International Review of Economics and Finance 29 (2014) 409–425

Contents lists available at ScienceDirect

International Review of Economics and Finance

journal homepage: www.elsevier.com/locate/iref

Effects of ultimate ownership structure and corporate tax on capital structures: Evidence from Taiwan

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ARTICLE INFO

Article history:
Received 25 March 2012
Received in revised form 2 July 2013
Accepted 12 July 2013
Available online 27 July 2013

JEL classification::
G30
G32
G38

Keywords:
Capital structure
Manager ownership
Controlling shareholder
Agency cost

ABSTRACT

Our study investigates how ultimate ownership structure and the corporate tax rate affect the equilibrium trade-off relation between manager ownership and debt in reducing agency costs. Considering the presence of the controlling shareholder, we find that higher corporate tax rates strengthen the trade-off relation between manager ownership and debt while higher control rights held by the controlling shareholder weaken it as well as the strengthening effect of corporate tax rate. Our study contributes to the literature by revealing tax and ultimate ownership structure dimensions and their interactions as additional determinants of corporate capital structure.

1. Introduction

Manager ownership and debt both reduce agency costs, and they exist in equilibrium in a firm. This study investigates how ultimate ownership structure and corporate tax status affect this equilibrium. The effect of a firm's ownership structure on performance has received considerable attention in the literature. However, few studies have examined the effects of ownership structure or corporate tax status on capital structure, and they focus on the interaction between manager ownership and debt financing (e.g., Crutchley & Hansen, 1989; Bathala, Moon, & Rao, 1994) or on the effect on debt financing of the tax subsidy for interest payments (Graham, 1996a, 1996b). The exception is Seetharaman, Swanson, and Srinidhi (2001) which has considered the effects on debt financing from both the perspectives of tax and ownership structure.[2]

In the United States, there is relatively little concentration in ownership structures. In contrast, in East Asia many firms are controlled by a single shareholder (e.g., La Porta, Lopez-de-Silanes, & Shleifer, 1999). In addition, firms in East Asia exhibit far more divergence between cash-flow rights and control rights than do U.S. firms. Control power is often enhanced beyond ownership stakes through pyramid structures or cross-holdings between firms. Moreover, large shareholders have stronger incentives and abilities to monitor firm managers, and the presence of the controlling shareholder can therefore reduce

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[2] Seetharaman et al. (2001) shows that the relation between debt and manager ownership is negative (i.e., they substitute for each other in reducing agency cost) and a firm's higher income tax rate affects the negative relation (substitution) between debt and managerial ownership. However, that study examines only U.S. corporations, which are usually dominated by managers; whether the results are applicable to corporations in other countries needs to be examined, given the pronounced differences in ownership structure between U.S. and non-U.S. firms.

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http://dx.doi.org/10.1016/j.iref.2013.07.004

managerial self-dealing. These ultimate ownership structure characteristics suggest that a study of non-U.S. firms can provide evidence of the effects of ownership structure on a firm's leverage that would be difficult to detect in U.S. data.

Because of the separation of control rights and ownership, firms face agency conflicts between stockholders and managers. Management stock ownership can reduce agency costs by aligning the interests of a firm's managers with those of its shareholders. However, because of management entrenchment (e.g., Demsetz, 1983; Fama & Jensen, 1983), an increase in manager ownership can be expected to increase agency costs. The relation between manager ownership and agency cost is therefore non-monotonic.

Both debt and manager ownership are devices to reduce agency costs, and a trade-off relation exists between them in reducing agency costs. Consistent with this argument, numerous studies find that manager ownership negatively impacts firm leverage (e.g., Bathala et al., 1994; Chen & Steiner, 1999; Friend & Lang, 1988; Jensen, Solberg, & Zorn, 1992), supporting the traditional trade-off model where firms determine their optimal leverage by weighting the costs (e.g., financial distress) and benefits (e.g., reducing agency costs) of the marginal dollar of debt. Similarly, firms weight effects of agency and entrenchment costs to determine the optimal manager ownership level (e.g., Rozeff, 1982; Schooley & Barney, 1994).

The difference in manager- and controlling-shareholder-dominated ownership structures thus motivates us to investigate how ultimate ownership structure affects the influences of firm manager stock ownership and income tax rate on capital structure. Although the trade-off between alternative mechanisms to reduce agency costs is well elaborated in prior studies, this paper introduces both tax and ultimate ownership structure dimensions to complement previous research. Accordingly, our study aims to (1) build a model based on the trade-off theory to predict the effects of the controlling shareholder, firm income tax rate, and their interactions on debt financing and (2) empirically test our model's predictions using a two-stage simultaneous least-squares regression to control for potential endogeneity between manager ownership and debt.[3]

Based on the framework of the trade-off theory, we assume that a firm chooses a cost-minimized combination of manager ownership and debt to reduce agency costs. We show that manager ownership negatively impacts the level of debt in a substitution relation, as reported in previous literature. Moreover, our model is more robust than those of prior studies also built on the trade-off theory (e.g., Chen & Steiner, 1999; Jensen et al., 1992; Seetharaman et al., 2001) because we consider a disciplining force that drives managers to pursue optimal decisions.

Specifically, one inherent theoretical flaw of the trade-off theory is the reliance on a “discipliner” to ensure that managers undertake optimal debt to maximize firm value, but this reliance ignores the fact that managers are self-interested and may not always run the firm in the best interest of its shareholders. A straightforward way to settle this problem is through concentrated shareholding (Shleifer & Vishny, 1997), because the controlling shareholder has the incentives and abilities to discipline managers' actions. By incorporating the controlling shareholder's influence, our model presents a more complete picture of the effect of ownership structure on firm financing decisions.

Based on our analyses, we predict that the greater the control rights held by the controlling shareholder, the larger (i.e., less negative) the trade-off between debt and manager ownership, because the greater the control rights, the more incentives and abilities the controlling shareholder has to monitor managers, thus leading to lower management entrenchment costs.[4] As the use of debt becomes costlier, firms will use less debt in their optimal choice for reducing agency costs, holding manager ownership constant.

In addition, our model shows that the higher a firm's income tax rate, the greater its interest payment tax shield and hence the lower its capital cost of debt, strengthening this trade-off (i.e., leading it to be more negative). Because higher controlling shareholder control rights decrease managerial entrenchment costs, offsetting the cost efficiency of the interest tax shield, we expect higher controlling shareholder control rights to mitigate the strengthening effect of the firm's tax rate on the trade-off relation.

Our study uses a sample of corporations listed in Taiwanese stock market, with 5027 firm-year observations from 1996 to 2006. We choose Taiwan as our experiment environment because firms there are usually dominated by a controlling shareholder. This ultimate ownership structure not only implies the existence of a discipliner but also provides new insights into how ownership structure affects firm leverage in a non-U.S. context.[5]

Consistent with our predictions, our empirical results show that there is an inverse (i.e., trade-off) relation between the level of debt and managerial ownership. Furthermore, we find that more control rights held by the controlling shareholder mitigate the trade-off relation between manager ownership and debt. We also find that higher firm tax rates strengthen this trade-off relation, but the strengthening effect is mitigated by the controlling shareholder's control rights.

Additional tests show that the relation between debt and managerial ownership is more negative for firms with higher levels of redundant cash and a lower probability of going bankrupt. This result implies that a higher degree of financial flexibility results in lower costs of raising additional debt and thus changes the trade-off relation. Moreover, the effect of the controlling

[3] Mechanisms to reduce agency costs include cash dividend payments, managerial stock ownership, and higher debt levels. To extend the work of Seetharaman et al. (2001), our study focuses on the relation between debt and manager stock ownership.

[4] Our definition of the trade-off relation is the ratio of the first-order derivative of debt divided by the first-order derivative of manager ownership, with the magnitude of the trade-off (i.e., a negative relation) depending on the marginal cost of manger ownership (i.e., entrenchment costs) relative to the marginal cost of debt. The reduction in entrenchment cost thus leads to a larger trade-off ratio, meaning that this ratio becomes less negative.

[5] Moreover, the simplicity of the tax system in Taiwan also helps us to more easily measure the firm-level effective income tax rate. In Taiwan, the tax rate for corporate income below NT$100,000 (about $3000 U.S. dollars) is 15%, and that above NT$100,000 is 25%. Since it is rare that listed firms make profits below NT $100,000, it is appropriate to conclude that corporate income is subject to essentially a single rate of 25%. The new corporate income tax rate is 17% (effective January 1, 2010).

shareholder on the trade-off relation is less prominent for family-controlled firms, since the management team and controlling shareholder in such firms are usually members of the same family. The conflict between managers and the controlling shareholder is therefore not as salient as for non-family firms.

Our study offers several contributions to the literature on capital structure and corporate governance. First, it provides a theoretical basis to demonstrate how the presence of the controlling shareholder affects the trade-off between capital structure decisions (debt level) and incentive-compatible contracts (managerial ownership level), adding new insight into the trade-off model. As researchers continue to explore the severity of agency problems by focusing on firm performance, we do so by focusing on whether the structure of equity ownership, taxation, and their interactions can help explain cross-sectional variations in capital structure. Despite the widespread interest in how firms make their financing decisions, most studies on the subject were conducted in countries with relatively developed capital markets. Our study thus provides additional insights by conducting tests in an emerging market with less investor protection and a high level of ownership concentration.

