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Effects of dividend tax and signaling on firm valuation: Evidence from taxable stock dividend announcements ☆

Nan-Ting Kuo [a,*], Cheng-Few Lee [b,c]

[a] National Central University, Taiwan
[b] Rutgers University, USA
[c] National Chiao Tung University, Taiwan

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ABSTRACT

Our study aims to isolate the negative tax effect of dividends from their positive signaling effect. We explore the market valuation of taxable stock dividends in Taiwan because management's voluntary taxation makes these dividends a reliable signal. We find that controlling shareholders' shareholdings positively impact market reactions to announcements of taxable stock dividends, while shareholders' weighted average tax rates and the discrepancy between controlling shareholders' ownership and control rights have negative impacts. The integrated tax system that reduces investors' dividend tax burdens alleviates the effects of both tax and signaling. We contribute to the literature by determining the relative importance of tax and signaling effects on firm valuation and demonstrating a unique characteristic of the interaction between stock dividends and ultimate ownership structure.

1. Introduction

The effects of corporate dividend policy on firm value are widely studied in economics, finance, and accounting. Because dividend taxation is an important factor in market imperfection and a tax-based signaling model resolves Black's (1976) dividend puzzle, it is crucial to discern between dividend tax and

☆ Data availability: The data used in this study are from public sources. A list of sample firms may be obtained from the authors on request.

* Corresponding author at: National Central University, No. 300, Jung-da Rd., Jung-Li 320, Taiwan. Tel.: +886 981153300.
E-mail address: kuonantin@hotmail.com (N.-T. Kuo).

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signaling effects on the basis of empirical evidence (Fama and French, 1998). This motivates us to conduct this research. Specifically, by exploring market reactions to taxable stock dividends in Taiwan, our study aims to disentangle dividends' negative tax effect from their positive signaling effect on firm valuation. Our study focuses on taxable stock dividends because prior studies that explore this issue are usually based on investigating cash dividends and thus are subject to the following problems, which make it difficult to achieve conclusive and robust results.

First, it is difficult to construct a research design that fully isolates the effects of taxes from nontax factors and measuring shareholders' tax statuses is a big challenge. Second, even if the tax effect can be isolated, the effects of the agency story and signaling models (tax based or not) are hard to estimate independently because both theories result in similar predictions in the case of cash dividends.[1] Indeed, the literature has not succeeded in determining the importance of dividend signaling relative to other possible explanations (Benartzi et al., 1997).

By exploiting special features of the Taiwanese tax system, our study can overcome these difficulties. The first special feature is the coexistence of taxable and nontaxable stock dividends. By comparing the empirical results of these two types of stock dividends, we can determine the magnitude of the tax effect without being confounded by nontax factors, because the most salient difference between the two types of stock dividends is in their tax treatment.

In addition, since taxable stock dividends do not affect firm cash flows, the major difference between taxable stock and cash dividends is the occurrence of firm cash payouts. Given this similarity, several arguments about the consequences of paying cash dividends, such as the negative pricing effect of dividend taxes, can be readily applicable to the study of taxable stock dividends and the results thereof can thus generate implications applicable to the literature of both cash dividends and stock dividends.

The investigation of taxable stock dividends allows us to attribute our results to the effect of tax-based signaling. Since taxable stock dividends do not affect a firm's cash flows, the mitigation of agency conflicts by distributing free cash flows (Jensen, 1986) cannot account for market responses to taxable stock dividend announcements. By the same logic, non-tax-based signaling models involving increased external investor monitoring (Easterbrook, 1984) or suboptimal investments due to cash payouts (Miller and Rock, 1985) are not plausible explanations in this case.

Taxable stock dividends can be used as a signal because they produce no real income, only taxes, and a voluntary taxable stock dividend decision is made conditional on managers' expectations about firms' future prospects (Chu, 1997; Hsu et al., 2000; Cheng et al., 2009; Kuo, 2013). Specifically, declaration of the taxable stock dividend can signal managerial confidence that the taxes they paid can be recovered from the firm's future profitability, which usually increases share prices.[2]

In addition, the prerequisite for reaching a signaling equilibrium is that managers bear a significant higher portion of the signaling cost than shareholders. Therefore, a high proportion of managers' shareholdings enhances the credibility of the signaling, because this implies that managers bear a large portion of overall dividend taxes relative to shareholders if they declare taxable stock dividends.[3] We thus expect that market reactions to taxable stock dividend announcements are positively correlated with the

[1] The effects of cash dividend payouts on firm value are well discussed in the literature. In short, cash dividends decrease firm value through taxation and increase firm value through signaling (e.g., Bhattacharya, 1979; John and Williams, 1985; Miller and Rock, 1985; Lee et al., 1993) and the mitigation of agency problems (Jensen and Meckling, 1976; Easterbrook, 1984; Jensen, 1986).

