001)***
ROE(%)	-	-2.244	-49.36(<.0001)***
InsHold(%)	+	0.458	8.87(<.0001)***
ELEC(0,1)	?	-1.585	-0.95(0.3423)

Note. adj R-Sq=0.2967;\*\*\*, \*\* denote significance at the 1% and 5%, respectively.

And the  $DYear \times INT$  regression coefficient is 4.773, and t-value is 5.12 (P-value <.0001). When  $INT$  is high, the  $DE$  is also high with statistical significance. Therefore, H3-1 is accepted. For the empirical samples of this study, nearly 99.4% samples have the  $DE$  below 3, which does not exceed the limit of deducting interest expenses, indicating that there are still debt financing tax benefits. Therefore, after the enactment, companies with a high  $INT$  have a high total debt-to-equity ratio.

Because the  $DYear \times ETR$  regression coefficient is 0.106, and t-value is 0.82 (P-value 0.4122). The empirical results indicate that shareholder  $ITC$  is higher than  $UDIS$ . Although they are positively correlated without statistical significance, H3-2 is not supported. And the  $DYear \times ITC$  regression coefficient is -0.372, and t-value is -2.25 (P-value 0.0245), which are negatively and significantly correlated. Therefore, H3-3 is accepted. The shareholder  $ITC$  is high, indicating that the dividend income double taxation can effectively reduce the debt financing tax benefits. Finally, the Table 5 indicates that the  $DYear \times UDIS$  regression coefficient is 0.134, and t-value is 2.63 (P-value 0.0085), which are significantly positively correlated. Therefore, H3-4 is accepted.

The regression analysis results of remaining control variables are almost the same as those described in Table 4. When  $INVPPE$ ,  $GTA$ ,  $LnSale$  and  $InsHold$  are high, the  $DE$  is also high, as expected, with statistical significance. The findings are consistent with Rutterford (1996), Omer and Terando (1999), and Wald (1999). When  $RDEP$ ,  $RRD$  and  $ROE$  are high, the  $DE$  is low, as expected, with statistical significance. The findings are consistent with Titman and Wessels (1998), Allen (1989), Chang and Rhee (1990), and Omer and Terando (1999).

## 5. Conclusion

This study explored the impact of the enactment of the anti-thin capitalization rules on the enterprise's capital structure. It first introduced the relevant anti-thin capitalization rules, and established the simple theoretical model to deduce the impact of the anti-thin capitalization rules on capital structure. Finally, the data from the period of 2006–2012 were used for the empirical study concerning the impact of anti-thin capitalization rules on the enterprise's capital structure.

According to theoretical model derivations, before the enactment, if the interest-bearing liability ratio is high, the marginal income tax rate, surtax on undistributed earnings, and debt-to-equity ratio are all high, while the shareholder imputed tax credits ratio is low. After the enactment, the debt-to-equity ratio and shareholder imputed tax credits ratio are low, while the surtax on undistributed earnings ratio and debt-to-equity ratio are high. However, the relationship of interest-bearing liability ratio, marginal income tax rate, and debt-to-equity ratio is not certain.

In the empirical study, according to the mean test results, after the enactment, the total debt-to-equity ratio and long term debt-to-equity ratio are significantly increased. As the pre-enactment regression results suggest, if the interest-bearing liability ratio is high, the marginal income tax rate, surtax on undistributed earnings, and total debt-to-equity ratio are all high, while the shareholder imputed tax credits ratio is low. This finding supports the theoretical hypothesis. However, the marginal income tax rate has not reached the significance level. Secondly, as the post-enactment regression results indicate, the total debt-to-equity ratio is significantly decreased. The

shareholder imputed tax credits ratio and total debt-to-equity ratio are negatively correlated, while interest-bearing liability ratio, marginal income tax rate, surtax on undistributed earnings, and total debt-to-equity ratio are positively correlated as expected. However, the marginal income tax rate is lack of statistical significance. Finally, the pledge ratio, investment growth opportunities, firm size, ownership of director and supervisor ratio, and total debt-to-equity ratio are significantly and positively correlated. Non-debt tax shields, R&D ratio and profitability, and total debt-to-equity ratio are significantly and negatively correlated. For the above two, the conclusions of before and after the enactment are the same as expected.