Second, because our empirical design considers the ownership of both managers and the controlling shareholder, we can better disentangle the effects of management entrenchment from those of controlling shareholder entrenchment, given the difficulty of this task with U.S. data. Specifically, our findings suggest that the controlling shareholder helps alleviate managerial entrenchment but also leads to another type of entrenchment due to the controlling shareholder's aversion to creditor scrutiny. Therefore, our results imply that the controlling shareholder plays the role of both monitor and expropriator at the same time.

Third, we employ an econometric technique that addresses the concerns of an endogenous choice of governance and financial policy, and thus our findings help resolve the issue of mixed research results. Specifically, the literature is not consistent regarding the precise relation between managerial ownership and leverage, since some studies (e.g., Brailsford, Oliver, & Pua, 2002; Moon & Tandon, 2007) find that the relation between debt and manager ownership is positive in some cases. By repeating our tests with ordinary least squares (OLS), we also find a positive coefficient for managerial ownership of the debt ratio, but when we conduct a two-stage least-squares regression, the coefficient turns negative. This result shows that by relying on OLS analysis, the positive relation found by prior studies may actually be driven by the interdependence between debt and manager ownership rather than by underlying economics.

Our paper is organized as follows. Section 2 reviews the related literature and introduces the tax system in Taiwan. Section 3 presents the model and develops our hypotheses. Section 4 discusses the research method. Section 5 presents the empirical results, and the final section discusses our conclusions.

2. Literature review

2.1. Role of debt and manager ownership in reducing agency costs

In the agency cost argument, manager ownership and debt are substitutes for controlling agency problems. Jensen and Meckling (1976) argue that one approach to reduce agency costs is to increase firm managerial ownership, since managers' interests will then align with those of stockholders. In addition, debt can reduce agency costs because periodic interest payments lead managers to have less control over the firm's free cash flow, thus reducing self-serving behavior.

However, under the managerial entrenchment hypothesis, the relation between managerial ownership and agency cost is non-monotonic (e.g., Schooley & Barney, 1994). That is, at some level, an increase in manager ownership may be expected to increase agency costs. Manager stock ownership gives managers increased control of the firm via voting rights, and increased control offers them the opportunity to pursue their own interests with a diminished threat of being replaced through either a hostile takeover or a proxy fight. Therefore, such entrenched management is costly to stakeholders because of the loss of their ability to monitor managers.

Likewise, leverage and agency costs also display a non-monotonic relation because firm debt results in increased bankruptcy costs. In addition, recent studies (e.g., DeAngelo, DeAngelo, & Whited, 2011) suggest that the loss of financial flexibility is also the cost of debt. Specifically, the increase in leverage produces the opportunity cost of borrowing in the present rather than preserving the option to issue debt in the future.

2.2. Ultimate corporate ownership structure and debt financing

In East Asia controlling owners generally possess control (voting) rights in excess of ownership (cash flow) rights, giving the controlling owners greater power and incentives to intervene in firm decisions as well as expropriate firm assets. Because of the difficulty in organizing dispersed shareholders, an ultimate owner that holds a large percentage of voting rights usually has de facto control over a firm's operation, and such an owner is defined as the controlling shareholder (e.g., La Porta, Lopez-de-Silanes, & Shleifer, 1998; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1997; La Porta et al., 1999).

The controlling shareholder's effect on firm debt financing decisions is unclear. On the one hand, the controlling shareholder may prefer debt to equity, because equity financing can introduce a new large shareholder who can threaten the dominant position of the incumbent controlling shareholder (Du & Dai, 2005).[6] On the other hand, as in the case of professional managers, the controlling shareholder may be also averse to debt financing, not only because of the resulting increased monitoring by creditors but also because the fixed obligation to repay interest and principal constrains the controlling shareholder's capacity to tunnel corporate resources. As a result, the effect of the controlling shareholder on debt financing is an open empirical issue.

Prior studies (e.g., Claessens, Djankov, Fan, & Lang, 2002; Shleifer & Vishny, 1997) suggest that because large shareholders have both a general interest in profit maximization and enough control over the assets of the firm, they have strong incentives pressure managers or even oust them through a proxy fight or takeover. This implies that the controlling shareholder's monitoring can induce the alignment of interests between manager and owners and mitigate managerial entrenchment problems.

However, Claessens et al. (2002) show that deviations between control rights and cash-flow rights are associated with discounts in firm value that generally increase with the size of the wedge between control rights and cash-flow rights. Accordingly, under the ultimate ownership structure, although the controlling shareholder can alleviate the managerial entrenchment effect, its presence can induce another entrenchment effect due to the difference between control rights and cash-flow rights, since such a difference creates more incentives for expropriation.

2.3. Tax and capital structure

The most straightforward benefit of firm leverage is the tax deductibility of interest payments. With the tax subsidy of interest, firms likely to generate higher levels of taxable income should, all else being equal, include more debt in their capital structure. By employing simulated firm tax rates to account for features of the tax code and non-debt tax shields, Graham (1996a, 1996b) indicates that firms with high tax rates indeed issue more debt than their counterparts with lower tax rates. Moreover, several studies document that firms change their capital structures in response to changes in the tax code. For example, by exploiting the U.S. 1986 tax reform as a natural experiment to control for non-tax factors, Givoly, Hahn, Ofer, and Sarig (1992) report that debt became less popular after the reduction in tax rates, with highly taxed firms decreasing debt the most.

3. Model and hypothesis development

3.1. Trade-off relation between debt and manager ownership

This section develops a trade-off model to demonstrate the inverse relation between debt and manager ownership in reducing agency costs. In particular, our model considers the effects of ultimate ownership structure and the corporate tax rate. We then develop empirical testable hypotheses based on our model.

According to Jensen and Meckling (1976) and Jensen (1986), the agency costs of stockholders can be reduced through debt financing and manager stock ownership. Hence, our model assumes that a firm's objective (i.e., the controlling shareholder's objective) is to choose the cost-minimizing combination of debt and manager ownership to reduce agency costs.[7]

Let θ represent the level of manager stock ownership and λ the level of debt. We can then express a firm's agency cost as a function of θ and λ, $L(\theta, \lambda)$. The cost of debt includes the capital cost C_D and the implicit costs of foregone financial flexibility and bankruptcy are represented by $F(\lambda)$. The cost function of debt is $\lambda \cdot C_D + F(\lambda)$, with $dF(\lambda)/d\lambda > 0$. Furthermore, under the entrenchment argument, manager stock ownership leads to higher entrenchment costs, and we represent the function of entrenchment costs as $E(\theta)$, with $dE(\theta)/d\theta > 0$.

Optimally, the ratio of the marginal benefit (i.e., reduction in agency costs) divided by the marginal cost (e.g., management entrenchment costs, or capital costs) must be the same for both θ and λ. Therefore, the solution of the optimal combination of debt and manager ownership can be expressed as

$$\frac{\partial L(\theta,\lambda)/\partial\lambda}{C_D + F(\lambda)_\lambda} = \frac{\partial L(\theta,\lambda)/\partial\theta}{\mathrm{E}(\theta)_\theta} \tag{1}$$

where

θ	stock ownership of the firm's managers,
λ	level of debt,
$L(\theta, \lambda)$	function of agency costs (comprised by θ and λ),
$E(\theta)_\theta$	simplification of $dE(\theta)/d\theta$, with $E(\theta)$ the function of the entrenchment cost for the manager's stock ownership (such that $dE(\theta)/d\theta > 0$), and
$F(\lambda)_\lambda$	simplification of $dF(\lambda)/d\lambda$, with $F(\lambda)$ the cost function of losing financial flexibility and going bankrupt for the debt (such that $dF(\lambda)/d\lambda > 0$).

To solve the trade-off relation between θ and λ, $d\lambda/d\theta$, we must set the total derivative of $L(\theta, \lambda)$ equal to zero, obtaining

$$\begin{aligned} &d\mathrm{L}(\theta,\lambda) = \partial L(\theta,\lambda)/\partial\theta \cdot d\theta + \partial L(\theta,\lambda)/\partial\lambda \cdot d\lambda = 0 \\ \Rightarrow &\frac{d\lambda}{d\theta} = -\frac{\partial L(\theta,\lambda)/\partial\theta}{\partial L(\theta,\lambda)/\partial\lambda} \end{aligned} \tag{2}$$

[7] Rozeff (1982) and Schooley and Barney (1994) refer to a similar setting. However, since their studies are based on a U.S. context, their analyses rely on the existence of a discipliner to monitor managers' decisions ex ante, but in widely held corporations this is rarely the case.

Combining Eqs. (1) and (2) yields

$$\frac{d\lambda}{d\theta} = -\frac{E(\theta)_\theta}{C_D + F(\lambda)_\lambda} \tag{3}$$

Since $C_D + F(\lambda)_\lambda > 0$ and $E(\theta)_\theta > 0$, we can arrive at the conclusion that $d\lambda/d\theta < 0$, which is consistent with the trade-off model where manager ownership and debt are substitutes in reducing agency costs. In addition, a more negative value of $d\lambda/d\theta$ implies that the firm's optimal choice is toward more debt and less manager ownership. For example, as the capital cost of debt C_D decreases, using debt to reduce agency costs will become cheaper and thus the firm will use more debt, leading λ to increase, holding θ constant.