[2] The conventional wisdom in corporate finance is that dividend payouts lead investors to incur more tax disadvantages relative to capital gains, so firms should pay lesser dividends. However, contradicting this wisdom, Taiwanese firms frequently and persistently distribute taxable stock dividends even though those dividends produce no real income but only taxes. This suggests certain factors offset the effect of taxes and signaling is one of the plausible factors.

[3] Suppose a firm has 100,000 outstanding shares and its managers declare taxable stock dividends that change one old share to 1.5 new shares. Assuming that both managers and shareholders are subject to a 40% tax rate and thus overall dividend taxes are $40\% * (1.5 - 1) * 100{,}000 * 10 = \$200{,}000$, where 10 is the legally defined par value per share (see discussions in Section 2.1). Consider the first case where, if managers hold 99% of the shares, they incur $\$200{,}000 * 99\% = \$198{,}000$ in dividend taxes. The second case is that the managers do not own any shares of the firm and therefore pay no taxes and the shareholders will incur $200,000 in taxes. Given that a signaling equilibrium requires managers to bear a higher portion of the signaling cost, the signaling effect of the first case is stronger than in the second case since the former features managers bearing the greater part of the $200,000 in taxes. Accordingly, this example illustrates why a higher proportion of managers' shareholdings lead to a stronger effect of taxable stock dividend signaling.

proportion of managers' shareholdings, given that the "bang for the buck" (Bernheim and Wantz, 1995) increases with managers' stock ownership.

It is noteworthy that in our study the term *managers* refers to those who have the ultimate power to decide firm policies and so it has the same meaning as *controlling shareholders*. The reasoning behind this is that, in East Asian countries such as Taiwan, the controlling shareholder has the ultimate power to decide firm policies (La Porta et al., 1999, 2000). Therefore, the terms *managers* and *controlling shareholders* are interchangeable in our study.

Moreover, the unique individual-level stock ownership data available in Taiwan allow us to construct a measure of shareholders' weighted average tax rate that considers tax heterogeneity and varies at the firm level. Because higher shareholder tax rates lead to a stronger negative effect of taxes on firm value (e.g., Ayers et al., 2002; Li, 2007), we expect that the negative effect of taxes on market reactions in taxable stock dividend announcements will be more prominent for firms with higher shareholder weighted average tax rates (*WAT* hereafter).

By exploiting the proportion of managers' shareholdings to capture the strength of the signaling effect and *WAT* to capture the effect of dividend taxes, our research design can thus separate the positive signaling effect from the negative tax effect, as well as determine the relative importance of these two effects.

The integrated tax system in Taiwan implemented in 1998 eliminates the double taxation of dividends at both the corporate and shareholder levels and thus reduces dividend income taxation, essentially benefiting domestic individual shareholders. By examining whether changes in tax regimes are synchronized with changes in tax and signaling effects, we can corroborate that our empirical results are robust and not spurious. Accordingly, we expect the new tax system to mitigate the negative effect of shareholders' tax rates and the positive effect of management's stock ownership on market reactions.

La Porta et al. (2000) and Claessens et al. (2000) argue that the fundamental agency problems in many developing countries such as Taiwan are due to the conflict of interest between controlling and minority owners. Therefore, we expect that the more severe the agency problems as measured by the wedge between cash flow rights and voting rights, the less credible the signaling of taxable stock dividends.

Since a short window-based empirical design is arguably easier to control for the effects of confounding factors than a long window-based empirical design, we select an event study framework to construct our empirical tests. By regressing three-day abnormal returns on taxable and nontaxable stock dividends and variables that control for market anticipation, we find that the market responds positively to announcements of both taxable and nontaxable stock dividends, but the positive response is stronger for the latter. This implies that dividend taxation reduces the market valuation of taxable stock dividends.