### Acknowledgments

We thank the editor and two anonymous reviewers for providing helpful comments. We acknowledge financial support from the Ministry of Science and Technology (NSC 100-2410-H-141-003).

### References

- Allen, D. E. (1989). The determinants of corporate capital structure: Japanese evidence. *Applied Economics*, 21(5), 569–585. <http://dx.doi.org/10.1080/758524891>
- Auerbach, A. J. (2002). Taxation and corporate financial policy. In Auerbach, A. J., & Feldstein, M. (Eds.), *Handbook of Public Economics* (pp. 1251–92). North-Holland, Amsterdam. [http://dx.doi.org/10.1016/S1573-4420\(02\)80023-4](http://dx.doi.org/10.1016/S1573-4420(02)80023-4)
- Booth, L., Aivazian, V., Demirguc-Kunt, A., & Maksimovic, V. (2001). Capital structures in developing countries. *The Journal of Finance*, 56(1), 87–130. <http://dx.doi.org/10.1111/0022-1082.00320>
- Bowen, R. M., Daley, L., & Huber, C. (1972). Evidence on the Existence and Determinants of Inter-Industry Differences in Leverage. *Financial Management*, 11(4), 10–20. <http://dx.doi.org/10.2307/3665227>
- Bradley, M. G., Jarrel, A., & Kim, E. H. (1984). On the Existence of Optimal Capital Structure: Theory and Evidence. *Journal of Finance*, 39(3), 857–880. <http://dx.doi.org/10.1111/j.1540-6261.1984.tb03680.x>
- Brocke, K. V., & Perez, E. G. (2009). Group financing: from thin capitalization to interest deduction limitation rules. *International Transfer Pricing Journal*, 16(1), 29–35. Retrieved from <http://www.ibfd.org/IBFD-Products/Journal-Articles/International-Transfer-Pricing-Journal/collections/itpj/html/itpj010902.html>
- Buettner, T., Overesch, M., Schreiber, U., & Wamser, G. (2012). The impact of thin-capitalization rules on the capital structure of multinational firms. *Journal of Public Economics*, 96, 930–938. <http://dx.doi.org/10.1016/j.jpubeco.2012.06.008>
- Burman, L., Clausing, K., & O'Hare, J. (1994). Tax reform and realizations of capital gains in 1986. *National Tax Journal*, 47(1), 1–18. Retrieved from [http://EconPapers.repec.org/RePEc:ntj:journal:v:47:y:1994:i:no\\_1:p:1-18](http://EconPapers.repec.org/RePEc:ntj:journal:v:47:y:1994:i:no_1:p:1-18)
- Buttner, T., & Wamser, G. (2007). *Intercompany loans and profit shifting-evidence from company-level data*. CESifo working paper, 1959. Retrieved from [http://www.cesifo.com/ifoHome/publications/working-papers/CESifoWP/CESifoWPdetails?wp\\_id=14557881](http://www.cesifo.com/ifoHome/publications/working-papers/CESifoWP/CESifoWPdetails?wp_id=14557881)
- Casey, M., & Dickens, R. (2000). The effects of tax and regulatory changes on commercial bank dividend policy. *Quarterly Review of Economics and Finance*, 40(2), 279–293. [http://dx.doi.org/10.1016/S1062-9769\(99\)00051-4](http://dx.doi.org/10.1016/S1062-9769(99)00051-4)
- Casey, M., Anderson, D., Mesak, H., & Dickens, R. (1999). Examining the impact of the 1986 tax reform act on corporate dividend policy: A new methodology. *The Financial Review*, 34(3), 33–46. <http://dx.doi.org/10.1111/j.1540-6288.1999.tb00461.x>
- Chang, R. P., & Rhee, S. G. (1990). The impact of personal taxes on corporate dividend policy and capital structure decisions. *Financial Management*, 19(2), 21–31. <http://dx.doi.org/10.2307/3665631>
- Chao, Y. Y., Hsiau, C. F., & Liao, C. C. (2012). An empirical study of the relationship between thin capitalization, tax planning and capital structure. *Journal of Global Management and Economics*, 8(1), 63–90.
- Chen, M. C., Wang, J. C. & Lin, Y. S. (2007). An empirical investigation into firms' choices between five-year exemption from corporate income tax and shareholder investment tax credits. *Journal of Management*, 24(1), 41–59. (in Chinese). Retrieved from <http://jom.management.org.tw/catalog/view.aspx?id=60>