Seetharaman et al. (2001) suggest that a higher corporate tax rate affects the substitution between debt and managerial ownership. We also achieve the same conclusion by differentiating the firm's income tax rate t_c to $d\lambda/d\theta$:

$$\frac{\partial}{\partial t_c}\left(\frac{d\lambda}{d\theta}\right) = \frac{E(\theta)_\theta}{(C_D + F(\lambda)_\lambda)^2} \cdot \frac{dC_D}{dt_c} \tag{4}$$

Because of the interest tax shield, the capital cost of debt is negatively related to the firm's tax rate; so $dC_D/dt_c < 0$ and $\partial(d\lambda/d\theta)/\partial t_c < 0$. The trade-off association becomes more negative as t_c increases, and a more negative $d\lambda/d\theta$ implies an inclination toward debt. This is intuitive, because the higher a firm's tax rate, the lower the capital cost of debt, and therefore using debt to reduce agency costs is more cost effective, leading the firm to use more debt. In other words, a higher income tax rate will strengthen the trade-off relation between debt and manager ownership.

3.2. Influence of the controlling shareholder on the trade-off relation between debt and manager ownership

As discussed in Section 2.2., the controlling shareholder usually has strong incentives and abilities to monitor managers' actions; therefore the entrenchment cost of managers, $E(\theta)_\theta$, should decrease as the controlling shareholder's control rights increase. That is, if we let V represent the controlling shareholder's control rights, then $dE(\theta)_\theta/dV < 0$. By differentiating V to $d\lambda/d\theta$, we obtain

$$\frac{\partial}{\partial V}\left(\frac{d\lambda}{d\theta}\right) = -\frac{1}{C_D + F(\lambda)_\lambda} \cdot \frac{dE(\theta)_\theta}{dV} \tag{5}$$

Since $dE(\theta)_\theta/dV < 0$, we know that $\partial(d\lambda/d\theta)/\partial V > 0$. This implies that with more control rights, the controlling shareholder can more effectively limit the managerial entrenchment effect, and so the cost of manager ownership decreases. Consequently, firms with controlling shareholder who holds more control rights will use less debt in their optimal choice for reducing agency costs. This result allows us to propose the following empirically testable hypothesis.

Hypothesis 1. The more control rights a firm's controlling shareholder holds, the less negative the trade-off relation between debt and manager ownership.

3.3. Interactions between the corporate tax rate, the influence of the controlling shareholder, and the trade-off relation between debt and manager ownership

Under the ultimate ownership structure, the monitoring role played by the controlling shareholder affects the influence of the corporate income tax rate on the trade-off relation between debt and manager ownership. This can be recognized by differentiating V to $\partial(d\lambda/d\theta)/\partial t_c$:

$$\frac{\partial}{\partial V}\left[\frac{\partial}{\partial t_c}\left(\frac{d\lambda}{d\theta}\right)\right] = \frac{1}{(C_D + F(\lambda)_\lambda)^2} \cdot \frac{dC_D}{dt_c} \cdot \frac{dE(\theta)_\theta}{dV} \tag{6}$$

Since $dC_D/dt_c < 0$ and $dE(\theta)_\theta/dV < 0$, the result of Eq. (6) is positive. This suggests that although a higher tax rate t_c leads to more tax shields for interest payments and the resulting tendency to increase leverage, this tendency is reduced because the controlling shareholder's higher control rights mitigate managerial entrenchment costs $E(\theta)_\theta$, offsetting the cost efficiency due to the interest tax shield. Accordingly, although a higher t_c leads to higher levels of debt, a higher V operates in the opposite direction, since a higher V results in a lower $E(\theta)_\theta$ and thus discourages firms to use debt to decrease agency costs. We thus propose the following hypothesis.

Hypothesis 2. An increase in the controlling shareholder's control rights decreases the strengthening effect of the firm's income tax rate on the trade-off relation between debt and manager ownership.

4. Research method

4.1. Research design

In our empirical design, we do not estimate our model by the OLS regression, since OLS assumes that dependent and independent variables are not interrelated, which may not be the case in our study. In a system compromised by potentially interdependent endogenous variables, the OLS method will result in biased or inconsistent parameter estimates. For example, Friend and Lang (1988) study the effects of insider ownership on debt ratios. The authors note that their OLS analysis implicitly assumes that insider ownership causes changes in debt levels and that it is also plausible that debt policy affects insider ownership choices (e.g., Demsetz & Lehn, 1985) or that both are independent of each other but related to similar firm-specific attributes. Accordingly, referring to previous studies (e.g., Chen & Steiner, 1999; Jensen et al., 1992; Seetharaman et al., 2001), we use the two-stage least-squares regression as our empirical model:

$$MSO_{it} = \alpha_0 + \alpha_1 DR_{it} + \alpha_2 DIVY_{it} + \alpha_3 INST_{it} + \alpha_4 Growth_{it} + \alpha_5 ROA_{it} + \alpha_6 Beta_{it} + \alpha_7 (Beta_{it})^2 + \alpha_8 Size_{it} + \alpha_9 R\&D_{it} + \mu_{it} \quad (7)$$

$$\begin{aligned} DR_{it} = {} & \beta_0 + \beta_1 MSO_{it} + \beta_2 DIVY_{it} + \beta_3 INST_{it} + \beta_4 Growth_{it} + \beta_5 Beta_{it} + \beta_6 Size_{it} + \beta_7 ROA_{it} + \beta_8 Fixed\ Asset_{it} + \\ & \beta_9 TR_{it} + \beta_{10} Control_{it} + \beta_{11} Deviation_{it} + \beta_{12} Depreciation_{it} + \beta_{13} TLC_{it} + \beta_{14} MSO_{it} \cdot TR_{it} + \\ & \beta_{15} MSO_{it} \cdot Control_{it} + \beta_{16} MSO_{it} \cdot TR_{it} \cdot Control_{it} + Industry + Year + e_{it} \end{aligned} \quad (8)$$

Eq. (7) is the first-stage regression that estimates the predicted value of manager ownership and Eq. (8) is the second-stage regression that estimates the relation between debt and the predicted value of manager ownership. Consistent with the proposition that debt and managerial ownership levels are determined simultaneously, debt appears as an independent variable in the managerial ownership equation, and vice versa.[8]

4.1.1. Independent variables

We measure the level of debt by *DR*, long-term debt divided by total assets, and the level of manager ownership by *MSO*, the percentage of outstanding shares of common stock held by a firm's directors and officers (Bathala et al., 1994; Crutchley & Hansen, 1989; Friend & Lang, 1988; Seetharaman et al., 2001; Warfield, Wild, & Wild, 1995).

4.1.2. Control variables

The variable *DIVY* is the dividend per share divided by the closing price on the day before the ex-dividend date. Prior research (e.g., Easterbrook, 1984; Jensen et al., 1992; Rozeff, 1982) argues that dividends reduce firm agency costs. By distributing dividends, managers are forced to seek external financing from the capital market, and the resulting scrutiny from external investors reduces agency costs (Chu, 1997; Kuo, 2013). This suggests a substitution relation between *DIVY* and *MSO*, as well as between *DIVY* and *DR*. On the other hand, shareholders and managers may have incentives to expropriate bondholders by simultaneously paying dividends and raising debt, especially in such emerging markets as Taiwan, with weaker credit right protections (Faccio, Lang, & Young, 2001). Therefore, it is also plausible that there exists a complementary relation between *DIVY* and *DR*.[9]

Miller (1977) argues that personal tax rates offset the tax advantages of corporate debt arising from interest tax shields. Specifically, investors are taxed more heavily on interest income than equity income given the lower capital gains tax rate than the ordinary income tax rate (i.e., as the case of Taiwanese tax system), so they demand higher risk-adjusted returns for holding debt (relative to holding equity), thereby increasing the capital cost of debt and discouraging the use of debt at the corporate level (Smith & Conover, 1993; Wu, 1996). Miller's argument suggests the importance of considering the effect of personal taxation in our empirical tests.

It is difficult to precisely measure investor tax status, but the evidence in Lee, Liu, Roll, and Subrahmanyam (2006) suggests that in Taiwan investor tax status is associated with the investee firm's dividend payments. Specifically, Lee et al. (2006) find that high-dividend (low-dividend) firms are held by investors with low (high) tax rates, consistent with the prediction of the dividend tax clientele argument. Their findings also suggest that *DIVY* can capture, at least partially, the effect of personal tax status, where a higher *DIVY* implies lower personal tax rates on average of investors in the firm. Therefore, the inclusion of *DIVY* as a control variable can mitigate concerns regarding the neglect of personal tax rates. If Miller's argument holds, then we should find that *DIVY* is positively related to *DR*, because a lower *DIVY* implies that investors have higher personal tax rates, which discourage the use of corporate debt.

The variable *INST* is the percentage of outstanding shares held by institutions.[10] Larger institutional investors are able to monitor management activities and limit agency problems (e.g., Bathala et al., 1994; Jensen & Meckling, 1976; Jiraporn, Kim, Kim, & Kitsabunnarat, 2012). In this respect, *INST* can be considered a substitute for manager ownership or debt. Moreover, because

[8] A Hausman test suggests that an endogenous relation exists between debt and managerial ownership. Therefore, the use of two-stage regression is reasonable.

[9] We recognize that the dividend can also be an endogenous variable, as argued by prior studies (e.g., Chen & Steiner, 1999; Jensen et al., 1992), but we assume it is exogenous because our focus is on exploring how ownership structures affect firm debt financing. Even if its coefficient is biased and inconsistent due to the lack of control for its endogeneity, our conclusions should remain fundamentally unaffected. We repeat our tests by employing models similar to those of Jensen et al. (1992), and our conclusions are qualitatively similar.