Consistent with our hypotheses, our empirical results show that a higher *WAT* leads to lower market reactions to announcements of taxable stock dividends, while a larger proportion of shareholdings held by the controlling shareholder leads to higher market reactions. Announcement market reactions are positively impacted by the ratio of controlling shareholder cash flow rights to voting rights (a large ratio implies a small discrepancy between cash flow rights and voting rights). In addition, implementation of an integrated tax system mitigates the positive effect of the controlling shareholder's shareholdings, since a reduction in dividend taxes leads to lower signal costs for the controlling shareholder. The new tax system also mitigates the negative effect of *WAT*, but only for individual shareholders, who are the primary beneficiaries under the integrated tax system. Because none of these findings holds for nontaxable stock dividends, we corroborate that our findings are indeed attributable to the effect of stock dividend taxation.

We contribute to the literature in several ways. First, our results help to clarify the effect of shareholder-level dividend taxes on firm valuation. We find that dividend taxes do affect firm value, contradicting the tax irrelevance view proposed by Miller and Scholes (1978). In contrast with prior studies, we go a step further by determining the relative importance of tax and signaling effects on firm value. In addition, we find that tax is an important factor for the dividend signaling effect, which supports the tax-based signaling model.

Second, our results provide new insights into why the market reacts to stock dividend announcements. Specifically, we find that the dividend tax reduces the market valuation of stock dividends if they are taxable as cash dividends and the taxation of stock dividends results in a signaling effect. The signaling role of taxable stock dividends adds a new dimension to the literature in regard to the message a firm's dividend policy conveys about future performance. This also explains why Taiwanese firms declare taxable stock dividends, even if such behavior results in conspicuous tax disadvantages.

Third, our study demonstrates how agency conflicts between controlling and minority shareholders, as featured by the ultimate ownership structure, affect stock dividend valuations in a corporate governance context different from that of the United States. This suggests that a firm's ownership structure influences its stock dividend policy. Since Taiwan is an emerging market, this result also helps understand the differences in corporate dividend policy between developed and developing countries.

Our paper is organized as follows. Section 2 introduces the stock dividend regulations and tax environment in Taiwan. Section 3 develops our hypotheses. Section 4 presents the sample selection and the research methodology. Section 5 discusses the empirical results. Section 6 presents additional analysis and the final section draws our conclusions.

2. Institutional background in Taiwan

2.1. Stock dividend regulations

Taiwan tax law distinguishes between stock dividends distributed from retained earnings and those distributed from capital surplus. Stock dividends distributed from capital surplus are considered a return of capital and are thus tax free, while those distributed from retained earnings are viewed as a distribution of profits and are thus taxable. Capital surplus can be used to distribute stock dividends but not to distribute cash dividends.

The legally defined par value per share is NT$10. If we define the dollar amount of the stock dividend per share as S, then shareholders receive S/10 additional shares for each share owned and S/10 is the stock split factor. Taxes incurred by shareholders equal S multiplied by their income tax rates.

In Taiwan, there is no difference in the accounting treatment for large and small stock dividends. In contrast, U.S. accounting rules (American Institute of Certified Public Accountants, 1953, Ch. 7B, para. 10; U.S. Securities and Exchange Commission, 1972) state that small stock dividends are those with a distribution size of less than 25%, which creates a classification problem in the context of U.S. studies (Rankine and Stice, 1997b). This is not a concern in our study, however, because whether the distribution is 25% or more is irrelevant to the accounting treatment.

2.2. Tax environment

For individual taxpayers, incomes from various sources, including dividends, are combined into a single, consolidated income subject to a progressive income tax rate up to 6%, 13%, 21%, 30%, and 40%. For domestic corporate shareholders, the corporate income tax rate is set at 25% and the tax deduction for dividends received is 80%. Foreign shareholders, both individuals and corporations, face a withholding tax rate of 20% of their income.

The integrated tax system was enacted on December 26, 1997, and implemented in 1998. It is noteworthy that in Taiwan dividends declared in the current year are generally distributed from the previous year's earnings, so the first effective year was one year after the implementation year. Therefore, 1999 was the first year when dividends were applicable to the integrated tax system, because dividends declared in that year were distributed from earnings of 1998, the first year of the implementation of the new tax system.[4]

This new system was a full imputation credit tax system, applicable only to domestic shareholders and targeted to reduce investors' dividend tax burdens. Under the integrated tax system, individuals subject to a higher marginal income tax rate have to pay a further tax equal to the higher rate multiplied by the grossed-up dividend, after which the tax credit is deducted. For individual shareholders whose dividend tax payables are lower than their tax credits, the remaining credits are fully refundable. For domestic corporate shareholders, the tax deduction for dividends increases from 80% to 100% and thus dividends

[4] By the same logic, in the implementation year 1998 the new tax system was not effective because dividends declared that year were distributed from earnings of 1997, when the new tax system was not yet implemented.

received by the corporation are tax free. Table 1 illustrates the impact of the integrated tax system on the after-tax dividend income of various types of shareholders.