- DeAngelo, H., & Masulis, R. W. (1980). Optimal capital structure under corporate and personal taxation. *Journal of Financial Economics*, 8(1), 3–29. [http://dx.doi.org/10.1016/0304-405X\(80\)90019-7](http://dx.doi.org/10.1016/0304-405X(80)90019-7)
- Desai, M., Foley, C., & Hines, J. (2004). A multinational perspective on capital structure choice and internal capital markets. *The Journal of Finance*, 59(6), 2451–2487. <http://dx.doi.org/10.1111/j.1540-6261.2004.00706.x>
- Farrar, J., & Mawani, A. (2008). *Debt-equity limitations in thin capitalization rules Canadian evidence*. 2008 Annual conference paper, Canadian Academic Accounting Association. <http://dx.doi.org/10.2139/ssrn.1080639>
- Haufler, A., & Runkel, M. (2008). *Firms' financial choices and thin capitalization rules under corporate tax competition*. CESifo working paper, 2429, CESifo Venice Summer Institute, Munich. Retrieved from [http://www.cesifo-group.de/ifoHome/publications/working-papers/CESifoWP/CESifoWPdetails?wp\\_id=14556823](http://www.cesifo-group.de/ifoHome/publications/working-papers/CESifoWP/CESifoWPdetails?wp_id=14556823)
- Huizinga, H., Laeven, K., & Nicodeme, G. (2007). *Capital structure and international debt-shifting*. IMF Working Paper, WP/07/39. Retrieved from <https://www.imf.org/external/pubs/ft/wp/2007/wp0739.pdf>
- Jong, A., Kabir, R., & Nguyen, T. T. (2008). Capital structure around the world: The roles of firm and country-specific determinants. *Journal of Banking and Finance*, 32(9), 1954–1969. <http://dx.doi.org/10.1016/j.jbankfin.2007.12.034>
- Kester, C. W. (1986). Capital and ownership structure: A Comparison of United States and Japanese manufacturing corporations. *Financial Management*, 15(1), 5–16. <http://dx.doi.org/10.2307/3665273>
- Long, M., & Malitz, I. (1985). The Investment-financing Nexus: Some empirical evidence. *Midland Corporate Finance Journal*, 3(3), 53–59.
- MacKIE-Mason, J. K. (1990). Do taxes affect corporate financing decision? *The Journal of Finance*, 45(5), 1471–1493. <http://dx.doi.org/10.1111/j.1540-6261.1990.tb03724.x>
- Marsh, P. (1982). The choice between equity and debt: An empirical study. *The Journal of Finance*, 37(1), 121–145. <http://dx.doi.org/10.1111/j.1540-6261.1982.tb01099.x>
- Miller, M. H. (1977). Debt and taxes. *Journal of Finance*, 32(2), 261–275. <http://dx.doi.org/10.1111/j.1540-6261.1977.tb03267.x>
- Miller, M. H., & Modigliani, F. (1958). The cost of capital, corporation finance, and the theory of investment. *The American Economic Review*, 48(3), 261–297. Retrieved from <http://www.jstor.org/stable/1809766>
- Mills, L. F., & Newberry, K. J. (2004). Do foreign multinationals' tax incentives Influence their U. S. income reporting and debt policy. *National Tax Journal*, 57(1), 89–107. Retrieved from <http://EconPapers.repec.org/RePEc:ntj:journal:v:57:y:2004:i:1:p:89-107>
- Mintz, J., & Weichenrieder, A. (2005). *Taxation and the financial structure of German outbound FDI*. CESifo working paper, 1612, CESifo Venice Summer Institute, Munich. Retrieved from [http://www.cesifo.com/ifoHome/publications/working-papers/CESifoWP/CESifoWPdetails?wp\\_id=14558526](http://www.cesifo.com/ifoHome/publications/working-papers/CESifoWP/CESifoWPdetails?wp_id=14558526)
- Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, 5(2), 147–175. [http://dx.doi.org/10.1016/0304-405X\(77\)90015-0](http://dx.doi.org/10.1016/0304-405X(77)90015-0)
- Newberry, K. J. (1998). Foreign tax credit limitations and capital structure decisions. *Journal of Accounting Research*, 36(1), 157–166. <http://dx.doi.org/10.2307/2491326>
- Omer, T. C., & Terando, W. D. (1999). The effect of risk and tax differences on corporate and limited partnership capital structure. *National Tax Journal*, 52(4), 699–715.
- Overesch, M., & Wamser, G. (2006). *German inbound investment, corporate tax planning, and thin-capitalization rules: A difference-in-differences approach*. IFO working Paper, 37.
- Papaioannou, G. J., & Savarese, C. M. (1994). Corporate dividend policy response to the tax reform act of 1986. *Financial Management*, 23(1), 56–63. <http://dx.doi.org/10.2307/3666056>
- Rutterford, J. (1996). Discussion of convertible debt financing: An empirical analysis. *Journal of Business Finance and Accounting*, 23(2), 335–338. <http://dx.doi.org/10.1111/j.1468-5957.1996.tb00917.x>
- Schulman, C. T., Thomas, D. W., Sellers, K. F., & Kennedy, D. B. (1996). Effects of tax integration and capital gains tax on corporate leverage. *National Tax Journal*, 49(1), 31–55. Retrieved from