[10] The relevant institutions include governments, domestic banks, domestic trust funds, domestic corporate institutions, other domestic institutions, overseas banks, overseas corporate institutions, and overseas trust funds.

institutional ownership is not a corporate decision variable, it is presumed to be external to the firm and therefore an exogenous variable over which management has no direct control.

In addition to variables capturing alternative mechanisms in reducing agency costs, we also follow prior studies (Chen & Steiner, 1999; Du & Dai, 2005; González, 2013; Jensen et al., 1992; Seetharaman et al., 2001) to include several variables to control for the effect of firm attributes on determining managerial ownership and debt. The variable *Growth* is the ratio of a firm's equity market value to its equity book value, representing the firm's investment opportunity. Because growth opportunities are intangible assets, they are difficult to use as collateral, thus reducing the firm's debt financing ability. In addition, it becomes more difficult to monitor managerial actions when a higher proportion of firm value is represented by growth opportunities, and managers may be required to invest more wealth in the firm to resolve the monitoring problem (Seetharaman et al., 2001). The variable *Beta* is a firm's de-geared beta for the last year, measuring the firm's business risk. If the firm's business risk is high, managers will be reluctant to invest their personal wealth in the firm, and we include $(Beta)^2$ to control for the potential nonlinear effect of risk on *MSO* (Chen & Steiner, 1999). Moreover, higher business risk results in the higher volatility of operating incomes, which affects a firm's ability to meet debt payments. The variable *Size* is the natural log of the market value of equity. Limits on managerial wealth make it more costly for managers to take controlling interests in large firms. Furthermore, Warner (1977) and Ang, Chua, and McConnell (1982) contend that the probability of bankruptcy decreases as firm size increases; the larger the firm, the more funds lenders are willing to supply it. On the other hand, larger firms may favor equity financing because their information asymmetry is less severe, and in this case firm size is negatively related to leverage. The variable *ROA* is a firm's current operating income divided by total assets, and it is used to measure firm profitability. Higher profitability brings about more internal capital, therefore reducing the need to seek external capital, such as debt (Jensen et al., 1992). Moreover, higher profitability results in more cash flows and resources which induce managers to overinvest or undertake perquisite consumption (Jensen, 1986). In this context, it becomes more important to monitor managerial actions, and one solution to this problem is to increase managerial ownership (Himmelberg, Hubbard, & Palia, 1999). The variable *Fixed asset* is the book value of fixed assets divided by total assets, used as a measure of asset tangibility. Tangible assets can serve as collateral, which will make it easier to obtain loans. The variable *R&D* is research and development expenses divided by total assets. As argued by Demsetz and Lehn (1985), higher research and development expenses make it more difficult for external investors to monitor managerial actions. Therefore, higher *R&D* values lead to higher incremental values of managerial ownership.

The variables below are associated with the tests of our hypotheses. First, the variable *TR* measures the firm's tax status (t_c in our theoretical model), represented by the effective tax rate,[11] defined as income tax expenses divided by pre-tax financial accounting income, or zero if either income tax expenses or pre-tax income is negative. We use effective tax rates to represent cross-sectional variations in t_c among different firms.[12] In principle, the calculation of *TR* must be based on a firm's taxable income; however, since these data are unavailable, we replace them with the firm's pre-tax financial accounting income. Hence, following previous research (Barclay & Smith, 1995; Fullerton, 1984), we use the effective tax rate as a proxy of *TR*. In addition, we follow Shevlin (1990) in measuring *TR* with a dummy variable. Consequently, if the value of the tax rate is calculated to be negative, we define its value as zero.[13] If the tax rate of the firm is higher, then the effect of the debt tax shield will be stronger, causing the firm to be inclined to debt financing. But a higher tax rate implies higher firm profitability, which decreases the demand for debt. Therefore, the effect of *TR* on *DR* is ambiguous.

The variable *Control* is the control rights (i.e., voting rights) held by the firm's controlling shareholder. Our definition of controlling shareholders and procedures for ferreting out chains of ownership closely follow those of La Porta et al. (1999) and Claessens, Djankov, and Lang (2000), both studies that focus on the ultimate ownership. The ultimate owners are identified via a determination of each one's share of voting and cash flow rights. This variable is used to capture the incentives and abilities of controlling shareholder in monitoring managers.[14]

Eq. (4) predicts that the coefficient of $MSO \cdot TR$ is negative. To support Hypothesis 1 we predict that the coefficient of $MSO \cdot Control$ is positive, and to support Hypothesis 2 we anticipate a positive coefficient for $MSO \cdot TR \cdot Control$. To increase the power of the test, we adopt a one-tailed *t*-test to determine the significance of these variables, since our model can provide a theoretical basis to predict their signs.

The variable *Deviation* is the ratio of the controlling shareholder's ownership rights (i.e., cash-flow rights) to control rights. Following Faccio et al. (2001) and Du and Dai (2005), this variable is used to proxy for the incentives of the controlling shareholder to expropriate firm funds by raising more debt, because higher debt provides more sources of funds for expropriation. Prior studies usually use this ratio to measure a corporation's vulnerability to insider expropriation because of its

[11] In general, the definition of the effective tax rate is tax paid divided by contemporaneous taxable income. The reason we do not use tax paid is because the variance of the tax rate based on tax paid is so great that it can influence our empirical results. The standard deviation of the tax rate based on income tax expense is 0.13, while that calculated based on tax paid is 3.68. Thus, the tax rate based on tax paid may not reflect a firm's long-term tax planning, suggesting that such a tax rate is meaningless in our empirical analyses.

[12] In our theoretical model, higher t_c leads to a lower capital cost of debt due to the resulting interest tax shield, whose value depends on the firm's tax status. As indicated by Trezevant (1992), a lower effective tax rate generates less taxable income for tax shields to offset. Specifically, interest deductions generate tax savings only if they offset taxable income, so it is reasonable to use *TR* to proxy for t_c, since a higher *TR* implies more income to be offset by interest deductions, thus raising the value of interest tax shields and reducing the capital cost of debt.

[13] A negative tax rate implies no current taxable income to offset the tax shields resulting from interest. This reasoning allows us to set the negative tax rate at zero.

[14] One concern is that ownership rights may be better than control rights to represent a controlling shareholder's abilities and incentives to monitor managers. However, unreported results show that replacing control rights with ownership rights does not change our conclusions.

conceptual simplicity, which facilitates exposition and empirical analysis (e.g., Claessens et al., 2000; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 2000). The deviation ratio is low if the controlling shareholder controls the corporation via a long chain of intermediate corporations, implying many opportunities to expropriate minority shareholders.

DeAngelo and Masulis (1980) argue that a non-debt tax shield is substituted for a debt tax shield, so it is crucial to control for the effects of non-debt tax shields in our empirical tests. Specifically, substantial non-debt tax shields, such as depreciations, decrease the expected value of interest tax savings, which reduces the incentive to finance by raising debt. Consistent with this notion, Downs (1993) finds that depreciation expenses are negatively related to debt ratio. Moreover, Auerbach and Poterba (1986) find that a firm carrying forward losses has a high probability of facing a zero tax rate again. In this context, each dollar of carryforwards is quite likely to crowd out a dollar of interest deductions, suggesting a negative relation between tax loss carryforwards and debt financing. This is consistent with evidence provided by MacKie-Mason (1990) which shows that firms with tax loss carryforwards are much less likely to issue debt. Based on these prior studies, we include depreciations and tax loss carryforwards to proxy for the effect of non-debt tax shields.[15]

Specifically, the variable *Depreciation* is depreciation expenses scaled by total assets, used as a measure to represent tax shields arising from depreciations. The variable *TLC* is a dummy variable that equals one if a net loss is reported for the prior year and zero otherwise, which is a proxy for tax shields resulting from tax loss carryforwards.

We also include industry dummy variables to control for differences in debt financings across industries. The variable *Industry* is the industry dummy variable. Industries are defined based on the classifications of the Taiwan Stock Exchange,[16] and thus we specify 18 industry dummy variables in Eq. (8). Firms in any given industry will evolve to adopt similar characteristics for lending purposes. The coefficients of industries are likely to be significant because firms in any given industry should have similar debt ratios from the perspective of operations. The term *Year* is the time dummy variable. Time dummies are used to control for the effects of economic cycles on firm debt financings and potential autocorrelations between residuals.

4.2. Sample selection

All our variables are computed or obtained from the *Taiwan Economic Journal* (*TEJ*) Data Bank. Our sampling period is from January 1996 to December 2006,[17] totaling 11 years. All samples are firms listed in the Taiwan Stock Exchange and the Taiwan OTC, excluding those in the financial and insurance industries. The size of our initial sample is 5501 firm-year observations. After deleting incomplete and omitted data, the final sample comprises 5027 firm-year observations. The sample selection criteria are shown in Table 1.