As shown in Table 1,[5] the increase in after-tax dividend income for domestic individual shareholders is $25 * (1 - t_d)$. Since the highest tax rate for individuals is 40%, the degree of the increase for individual shareholders will be at least $(1 - 40\%) * \$25 = \$15$. For domestic corporate shareholders, the increase in after-tax dividend income is \$75–\$71.25 = \$3.75, which is much smaller than the increase for individuals. Accordingly, Table 1 suggests that individual shareholders are the primary beneficiaries of the tax reform.

In addition to the integrated tax system, Taiwan's tax system and institutional background have several noteworthy features: (1) Capital gains taxes on securities trading have been suspended since January 1, 1990. (2) Unlike the United States, where firms announce dividends quarterly, in Taiwan firms generally announce dividends once a year; therefore the dividend yield need not be annualized, simplifying our research design.

3. Hypothesis development

3.1. Dividend tax and firm valuation

The negative effect of dividend taxes on firm valuation is well documented in the literature (Graham, 2008; Hanlon and Heitzman, 2010). Prior studies report that taxes reduce firm values even for the case of taxable stock dividends. For example, Athanassakos and Smith (1996) explore abnormal return differences in taxable and nontaxable stock dividends to show that in Canada taxes have significant impacts on ex-day stock pricing. Anderson et al. (2004) examine taxable stock dividend data in New Zealand and reach similar conclusions. Francis et al. (2012) show that in Taiwan the implementation of the integrated tax system impacts the ex-day price changes for taxable stock dividends but not those for nontaxable stock dividends. These findings suggest that stock dividend taxes affect firm values, as in the case of cash dividends.

A natural expectation is that the higher the tax rates of shareholders, the stronger the effect of taxes on firm valuation. As a result, the key to successfully verifying the negative pricing effect of dividend taxes relies on a good measure of investor tax status, a tough undertaking.

Prior studies (Poterba, 1987; Bernheim and Wantz, 1995; Bernhardt et al., 2005; Sialm, 2009) estimate investor tax status by weighting the marginal tax rates of various investor classes by their economy-wide equity ownerships. However, this approach implicitly assumes that shareholder dividend tax burdens are the same across all stocks during a specific year and, because this economy-wide variable varies only over time, the empirical results thereof may be period specific. To overcome this problem, Li (2007) uses the level of institutional ownership for specific firms to represent investor tax status. Nevertheless, this method relies on the existence of a hypothetical marginal investor (Guenther and Sansing, 2010) and ignores tax heterogeneity among shareholders. Other estimate approaches based on implicit taxes or ex-dividend date price declines (e.g., Elton and Gruber, 1970) also rely on the assumption of the marginal investor and hence encounter similar problems.

The survey of the literature above suggests that a good tax measure of shareholder tax status must consider both the time-varying nature and tax heterogeneity among shareholders at the firm level. The feasibility of estimating shareholders' *WAT* allows us to meet these standards. We elaborate the details of how to estimate *WAT* in Section 4.2.

In short, if dividend taxes indeed negatively impact firm valuation, we should find that the tax rates of shareholders as represented by *WAT* negatively affect market responses to stock dividend announcements. Accordingly, we propose our first hypothesis.

Hypothesis 1. Ceteris paribus, a firm's weighted average tax rate for its shareholders is negatively related to the market reactions to its taxable stock dividend announcements. That is, dividend tax affects firm equity valuation.

[5] Table 1 is from Francis et al. (2012). For investee firms, profits earned but retained within the company are subject to a 10% retained earnings tax. Retained earnings taxes become tax credits to shareholders if the related retained earnings are distributed to them.

Table 1
After-tax dividend income under the classical tax and integrated tax systems.

	Shareholder		
	Individual	Corporation	Foreign
Classical tax system			
Pre-tax dividend income[a]	$75	$75	$75
Minus: dividend tax liability[b]	$t_d * \$75$	$\$75 * (1 - 80\%) * 25\%$	$\$75 * 20\%$
After-tax dividend income	$\$75 * (1 - t_d)$	$71.25	$60
Integrated tax system			
Pre-tax dividend income	$75	$75	$75
Minus: dividend tax liability[c]	$\$75/(1 - 25\%) * t_d$	$\$75 * (1 - 100\%) * 25\%$	$\$75 * 20\%$
Add: tax credit[d]	$25	$0	$0
After-tax dividend income	$\$100 * (1 - t_d)$	$75	$60

[a] We assume that the investee corporation has pre-tax earnings of $100. Since the corporate income tax rate is a single rate of 25% without any progression, the after-tax earnings are $75. We further assume that the corporation distributes the entire $75 as dividends to avoid the 10% retained earnings tax; thus shareholder dividend revenue is $75.