- <http://www.jstor.org/stable/41789184>
- Schwartz, E., & Aronson, J. R. (1967). Some Surrogate Evidence in Support of the Concept of Optimal Financial Structure. *Journal of Finance*, 22(1), 10–18. <http://dx.doi.org/10.1111/j.1540-6261.1967.tb01650.x>
- Scott, D. F. (1972). Evidence on the Importance of Financial Structure. *Financial Management*, 32(1), 45–50. <http://dx.doi.org/10.2307/3665143>
- Smith, C. (1977). Alternative methods for raising capital: Rights versus underwritten offerings. *Journal of Financial Economics*, 5(3), 273–307. [http://dx.doi.org/10.1016/0304-405X\(77\)90040-X](http://dx.doi.org/10.1016/0304-405X(77)90040-X)
- Stiglitz, J. (1972). Some aspects of the pure theory of corporate finance: bankruptcies and takeovers. *Bell Journal of Economic*, 3(2), 458–482. <http://dx.doi.org/10.2307/3003033>
- Titman, S. (1984). The effect of capital structure on a firm's liquidation decision. *Journal of Financial Economics*, 13(1), 137–151. [http://dx.doi.org/10.1016/0304-405X\(84\)90035-7](http://dx.doi.org/10.1016/0304-405X(84)90035-7)
- Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *Journal of Finance*, 43(1), 1–19. <http://dx.doi.org/10.1111/j.1540-6261.1988.tb02585.x>
- Tong, G., & Green, C. J. (2005). Pecking order or trade-off hypothesis? Evidence on the capital structure of Chinese companies. *Applied Economics*, 37(19), 2179–2189. <http://dx.doi.org/10.1080/00036840500319873>
- Wald, J. K. (1999). How firm characteristics affect capital structure: An international comparison. *The Journal of Financial Research*, 22(2), 161–187. <http://dx.doi.org/10.1111/j.1475-6803.1999.tb00721.x>
- Wang, J. C. (2013). An investigation of anti-thin capitalization provisions in China on Taiwanese Enterprises' financing decision. *Review of Accounting and Auditing Studies*, 3(2), 81–125. (in Chinese). Retrieved from [http://www.taef.org.tw/raas/pdf/0302\\_04.pdf](http://www.taef.org.tw/raas/pdf/0302_04.pdf)
- Wang, J. C., & Chen, M. C. (2004). An empirical investigation of impacts of the imputation tax system on corporate dividend payouts. *Journal of Management*, 21(2), 257–277. (in Chinese). Retrieved from [http://db1n.sinica.edu.tw/textdb/tssci/listsrchpr.php?\\_op=?paperID:9989](http://db1n.sinica.edu.tw/textdb/tssci/listsrchpr.php?_op=?paperID:9989)