5. Empirical results

5.1. Main empirical results

Table 2 shows descriptive statistics for all the variables in our regression. The mean and median of *DR* are 8.69% and 5.57%, respectively, well below those reported in studies exploring U.S. firms (e.g., Jensen et al., 1992; Seetharaman et al., 2001). This shows that Taiwanese firms use less debt and more equity in their capital structure. Because the financing decisions of Taiwanese firms are most likely to reflect the preference of the controlling shareholder, the lower leverage may imply the controlling shareholder's aversion to creditor monitoring. Moreover, the mean and median of *MSO* are 25.06% and 22.60%, respectively, well above those reported in Jensen et al. (1992) and Seetharaman et al. (2001). This may suggest that the presence of the controlling shareholder can effectively mitigate managerial entrenchment effects, and therefore greater manager ownerships are tolerable. Consistent with this notion, the mean and median of *Control* are 29.59% and 27.93%, and both are higher than those of *MSO*, which suggests that controlling shareholders have sufficient power to govern managers' actions. However, the mean of *Deviation* is 81.35%, which suggests a high level of divergence between the controlling shareholders' ownership and control rights. The descriptive results regarding *Control* imply that the controlling shareholder helps alleviate managerial entrenchment, but the results regarding *Deviation* suggest the controlling shareholder's incentive to expropriate. Hence, the controlling shareholder may play the role of both monitor and expropriator at the same time. The mean and median of *TR* are 10.36% and 6.09%, and these imply that the firm can obtain substantial interest tax shields by raising more debt, because a high *TR* represents that more taxable income for tax shields to offset. So, it makes sense to use *TR* to represent a firm's tax status. It is noteworthy that the maximum and minimum values of *Beta* are 10.3543 and −6.9498, and those of *ROA* are 0.4435 and −1.2471. These results suggest the presence of extreme values. However, these extreme values are unlikely to have significant influences on our empirical results, because these two variables are not our main experiment targets. Moreover, the means of these two variables are close to their medians, so their sample distributions are not highly affected by extreme values.

[15] Another proxy which is often used by prior studies is investment tax credits. However, our study does not consider these due to data availability issues, since not all firms disclose this information in Taiwan. However, the omission of investment tax credits is not a serious concern, because MacKie-Mason (1990) reports that investment credits do not decrease the probability of issuing debt. This is because firms with high investment credits often have good investment opportunities, so they are usually profitable and thereby produce sufficient taxable income to exhaust all tax shields. In this regard, investments credits will not crowd out interest deductions, suggesting that investment credits have no effect on the debt ratio.

[16] The industry classification comprises 19 categories: cement, food, plastics, textiles, electronic machinery, electronic appliances, chemicals, glass and china, paper, steel, rubber, cars, electronics, construction, transportation, tourism, general merchandise, gas and oil, and other.

[17] Because controlling shareholder ownership information provided by the *TEJ* database is only available since 1996, our sample begins correspondingly in 1996.

Table 1
Sample selection criteria.

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Initial	286	318	367	432	489	530	585	611	619	628	636	5501
Data incomplete or missing	(33)	(57)	(69)	(98)	(84)	(60)	(8)	(13)	(11)	(19)	(22)	(474)
Final	253	261	298	334	405	470	577	598	608	609	614	5027

Table 2
Descriptive Statistics. (N = 5027).

Variable	Mean	Median	Maximum	Minimum	Std. Dev
DR	0.0869	0.0557	0.7031	0.0000	0.0980
MSO	0.2506	0.2260	0.9533	0.0019	0.1384
DIVY	0.0210	0.0035	0.2506	0.0000	0.0283
INST	0.3614	0.3362	0.9866	0.0000	0.2165
Growth	1.7151	1.3100	22.7400	0.0400	1.5015
Beta	0.8206	0.8205	10.3543	−6.9498	0.4091
Size	6.8146	6.7484	8.7586	5.4963	0.5105
ROA	0.0441	0.0358	0.4435	−1.2471	0.0725
Fixed asset	0.2848	0.2577	0.9372	0.0000	0.1891
R&D	1.3915	0.4392	30.0680	0.0000	2.3118
TR	0.1036	0.0609	0.9868	0.0000	0.1281
Control	0.2959	0.2793	0.9545	0.0008	0.1653
Deviation	0.8135	0.9397	1.0000	0.0000	0.2536
Depreciation	0.0262	0.0202	0.1607	0.0000	0.0234
TLC	0.1973	0.0000	1.0000	0.0000	0.3980

Notes:
The variable *DR* is long-term debt divided by total assets; *MSO* is the percentage of outstanding shares of common stock held by the firm's directors and officers; *DIVY* is dividend per share divided by the closing price on the day before the ex-dividend date; *INST* is the percentage of outstanding shares held by institutions; *Growth* is the ratio of the equity market value to the equity book value; *Beta* is the average beta of the firm for the last year; *Size* is the log of total assets; *ROA* is current operating income divided by total assets; *Fixed asset* is the book value of fixed assets divided by total assets; *R&D* is research and development expenses divided by total assets; *TR* is the firm's effective tax rate, defined as income tax expenses divided by pre-tax financial accounting income, and zero if either income tax expense or pre-tax income is negative; *Control* is control rights (i.e., voting rights) held by the firm's controlling shareholder; and *Deviation* is the ratio of the controlling shareholder's ownership rights (i.e., cash-flow rights) to control rights. *Depreciation* is depreciation expenses scaled by total assets; *TLC* is a dummy variable that equals one if a net loss is reported for the prior year and zero otherwise.

The correlation matrix reported in Table 3 indicates a negative correlation between *DR* and *MSO*, which is preliminarily consistent with our argument that debt and manager ownership substitute for each other. The problem of multicollinearity seems not to be serious, because the correlations of all the variables are low (less than 0.7)[18] and the variance inflation factors for all variables are well below 10. In the current analysis, the endogenous variables are debt (*DR*) and managerial ownership (*MSO*); the rest of the variables are considered independent (i.e., exogenous), based on the statistics in Table 3 that indicate low correlations.

The correlation between *DR* and *Control* is negative, which implies that a controlling shareholder with higher control rights prefers less debt to avoid the scrutiny of creditors. In addition, the correlation between *DR* and *Deviation* is negative, implying that greater divergence between control rights and ownership rights results in more incentives for controlling shareholders to expropriate firm assets (e.g., Claessens et al., 2000; La Porta et al., 1999) and induces them to raise more debt that provides more resources for expropriation.

Table 4 shows the results of the two-stage least-squares regression: Panel A shows that the coefficients of most determinants of manager ownership are statistically significant and the explanatory power of the regression model is high (adjusted R^2 equals 0.2023). These results indicate that the specification of our empirical model in determining *MSO* is appropriate. In addition, although the coefficient of *DR* is negative, it is not significant at conventional levels. This finding is similar to that of Jensen et al. (1992), implying that the casual direction is from manager ownership to debt, and not vice versa. Furthermore, the coefficients of *DIVY* and *INST* are both positive and significant. This suggests that, unlike in the United States, in Taiwan dividend payouts and institutional ownerships are not substitutes for manager ownership, so the trade-off model may thus not be applicable to *DIVY* and *INST*, meaning that these variables can be appropriately treated as exogenous in our empirical model.

In addition, as shown in Panel A, the negative and significant coefficient of *Beta* shows that managers are reluctant to invest their personal wealth in firms with high business risk. The positive coefficient of *Growth* suggests that it is difficult for external investors to monitor managers if firms have more growth opportunities, and in this case managers may be required to invest more wealth in the firm to resolve the monitoring problem (Demsetz & Lehn, 1985). The positive coefficient of *ROA* shows that firms with higher profitability are subject to a more serious concern about overinvestment or managerial perquisite consumption

[18] As a rule of thumb, David, Sweeney, and Williams (1999) suggest that a correlation lower than 0.7 is less likely to induce problems of multicollinearity.

Table 3
Pearson's correlation coefficients for variables used in the model (N = 5027).

	DR	*MSO*	*DIVY*	*INST*	*Growth*	*Beta*	*Size*	*ROA*	*FA*	*R&D*	*TR*	*Control*	*Deviation*	*Dep*	*TLC*
DR	1.0000	−0.0449	−0.0940	0.0474	−0.1126	−0.1832	0.1439	−0.1626	0.2641	−0.1091	−0.1345	−0.0382	−0.0811	0.2247	0.0560
MSO		1.0000	0.1597	0.3671	0.1306	−0.1714	0.0050	0.1553	0.0572	0.0144	0.1304	0.6423	−0.1260	0.0377	−0.1682
DIVY			1.0000	0.1976	−0.0114	−0.0782	0.1252	0.2687	−0.1551	0.0583	0.1683	0.1254	−0.0250	−0.0804	−0.3605
INST				1.0000	0.1539	−0.0607	0.3721	0.1600	−0.0159	−0.0476	0.0073	0.3251	−0.2576	0.0075	−0.1396
Growth					1.0000	0.0805	0.4658	0.4597	−0.1465	0.2693	0.0224	0.0296	−0.0826	−0.0523	−0.2184
Beta						1.0000	0.2584	0.0512	−0.1673	0.1470	−0.0431	−0.2049	−0.1074	−0.0311	−0.0442
Size							1.0000	0.3006	−0.0628	0.0990	−0.0499	−0.0473	−0.2154	0.0689	−0.2887
ROA								1.0000	−0.1151	0.2204	0.2765	0.0869	−0.0442	−0.0500	−0.3815
FA									1.0000	−0.2097	−0.0321	0.0286	0.0220	0.6123	0.1172
R&D										1.0000	−0.1089	−0.1042	−0.1833	0.0372	−0.0838
TR											1.0000	0.0399	−0.0409	−0.0782	−0.2056
Control												1.0000	0.0461	−0.0815	−0.0899
Deviation													1.0000	−0.1138	0.0486
Dep														1.0000	0.1004
TLC															1.0000

Notes: *Fixed asset* is abbreviated as *FA*, and *Depreciation* is abbreviated as *Dep*. The definitions of the variables are shown in Table 2.