[b] The variable t_d is the marginal income tax rate for individual shareholders, which ranges from 0%, 6%, 13%, 21%, and 30% to 40%. For local corporate shareholders, the tax deduction for dividends is 80% and the dividend tax is $\$75 * (1 - 80\%) * 25\%$. Foreign shareholders, individual and corporate, face a withholding tax rate of 20% of their dividend incomes; thus their dividend taxes are $\$75 * 20\%$.

[c] Under the integrated tax system, individual shareholders' dividend taxes are calculated by restoring the dividend received back to corporate pre-tax earnings amounts—$\$75/(1 - 25\%) = \$100$—and then multiplying this restored amount by shareholders' applicable marginal dividend income tax rates. In addition, for domestic corporate shareholders the tax deduction increases from 80% to 100%, so their dividend tax liability is essentially zero.

[d] The tax credit for individual shareholders is the income tax the corporation repaid, so it is $\$100 * 25\% = \$25$.

3.2. Taxable stock dividends and signaling

This section develops a simple signaling equilibrium model to demonstrate how taxable stock dividends can signal managers' (i.e., controlling shareholders in our study) beliefs in a firm's prospects and how their proportions of shareholdings relate to this signal's credibility.

Several studies based on exploring Taiwanese data (e.g., Chu, 1997; Hsu et al., 2000; Kuo, 2013) report that the declarations of taxable stock dividends are associated with firms' future profitability. This empirical evidence suggests the plausibility of using taxable stock dividends to signal a firm's prospects. In addition, Kuo (2013) find that taxable stock dividends lead to higher market valuation of a firm's future earnings, which suggests that investors recognize the information content conveyed by taxable stock dividends.

Referring to John and Williams (1985) and Ambrish et al. (1987), we consider a two-period setting where a representative firm plans to raise funds from the equity market to finance its operations in the first period and its earnings, which depend on its productivity, will be revealed in the second period. Since firm productivity is the private information of managers, they must send a signal to communicate their beliefs about firm prospects to the equity market.

We assume that the manager can only use taxable stock dividends to signal[6] and the equity fund investors are willing to provide depends on the magnitude of this signal.[7] Let S represent the amount of taxable stock dividends declared by the firm and I be the funds raised from the equity market, where $I =$

[6] Firms that need to raise external equity capital often lack sufficient internally generated capital to finance all their investment projects (Myers and Majluf, 1984). In this case cash payouts are suboptimal, because they force firms to seek external capital, which is more expensive than internally generated capital. Consequently, firms are more likely to use non-cash devices for signaling and taxable stock dividends are one of such an alternative device.

[7] D'Mello et al. (2003) find that firms that split their stocks can raise more funds in seasoned equity offerings. Since stock dividends are similar to stock splits, it is reasonable to assume a positive relation between I and S.

$k \cdot \ln S$, with k a constant. Let $F(I)$ to be the firm's productivity function, $F'(I) > 0$, $F''(I) < 0$, and $F(0) = 0$. We assume that I can be used only to fund $F(I)$ and for no other purpose.

A manager chooses a level S to maximize his or her utility, represented as $\beta \cdot F(I) - \alpha \cdot t \cdot S$, where t is the manager's marginal dividend tax rate; β is the weight the manager places on the firm's earnings, which represents the degree of the control benefits managers can obtain[8]; and α is the proportion of the firm's shareholdings held by the manager. Because managers are equivalent to the controlling shareholder in our analysis, β can be viewed as control rights and α as cash flow rights held by the controlling shareholder.