- Wang, J. C., & Chen, M. C. (2007). An empirical investigation of impacts of the integrated income tax system. *Chiao Da Management Review*, 27(1), 221–246. (in Chinese). Retrieved from [http://db1n.sinica.edu.tw/textdb/tssci/listsrchpr.php?\\_op=?paperID:12966](http://db1n.sinica.edu.tw/textdb/tssci/listsrchpr.php?_op=?paperID:12966)
- Wang, Y. J., & Gu, Y. F. (2003). The choice of capital structure, the scale of financing and debt refunding. *Journal of Financial Studies*, 11(3), 35–87. (in Chinese). Retrieved from <http://www.jfs.org.tw/index.php/jfs/article/view/2011148>
- Yang, S. Y., Liao, S. L., & Huang, J. C. (2000). Optimal Dynamic Capital Structures of Taiwan Industries: An Application of Dynamic Capital Structure Model. *Asia-Pacific Economic and Management Review*, 3(2), 41–64. (In Chinese). Retrieved from [http://www.airiti.com/ceps/ec\\_en/ecjnlarticleView.aspx?jnlcattype=0&jnlptype=0&jnltype=0&jnliid=424&issueid=136004&atliid=2590473](http://www.airiti.com/ceps/ec_en/ecjnlarticleView.aspx?jnlcattype=0&jnlptype=0&jnltype=0&jnliid=424&issueid=136004&atliid=2590473)

## Notes

Note 1. See Buettner et al. (2012).

Note 2. The interest of loans that are not necessary for business activities will not be recognized; the loans of the owner of the sole proprietorship or partners of the partnership are recognized as capital transaction of the capital owners and shall not be listed as interest expenses.

Note 3. Banks, credit cooperatives, financial holding corporations, bond and bill financial corporations, insurance companies and securities firms are not subject to the relevant provisions.

Note 4. For literature on tax and the company's capital structure, please refer to Auerbach (2002).

Note 5. A company can be regarded as the parent (host) company of B company.

Note 6. The impact of change in  $T_u$  and  $k$  are not considered in Wang(2013).

Note 7. To elaborate on the effects of changes in the tax rates of capital investment, the consolidated income taxes of the creditors and shareholders are processed separately. According to the above settings, A company provides the capital, and the tax rates of the two should be the same, that is,  $T_d = T_e = T$ . The differentiation of

$\delta_b$  against  $T$  is:  $\partial\delta_b/\partial T = r(\alpha-1) < 0$ .

Note 8. If the current pre-tax income is negative, then the *UDIS* is 0; if the undistributed earnings are negative, the *UDIS* is 0.

### Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/3.0/>).