Table 4
Estimated results of two-stage least-squares regression.

Model of Panel A:

$$MSO_{it} = \alpha_0 + \alpha_1 DR_{it} + \alpha_2 DIVY_{it} + \alpha_3 INST_{it} + \alpha_4 Growth_{it} + \alpha_5 ROA_{it} + \alpha_6 Beta_{it} + \alpha_7 (Beta_{it})^2 + \alpha_8 Size_{it} + \alpha_9 R\&D_{it} + \mu_{it}$$

Model of Panel B:

$$DR_{it} = \beta_0 + \beta_1 MSO_{it} + \beta_2 DIVY_{it} + \beta_3 INST_{it} + \beta_4 Growth_{it} + \beta_5 Beta_{it} + \beta_6 Size_{it} + \beta_7 ROA_{it} + \beta_8 Fixed\ Asset_{it} + \beta_9 TR_{it} + \beta_{10} Control_{it} + \beta_{11} Deviation_{it} + \beta_{12} Depreciation_{it} + \beta_{13} TLC_{it} + \beta_{14} MSO_{it} \cdot TR_{it} + \beta_{15} MSO_{it} \cdot Control_{it} + \beta_{16} MSO_{it} \cdot TR_{it} \cdot Control_{it} + Industry + Year + e_{it}$$

.

	Panel A: Results of Eq. (7) Dependent variable: *MSO*				Panel B: Results of Eq. (8) Dependent variable: *DR*		
	Estimated coefficient	Standard error	p-Value		Estimated coefficient	Standard error	p-Value
Intercept	0.3247	0.0121	0.0000***	*Intercept*	5.8700	1.6069	0.0003***
DR	−0.0250	0.0224	0.2636	*MSO*	−18.0697	4.9097	0.0002***
DIVY	0.3955	0.0726	0.0000***	*DIVY*	6.9162	1.9807	0.0005***
INST	0.2493	0.0114	0.0000***	*INST*	4.4733	1.2304	0.0003***
Growth	0.0128	0.0017	0.0000***	*Growth*	0.2297	0.0644	0.0004***
ROA	0.1320	0.0284	0.0000***	*Beta*	−0.7409	0.2173	0.0007***
Beta	−0.0413	0.0093	0.0000***	*Size*	−0.8110	0.2302	0.0004***
$(Beta)^2$	0.0013	0.0026	0.6113	*ROA*	2.3350	0.6775	0.0006***
Size	−0.0462	0.0044	0.0000***	*Fixed asset*	0.0473	0.0227	0.0372**
R&D	0.0006	0.0007	0.4371	*TR*	0.1558	0.0686	0.0232**
				Control	−0.1421	0.0642	0.0269**
				Deviation	−0.0218	0.0042	0.0000***
				Depreciation	0.1514	0.0503	0.0027***
				TLC	−0.0046	0.0022	0.0389**
				*MSO*TR*	−0.9504	0.3127	0.0012***
				*MSO*Control*	0.4780	0.2542	0.0301**
				*MSO*TR*Control*	0.3218	0.1565	0.0199**
Adjusted R2 = 0.2023				Adjusted R2 = 0.6030			
F-value = 146.6280***				F-value = 174.4665 ***			

Notes:
(1) The definitions of the variables are shown in the note of Table 2.
(2) The variable *MSO* in Panel B is the predicted value of the dependent variable for Panel A.
(3) The standard errors of the regression coefficients are calculated using +White's (1980) heteroskedasticity-corrected procedure.
(4) The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

and thus need more managerial ownership to mitigate this concern. The negative coefficient of *Size* indicates the limitations of manager wealth in assuming controlling interests in large firms.

Panel B of Table 4 estimates the results of our second-stage regression. The coefficient of *MSO* is negative and significant at the 1% level, consistent with our prediction that there exists a trade-off relation between debt and manager ownership. Moreover, we find a negative and significant coefficient for *MSO*TR*, consistent with the influence of corporate tax status on the relation between debt and manager ownership.

Consistent with Hypothesis 1, we find that the coefficient of *MSO*Control* is significantly positive. This finding implies that with higher control rights, controlling shareholder are more likely to mitigate managerial entrenchment effects; this leads to lower marginal entrenchment costs and a relative higher cost of debt in reducing agency costs, causing firms to use less debt. The coefficient of *MSO*TR*Control* is also significantly positive, and therefore supports Hypothesis 2. That is, the negative effect on debt usage due to the mitigation of managerial entrenchment through the controlling shareholder's control rights offsets the positive effect on debt usage resulting from higher tax rates.

To test whether our results in Table 4 are robust to the definition of *DR*, we repeat our tests by redefining *DR* as market leverage, and unreported result shows that the findings are unchanged, where the coefficients of *MSO* and *MSO*TR* remain significantly negative (p-values are 0.0003 and 0.0007, respectively), and coefficients of *MSO*Control* and *MSO*TR*Control* remain significantly positive (p-values are 0.0507 and 0.0863, respectively). We also repeat our tests by redefining *DR* as long-term debt scaled by the market value of equity instead of scaled by total assets, and our conclusions are the same, where the coefficients of *MSO* and *MSO*TR* remain significantly negative (p-values are 0.0005 and 0.0000, respectively), and those of *MSO*Control* and *MSO*TR*Control* remain significantly positive (p-values are 0.0184 and 0.0393, respectively). In addition, our results also remain qualitatively similar by redefining *DR* as long-term debt scaled by the book value of equity. These results suggest that our findings in Table 4 are robust to how we measure *DR*.

In Panel B, the coefficients of *DIVY* and *INST* are both positive and significant, as in Panel A of Table 4. Again, this suggests that these two variables should be exogenous in our empirical specification. Moreover, the positive coefficient of *DIVY* also mitigates potential concerns resulting from omitting personal tax rates, because this implies that *DIVY* reflects the effect of investor tax status, since firms' dividend payments are negatively associated with investor tax rates, as found by Lee et al. (2006). The coefficients of *Control* and *Deviation* are both negative and significant, consistent with the results of the correlation matrix. A negative coefficient for *Deviation* is consistent with the findings of Faccio et al. (2001), that higher debt facilitates the expropriations of the controlling shareholder. Unreported results show that most of the industry dummies are significant, and so there exist prominent differences in capital structure between firms in different industries.

The coefficients of *Control* and *Deviation* together with that of *MSO*Control* have implications for the agency literature: On the one hand, the positive coefficient of *MSO*Control* indicates that the presence of the controlling shareholder helps alleviate managerial entrenchment. On the other hand, that presence itself leads to agency problems, since the negative coefficients of *Control* and *Deviation* represent the controlling shareholder's resistance to creditor scrutiny. Therefore, our results imply that the controlling shareholder has two side effects, as both monitor and expropriator simultaneously.

The coefficient of *TR* is positive and significant, which confirms the benefit of tax shields of interest payments on debt financing (Graham, 1996a). Interestingly, untabulated results show that if we omit *MSO* and its interaction terms from the regression, the coefficient of *TR* will become negative. This suggests that a negative relation between debt and a firm's tax rate may not be descriptive due to the omission of the management ownership variable; hence managerial ownership is an important factor in determining firm debt level.

For the remaining firm attribute control variables, the positive coefficient of *Fixed asset* is consistent with the notion that higher asset tangibility leads to a higher debt ratio, because tangible assets more easily serve as collateral. The coefficient of *Beta* is negative, and therefore higher business risk leads to higher uncertainty in meeting debt repayments and affects firm willingness to raise debt. Likewise, the coefficient of *Size* is negative, suggesting that lower information asymmetry induces large firms to favor equity financing. Inconsistent with the debt collateral argument, the coefficient of *Growth* is positive, implying that firms may require more funds to finance their growth opportunities and thereby increases leverage. Moreover, the positive coefficient of *ROA* suggests that higher profitability does not reduce the need to seek external capitals. The reasoning may be because higher profitability provides sufficient taxable incomes to exhaust all tax shields, which encourages the usage of debt to generate interest tax shields. Similarly, the positive coefficient of *Depreciation* implies that depreciation expenses capture not only the effect of non-debt tax shield on capital structure. As shown in Table 3, the correlation between *Fixed asset* and *Depreciation* is high (0.6123), so high depreciation expenses imply that the firm have more fixed assets, and the result that both coefficients of *Fixed asset* and *Depreciation* are positive suggests that the effect of asset tangibility on debt collateral, as represented by fixed assets, dominates the effect of non-debt tax shields resulting from depreciations. On the contrary, a negative coefficient of *TLC* is consistent with the crowding-out effect of non-debt tax shields, meaning that firms with tax loss carryforwards use less debt, as indicated by MacKie-Mason (1990).

5.2. Additional analysis

5.2.1. Considering financial flexibility in the sensitivity to the inferences of our model

Eq. (3) shows that $F(\lambda)_\lambda$ affects the trade-off between *DR* and *MSO*, but the results in Table 4 do not consider this effect. Accordingly, this section examines whether factors that have effects on $F(\lambda)_\lambda$ also affect the trade-off between *DR* and *MSO*. This test is important since the results of Table 4 may be spurious if the empirical results herein are not consistent with our predictions on the effects of non-tested model parameters.