Without considering the time value of money, we can express the manager's objective function as

$$\underset{S}{Max}\, \beta \cdot F(I) - \alpha \cdot t \cdot S \tag{1}$$

whose first-order condition is

$$\beta \cdot F'(I) \cdot k \cdot 1/S - \alpha \cdot t = 0 \Rightarrow S^* = \frac{\beta \cdot F'(I) \cdot k}{\alpha \cdot t}. \tag{2}$$

As shown in Eq. (2), the optimal level of taxable stock dividends S^* increases with the marginal productivity $F'(I)$, so the better the firm's future performance, the more taxable stock dividends the manager is willing to declare and thus incurs more dividend taxes. Moreover, Eq. (2) results in a separating equilibrium where a false signal is costly to managers, to serve as a disincentive against misleading investors. Specifically, managers of different $F'(I)$ self-select themselves through differences in their choices of taxable stock dividends.[9] Accordingly, investors can infer a firm's future performance from the magnitude of taxable stock dividends it declares. This can be easily shown by manipulating Eq. (2), as follows:

$$\frac{\partial F'(I)}{\partial S^*} = \frac{\alpha \cdot t}{\beta \cdot k}. \tag{3}$$

As shown in Eq. (3), a higher S^* signals higher future performance $F'(I)$. In addition, the strength of this signal monotonically increases with α. This is a natural result, because the tax burdens of managers increase monotonically with their shareholdings and the higher the proportions of shares they hold, the higher the proportion of stock dividend taxes they bear relative to shareholders and hence the more salient the effect of the resultant signaling. Given the preceding discussions, we propose our second hypothesis.[10]

Hypothesis 2. Ceteris paribus, the proportion of a firm's shares owned by management is positively related to the market reactions to its taxable stock dividend announcements.

3.3. Stock dividends and ultimate ownership structure

In East Asian countries such as Taiwan, the salient agency problem is the expropriation of outside shareholders by the controlling shareholder (La Porta et al., 1999). Controlling shareholders' incentives for expropriation result from discrepancies between their ownership rights (i.e., cash flow rights) and control

[8] In the case of the controlling shareholder, β is similar to control rights because it represents the factual degree that the controlling shareholder can control and thus benefit from firm earnings regardless of his or her proportion of shareholdings (cash flow rights, as represented by α). By exercising the control power over the firm, the controlling shareholder can obtain disproportionate benefit from firm earnings, even if he or she owns only a very small proportion of the firm's shares.

[9] That is, if $F'(I)_1 < F'(I)_2$, then $S^*_1 < S^*_2$. Managers with $F'(I)_1$ will not find it in their self-interest to misrepresent themselves as $F'(I)_2$ by choosing a higher level of taxable stock dividends S^*_2, because under such circumstances the marginal cost $\alpha \cdot t$ is higher than the marginal benefit $F'(I)_1$.

[10] In Hypothesis 2 firm management represents the controlling shareholder because the controlling shareholder owns the ultimate decision power in creating dividend policy. Consistent with this conjecture, Faccio et al. (2001) and Claessens et al. (2002) suggest that the control links dominated by the controlling shareholder are well recognized by investors.

rights (i.e., voting rights). Prior studies usually use the ratio of ownership to control rights (O/C) to measure a corporation's vulnerability to insider expropriation because of its conceptual simplicity, which facilitates exposition and empirical analysis (e.g., Claessens et al., 2000; La Porta et al., 2000; Fan and Wong, 2002). A low O/C demonstrates more severe agency conflicts between the controlling and minority shareholders because it gives the controlling shareholder more incentives for expropriation.

Stock dividends may facilitate expropriation by legitimately paying less cash dividends. Specifically, the declaration of stock dividends reduces distributable retained earnings and thus leaves minority shareholders less power against expropriation by requiring cash dividend payouts.[11] This problem is more severe for firms with low O/C values because of the resulting entrenchment effects and incentives for expropriation (Claessens et al., 2002).

As shown by Eq. (3), a higher β relative to α decreases $\partial F'(I)/\partial S^*$. This implies that a low O/C weakens the signaling strength of taxable stock dividends, because the controlling shareholder can obtain large control benefits (e.g., by paying less cash dividends that facilitate expropriation, where the strength of this incentive is represented by β) but pay small taxes due to a low α (where α is ownership rights). The low taxes relative to the large control benefits thus lead outside investors to believe that the controlling shareholder declares taxable stock dividends not because of confidence about the firm's prospects, but because this leaves minority shareholders less power to require cash dividends and hence facilitates the controlling shareholder's realization of control benefits through expropriation. Consequently, low O/C values cause the capital market to downgrade the signaling strength of taxable stock dividends. We thus propose our third hypothesis.

Hypothesis 3. Ceteris paribus, the ratio of a firm's controlling shareholder's ownership rights to control rights is positively related to the market reactions to the firm's taxable stock dividend announcements.

3.4. Effect of the integrated tax system

The implementation of the integrated tax system provides a clean experiment for testing whether dividend taxes are relevant to stock pricing, because this tax change targets only dividend income and no other major tax law changes operate concurrently. This reduces the likelihood that the new tax system will have widespread confounding effects on firms' underlying cash flows, unlike other major tax acts such as the U.S. Tax Reform Act of 1986.

Because the new tax system is a full imputation system that reduces investors' dividend tax burdens, it is natural to expect it to mitigate the negative tax effect on firm valuation. In addition, we can check whether our empirical results are spurious by examining whether the change in tax regime is synchronized with changes in tax and signaling effects. That is, if Hypothesis 1 holds as we find that *WAT* indeed negatively affects market reactions, then we should also find that such a relation becomes less negative after implementation of the integrated tax system. This should hold, regardless of the validity of nontax reasons.[12] We therefore propose our fourth hypothesis.

Hypothesis 4. Ceteris paribus, the negative relation between a firm's weighted average tax rate for its shareholders and the market reactions to its taxable stock dividend announcements has been mitigated by the integrated tax system.

By the same logic, the integrated tax system should mitigate the signaling strength of taxable stock dividends. The reasoning is that the strength of such signaling relies on tax burdens incurred by management and, because

[11] Cash dividends limit insider expropriation because they remove corporate wealth from insider control and thus mitigate minority shareholders' concern that undistributed cash will be expropriated by the controlling shareholder (La Porta et al., 2000; Faccio et al., 2001; Gugler and Yurtoglu, 2003).

[12] For example, one may conjecture that market responses to stock dividends are attributable to behavioral factors such as catering to investor demands (Baker and Wurgler, 2004). However, this conjecture can be rejected if we find the tax change to be influential, since the underlying behavioral explanation is unrelated to taxes or tax reforms.

the new tax system reduces dividend taxes, investors should anticipate the signal thereof becoming less credible. We thus propose our fifth hypothesis.

Hypothesis 5. Ceteris paribus, the positive relation between the proportion of a firm's shares owned by management and the market reactions to the firm's taxable stock dividend announcements has been mitigated by the integrated tax system.

4. Sample and empirical specification

4.1. Sample

All our data, including announcement dates,[13] corporate financial information, and ownership structure, are extracted from the Taiwan Economic Journal database. Our sampling period is from 1997 to 2000, two years (1997 and 1998) before and two years (1999 and 2000) after the effective date of the integrated tax system. The reason our two sampling sub-periods center on 1998 and 1999 is because 1999 was the first effective year of the new tax system, given that dividends declared in 1999 were distributed from earnings of 1998, the year of implementation for the new tax system (see Section 2.2). The reason we choose only four sampling years is because the measurement of *WAT* is most precise during 1998–1999 (see Section 4.2), so a longer sampling period may lead to significant measurement errors of *WAT*.

Our sample initially includes all firms listed on the Taiwan Stock Exchange Corporation, the Taiwan over-the-counter market, or the GreTai Securities Market that announce stock or cash dividends during our sampling period. Asquith et al. (1989) describe the difficulty in distinguishing between market reactions to a stock dividend announcement and to a simultaneous cash dividend announcement. To mitigate this potentially confounding impact, our sample only covers stock dividend declarations that are not accompanied by simultaneous cash dividend announcements. We also exclude firms that announce both new stock issuances and stock dividends simultaneously and firms with incomplete data.

Based on these screening criteria, our final sample contains 522 firm–year observations, among which 112 declared only taxable stock dividends (*taxable only cases*), 81 declared only nontaxable stock dividends (*nontaxable only cases*), and 329 simultaneously declared both classes of stock dividends (*simultaneously both cases*). The industry distribution of the sample is shown in Table 2. Our definition of industries is based on the classifications of the Taiwan Stock Exchange.

Table 2 shows that the distribution of these observations does not focus on any particular industry, except for the electronics industry, which contains 144 observations. This pattern is consistent with anecdotal evidence that the high-tech industry (i.e., electronics industry) accounts for a large portion of overall stock dividend distributions, which suggests the importance of controlling for this industry effect in our empirical tests.

4.2. Measurement of the weighted average tax rate of shareholders

Referring to Lee et al. (2006), we separate individual ownership into five classes based on the five tax brackets of individuals. The use of both institutional and individual ownerships to represent shareholder tax statuses allows us to consider tax heterogeneity among shareholders at the firm level.