As elaborated in our model settings, $F(\lambda)_\lambda$ represents the cost of raising additional debt, resulting from deterioration in financial flexibility and the increased probability of financial distress, as in our model setting. If f denotes firm financial flexibility, then, by differentiating f to $d\lambda/d\theta$, we can derive the equation

$$\frac{\partial}{\partial f}\left(\frac{d\lambda}{d\theta}\right) = \frac{E(\theta)_\theta}{(C_D + F(\lambda)_\lambda)^2} \cdot \frac{dF(\lambda)_\lambda}{df} \tag{9}$$

Since a greater level of financial flexibility results in lower costs of raising additional debt, we know that $dF(\lambda)_\lambda/df$ is negative, and so the result of Eq. (9) is also negative. This is because a higher f cheapens the use of debt in reducing agency costs and thus induces the firm to increase its leverage, holding manager ownership constant. Similarly, if f represents the probability of financial distress, we recognize that the result of Eq. (9) will become positive because the probability of financial distress is positively related to $F(\lambda)_\lambda$.

Moreover, firm growth opportunities can also affect $d\lambda/d\theta$. The free cash flow hypothesis (Jensen, 1986) implies that managers tend to spend free cash flow on wasteful projects, or perquisite consumption, known as the overinvestment problem. In general, the overinvestment problem leads to higher costs of managerial entrenchment and is less severe for firms with more growth opportunities. That is, a firm's higher growth potential motivates managers to spend free cash flow on investments, because in this case the opportunity cost of perquisite consumption is very high due to its crowding out positive NPV projects. If G represents growth opportunity, then $dE(\theta)_\theta/dG$ is negative and thereby the differential of G to $d\lambda/d\theta$ is positive, since higher growth opportunities lead to lower managerial entrenchment costs.

To test these inferences, we rerun the two-stage least-squares regressions by including three interaction variables: *MSO*Growth*, *MSO*Z-Score*, and *MSO*Cash*. The variable *Z-Score* is Altman, Hartzell, and Peck (1995) *Z*-score,[19] which measures the probability of financial distress. A higher *Z-Score* implies a lower probability of bankruptcy and is therefore negatively related to $F(\lambda)_\lambda$. The variable *Cash* is used to measure the degree of a firm's financial flexibility and is a dummy variable equal to one if the redundant cash balance[20] of the observation is higher than the median of the overall sample, and zero otherwise. The variable *Growth* is defined as Section 4.1.2.

Based on discussions above, we predict that the sign of *MSO*Growth* is positive, and those of *MSO*Cash* and *MSO*Z-Score* are negative. Table 5 presents the re-estimated results (only the results of the second-stage regression are shown). As indicated, the coefficients of *MSO*Cash*, *MSO*Z-Score,* and *MSO*Growth* are all significant at the 5% level or above, with signs consistent with our expectations, and the coefficients of *MSO · TR*, *MSO · TR · Control*, and *MSO · Control* remain significant, with their signs unchanged. These results show that our model developments are robust and the results reported in Table 4 are not spurious.

5.2.2. Outlier sensitivity

From the descriptive statistics in Table 1, we observe that the range between the maximum and minimum is large for some variables, which indicates the need to conduct an outlier sensitivity test to ensure the robustness of our results. Our main variables are the corporate tax rate, debt, and manager ownership. We refer to the distribution of the descriptive statistics in previous studies to determine whether our three main variables have outliers.

Compared with earlier studies (e.g., Chen & Steiner, 1999; Seetharaman et al., 2001), our distributions of debt and manager ownership are reasonable. However, we find that the maximum tax rate in Seetharaman et al. (2001) is 39.5% while ours is 98.69%, which is much higher. Therefore, we should determine if our results are driven by outliers of corporate tax rate. We define outliers as the top 0.5%, 1%, and 1.5% of the distribution of the *TR* (25, 50, and 75 observations, respectively), and the re-estimated results are shown in Panels A to C of Table 6, respectively.

From Table 6, we can see that after deleting the outliers, the results are generally consistent with those of Table 4. Therefore, outliers have little influence on our empirical results. In addition, since there are many observations with zero values of *TR*, we repeat our tests by including firms with positive *TR* values. Although this significantly reduces our sample size from 5027 to 3130, the results are still consistent with our two hypotheses. Outliers should therefore not be a concern to our study.

5.2.3. Results of using OLS versus two-stage OLS

While our model and empirical test show that managerial stock ownership substitutes for debt, their precise relation is not consistent in the literature. Several studies (e.g., Brailsford et al., 2002; Moon & Tandon, 2007) find that the relation between debt and manager ownership is not globally negative, contrary to our arguments. For example, Brailsford et al. (2002) suggests that at low levels, manager ownership is positively related to the ratio of debt, while at high levels of managerial ownership, such a positive relation turns negative. Moon and Tandon (2007) state that the relation between managerial ownership and debt is positive for firms with low growth opportunities. However, because their empirical design is based on the OLS specification, we conjecture that the inconsistent results in the literature might be due to the use of different econometric techniques.

To determine whether the inconsistent results are attributable to difference in econometric settings, we first test the argument of Brailsford et al. (2002) by separating our sample into high- and low-*MSO* subsamples, which are defined as observations with above- and below-median levels of managerial stock ownership, respectively. We repeat our tests with OLS and two-stage OLS for these two subsamples. To be compatible with the specifications of Brailsford et al. (2002) and Moon and Tandon (2007), we drop our three experiment variables *MSO·TR*, *MSO·Control*, and *MSO·TR·Control*. Table 7 presents the re-estimate results of using OLS and two-stage OLS.

Panel A of Table 7 shows that by using the OLS regression, the coefficient of *MSO* is negative for high-*MSO* firms and positive for low-*MSO* firms, consistent with the prediction of Brailsford et al. (2002). However, as shown in Panel B, which adopts the two-stage OLS regression, the coefficient of *MSO* is negative for both high- and low-*MSO* firms. This suggests that the positive relation reported by Brailsford et al. (2002) is sensitive to the interdependence between debt and manager ownership.

We also test the argument of Moon and Tandon (2007) by separating our sample into high- and low-*Growth* subsamples, which are defined as observations having above- and below-median levels of the ratio of the equity market value to book value, respectively. Unreported results show that, consistent with Moon and Tandon (2007), we find that when the OLS regression is used, the coefficient of *MSO* is positive for low-*Growth* firms but its sign becomes negative when the two-stage OLS regression is used.

These results suggest the importance of considering the effect of endogeneity. In addition, the positive relation between debt and manager ownership reported by prior studies may actually be driven by the interdependence between debt and manager ownership, instead of underlying economics.

[19] Altman et al. (1995) *Z*-score is equal to [0.6*book value of equity/total liabilities +(6.72*income before interest and taxes +3.26*retained earnings +6.56*working capital)/total asset]. This formula is specific to emerging markets.

[20] A redundant cash balance is defined as a firm's cash balance divided by the sum of the net purchase amount of fixed assets, research and development expenditures, and interest payments. Intuitively, a greater redundant cash balance leads to a higher degree of financial flexibility. Since this definition is somewhat arbitrary, we repeat our tests by replacing cash balance with cash flow from operations, and the results remain unchanged.

Table 5
Estimated results of two-stage least-squares regression considering financial flexibility (with only second-stage results shown).

$$DR_{it}=\beta_0+\beta_1 MSO_{it}+\beta_2 DIVY_{it}+\beta_3 INST_{it}+\beta_4 Growth_{it}+\beta_5 Beta_{it}+\beta_6 Size_{it}+\beta_7 ROA_{it}+\beta_8 Fixed\ Asset_{it}+\beta_9 TR_{it}+\beta_{10} Control_{it}+\beta_{11} Deviation_{it}+\beta_{12} Depreciation_{it}+\beta_{13} TLC_{it}+\beta_{14} MSO_{it}\cdot TR_{it}+\beta_{15} MSO_{it}\cdot Control_{it}+\beta_{16} MSO_{it}\cdot TR_{it}\cdot Control_{it}+\beta_{17} MSO\cdot Growth+\beta_{18} MSO\cdot Z\text{-}Score+\beta_{19} MSO\cdot Cash+Industry+Year+e_{it}.$$

	Coefficient	Standard error	p-Value
Intercept	5.8888	1.6844	0.0005***
MSO	−18.0902	5.1545	0.0005***
DIVY	6.9497	2.0534	0.0007***
INST	4.4785	1.2861	0.0005***
Growth	0.2100	0.0678	0.0020***
Beta	−0.7362	0.2281	0.0013***
Size	−0.8088	0.2406	0.0008***
ROA	2.3896	0.6817	0.0005***
Fixed asset	0.0374	0.0190	0.0494**
TR	0.1245	0.0657	0.0583*
Control	−0.1097	0.0518	0.0343**
Deviation	−0.0169	0.0041	0.0000***
Depreciation	0.1533	0.0541	0.0046***
TLC	−0.0065	0.0026	0.0138**
*MSO*TR*	−0.7852	0.3061	0.0052***
*MSO*Control*	0.3767	0.2126	0.0383**
*MSO*TR*Control*	0.3203	0.1561	0.0201**
*MSO*Growth*	0.0581	0.0346	0.0467**
*MSO*Z-Score*	−0.0092	0.0054	0.0492**
*MSO*Cash*	−0.0609	0.0165	0.0001***
Adjusted R2 = 0.6194			
F-value = 175.0035***			

Notes:
(1) The variable *Z-score* is equal to [0.6*book value of equity/total liabilities + (6.72*income before interest and taxes + 3.26*retained earnings +6.56*working capital)/total asset]. The variable *Cash* is a dummy variable that equals one if the firm's redundant cash balance is higher than the median of the overall sample, and zero otherwise. The redundant cash balance is defined as the firm's cash balance divided by the sum of the net purchase amount of fixed assets, research and development expenditures, and interest payments. The definitions of the other variables are given in Table 2.
(2) The definitions of variables are given in Table 2.
(3) The standard errors of the regression coefficients are calculated using White's (1980) procedure.
(4) The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5.2.4. Effect of family-controlled firms

In family-controlled firms, the management team and the controlling shareholder are usually members of the controlling family (La Porta et al., 1999). This implies a greater alignment of interest between managers and the controlling shareholder, and so there is less need for the controlling shareholder to monitor managers. In other words, in a family-controlled firm, the mitigating effect of the controlling shareholder on managerial entrenchment may be less pronounced. Therefore, this section tests whether the effect of the controlling shareholder's control rights differs between family and non-family firms.

We set the value of the dummy variable *Family* to be one if the firm corresponds to the definition of family controlled,[21] and zero otherwise. By repeating our two-stage least-squares regression with the new variable *MSO*Control*Family*, we find that the coefficient of this interaction variable is −0.0446 and significant at the 5% level (p-value = 0.0332). This result supports our argument that, in a family-controlled firm, the presence of the controlling shareholder has less effect on mitigating managerial entrenchment because the conflict between managers and the controlling shareholder is not as salient as in non-family firms.

6. Conclusions

Our study examines the influences of ultimate ownership structure and the corporate income tax rate on the trade-off relation between managerial ownership and debt in reducing agency costs. In addition to advancing the understanding of the agency problem, our study introduces ownership structure and tax dimension to corporate governance research. Based on the trade-off model, we develop a theoretical foundation featuring the presence of the controlling shareholder serving as discipliner to monitor managers' actions.

[21] We follow the *TEJ* database's definition for a family-controlled firm. Specifically, if the board chairman and chief executive officer are both members of the controlling family or at least three members of the controlling family serve as managers or board members, then the firm is defined as family controlled. Such a definition is reasonable, since to gain control power, the family must insert its members into key firm positions.

Table 6
Estimated results of two-stage least-squares regression after deleting outliers (only second-stage results shown).

	Panel A (1)			Panel B (1)			Panel C (1)		
	Estimated coefficient	Standard error	p-Value	Estimated coefficient	Standard error	p-Value	Estimated coefficient	Standard error	p-Value
Intercept	5.8482	1.6075	0.0003***	5.8362	1.6087	0.0003***	5.8324	1.6131	0.0003***
MSO	−17.9988	4.9117	0.0003***	−17.9600	4.9151	0.0003***	−17.9465	4.9268	0.0003***
DIVY	6.8911	1.9798	0.0005***	6.8789	1.9805	0.0005***	6.8786	1.9852	0.0005***
INST	4.4568	1.2302	0.0003***	4.4478	1.2305	0.0003***	4.4452	1.2334	0.0003***
Growth	0.2287	0.0644	0.0004***	0.2283	0.0644	0.0004***	0.2281	0.0646	0.0004***
Beta	−0.7386	0.2172	0.0007***	−0.7372	0.2172	0.0007***	−0.7369	0.2176	0.0007***
Size	−0.8079	0.2302	0.0005***	−0.8061	0.2303	0.0005***	−0.8057	0.2310	0.0005***
ROA	2.3306	0.6776	0.0006***	2.3267	0.6785	0.0006***	2.3256	0.6817	0.0007***
Fixed asset	0.0476	0.0231	0.0389**	0.0479	0.0232	0.0387**	0.0485	0.0234	0.0381**
TR	0.1628	0.0794	0.0404**	0.1740	0.0925	0.0599*	0.1965	0.1129	0.0818*
Control	−0.1424	0.0645	0.0272**	−0.1439	0.0652	0.0274**	−0.1475	0.0681	0.0304**
Deviation	−0.0213	0.0042	0.0000***	−0.0213	0.0042	0.0000***	−0.0212	0.0042	0.0000***
Depreciation	0.1518	0.0504	0.0026***	0.1538	0.0506	0.0024***	0.1521	0.0508	0.0028***
TLC	−0.0049	0.0023	0.0328**	−0.0050	0.0023	0.0291**	−0.0049	0.0023	0.0357**
*MSO*TR*	−1.0244	0.3559	0.0020***	−1.0878	0.4046	0.0036***	−1.1861	0.4641	0.0053***
*MSO*Control*	0.4774	0.2546	0.0304**	0.4824	0.2566	0.0301**	0.4920	0.2678	0.0332**
*MSO*TR*Control*	0.3583	0.1671	0.0161**	0.3692	0.1835	0.0222**	0.4061	0.1904	0.0165**
Adjusted R^2			0.6035			0.6035			0.6033
F-value			174.0332***			173.1112***			172.1522***

Notes: (1) Panels A to C exclude the top 0.5%, 1%, and 1.5% of the distribution of *TR*, respectively (with 25, 50, and 75 observations, respectively). The definitions of the variables are described in Table 2. The standard errors of the regression coefficients are calculated using +White's (1980) heteroskedasticity-corrected procedure.
(2) The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

We show that debt and manager stock ownership are alternative mechanisms in reducing agency costs and so there exists a trade-off relation between them. In addition, because a firm's income tax rate generates tax shields of interest payments, it thus strengthens this trade-off relation because of the resulting lower cost of debt. We also show that the controlling shareholder's control rights weaken the trade-off relation between debt and manager ownership, and higher control rights weaken the strengthening effect of a firm's tax rate on the trade-off relation. By employing a two-stage simultaneous least-squares regression to control for potential endogeneity between manager ownership and debt, our empirical results are consistent with our predictions.

The econometric model we use can address the concerns of endogenous choices of governance and financial policies, so our tests provide more robust evidence than studies conducting only OLS. Because the precise relation between managerial ownership and leverage is not consistent in the literature, our results help resolve a mixed area of research. We conclude that the

Table 7
Results of using OLS versus two-stage OLS.

	Panel A: Results of using OLS				Panel B: Results of using two-stage OLS			
	High-MSO sample		*Low-MSO sample*		*High-MSO sample*		*Low-MSO sample*	
	Coefficient	p-Value	Coefficient	p-Value	Coefficient	p-Value	Coefficient	p-Value
Intercept	−0.0564	0.0139**	−0.0496	0.0275**	4.1211	0.0157**	10.1874	0.0000***
MSO	−0.0266	0.2473	0.0060	0.8805	−12.7358	0.0143**	−31.3501	0.0000***
DIVY	−0.4433	0.0000***	−0.4442	0.0000***	4.7195	0.0241**	12.3691	0.0000***
INST	−0.0114	0.2270	−0.0227	0.0577*	3.1591	0.0144**	7.7960	0.0000***
Growth	−0.0081	0.0000***	−0.0102	0.0000***	0.1610	0.0170**	0.4053	0.0000***
Beta	−0.0472	0.0009***	−0.1266	0.0000***	−0.5273	0.0230**	−1.2525	0.0000***
Size	0.0490	0.0000***	0.0649	0.0000***	−0.5619	0.0203**	−1.4416	0.0000***
ROA	−0.2690	0.0000***	−0.1146	0.0001***	1.5557	0.0309**	4.1643	0.0000***
Fixed asset	0.1132	0.0000***	0.1064	0.0000***	0.0689	0.0081***	−0.0022	0.6717
TR	−0.0509	0.0008***	−0.0270	0.0500*	−0.0580	0.0000***	−0.0411	0.0000***
Control	0.0281	0.0641*	−0.0459	0.0042***	0.0087	0.4346	−0.0180	0.0026***
Deviation	−0.0177	0.0117**	−0.0140	0.0750*	−0.0240	0.0001***	−0.0146	0.0002***
Depreciation	0.1060	0.3922	0.1664	0.1136	0.1218	0.1682	0.1702	0.0000***
TLC	−0.0053	0.4028	−0.0060	0.1611	−0.0030	0.5299	−0.0003	0.8780
Adjusted R^2		0.2596		0.3055		0.4976		0.8720
F-value		22.4849***		27.9375***		61.6760***		418.6393***

Notes: (1) The definitions of the other variables are described in Table 2. For Panel B, only the results of the second-stage regression are shown.
(2) The standard errors of the regression coefficients are calculated using +White's (1980) heteroskedasticity-corrected procedure.
(3) The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

positive relation found by prior studies, since it relies on OLS analysis, may actually be driven by the interdependence between debt and manager ownership and is therefore spurious. Moreover, although the presence of the controlling shareholder helps alleviate managerial entrenchment, it also leads to another type of entrenchment, such that the controlling shareholder plays the role of monitor and expropriator simultaneously.

In a general sense, our work complements the body of research that aims to further understand how taxes affect business decisions. Our study also contributes to the literature on cross-sectional determinants of capital structure and supports the prediction of the trade-off model of the firm. From a policy perspective, our study shows the interaction between corporate tax rates and organizational dynamics, which implies that policymakers should consider the potential effect of ownership structure on capital structure when making new tax laws.

Acknowledgments

We thank the editor and an anonymous reviewer for their helpful comments and suggestions. We acknowledge the financial support from the National Science Council of Taiwan (NSC 100-2410-H-008-077).

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