Specifically, the Taiwan Economic Journal database includes two kinds of ownership information: One is the proportions of shares held by shareholders of various identities, including domestic individual shareholders, foreigners,[14] and domestic institutions,[15] while the other is the proportions of shares held by all shareholders, tabulated into different lot sizes (where one lot equals 1000 shares). The tabulated ranges

[13] To accommodate Taiwanese industry practices, we define the announcement dates as the annual meeting dates of boards of directors, which is usually the first day dividend news becomes public.

[14] In practice, foreign individuals are also subject to the same tax rate as that of foreign institutions and the majority of foreign individuals undertake their investments through foreign institutions. We therefore define the stock ownership of foreigners to include both individual and institutional foreign investors.

[15] Domestic institutions include government entities, financial institutions (securities firms and banks), corporations, and mutual funds.

Table 2
Industry distribution.

Industry	Total size	%	Taxable only cases	%	Nontaxable only cases	%	Simultaneously both cases	%
Electronics	144	28%	27	24%	16	20%	101	31%
Electric machineries	23	4%	1	1%	5	6%	17	5%
Chemicals	28	5%	13	12%	2	2%	13	4%
Automobiles	2	0%	0	0%	0	0%	2	1%
Cement	5	1%	4	4%	1	1%	0	0%
Food	23	4%	4	4%	3	4%	16	5%
Plastics	23	4%	11	10%	5	6%	7	2%
Textiles	57	11%	7	6%	9	11%	41	12%
Electronic appliances	14	3%	1	1%	4	5%	9	3%
Glass and china	4	1%	4	4%	0	0%	0	0%
Paper	9	2%	0	0%	3	4%	6	2%
Steel	29	6%	7	6%	9	11%	13	4%
Rubber	21	4%	5	4%	3	4%	13	4%
Architecture	39	7%	10	9%	8	10%	21	6%
Transportation	16	3%	4	4%	2	2%	10	3%
Tourism	11	2%	2	2%	4	5%	5	2%
Finance	34	7%	3	3%	3	4%	28	9%
General merchandise	12	2%	1	1%	3	4%	8	2%
Gas and oil	4	1%	0	0%	0	0%	4	1%
Other	24	5%	8	7%	1	1%	15	5%
Total	522	100%	112	100%	81	100%	329	100%

(1) The definition of industries is based on the classifications of the Taiwan Stock Exchange.
(2) The taxable only case column covers only taxable stock dividends (distributed from retained earnings), the nontaxable only case column covers only nontaxable stock dividends (distributed from capital surplus), and the column with simultaneously both cases covers observations that declared both taxable and nontaxable stock dividends simultaneously.
(3) We combine the banking and insurance industries with the securities trading industry in the finance industry. The chemicals industry includes both chemicals and biotechnology.

are less than one, one to five, five to 10, 10 to 15, 15 to 20, 20 to 30, 30 to 50, 50 to 100, 100 to 200, 200 to 400, 400 to 600, 600 to 800, 800 to 1000, and 1000 lots and above.[16]

Lee et al. (2006) estimate the income tax rates of individual investors by calculating the fraction of shares held by individual shareholders with holdings above a certain lot size threshold. As justification for basing their tax proxy on ownership, Lee et al. (2006) use 1998 and 1999 data from the Taiwan Ministry of Finance to relate the average shareholdings of householders to their tax rate brackets. The authors find that shareholdings increase monotonically with tax brackets and that the (effective tax rate range, average shareholdings in lots) pairs for different effective tax rate brackets are (0–13%, 35.6), (13–21%, 66.7), (21–30%, 200.1), and (>30%, 1136.7). Since Lee et al. (2006) investigate only two years of data, it may be inappropriate to extend their findings to the long term, so our sampling period includes only four years.

We define the (effective tax rate range, individual shareholdings based on tabulated lot ranges) pairs for different tax brackets as (0–6%, less than 10),[17] (6–13%, 10–50), (13–21%, 50–100), (21–30%, 100–1000), and (30–40%, 1000 and above). We thus have five individual ownership variables representing five different tax brackets.[18]

[16] This dataset only provides the shareholding fractions of different tabulated ranges without the identities of the shareholders and thus we assume that all institutional shareholders hold stocks in groups of 1000 lots and above. Hence, the shareholding proportion of individuals who own 1000 lots and above is equal to the fraction of all shareholders who own 1000 lots and above minus the sum of all institutional shareholding proportions. If the result is negative, we set the value to zero.

[17] Although Lee et al. (2006) only report the tabulated range (0–13%, 35.6) rather than the two separate ranges (0–6%) and (6–13%), they consider individuals who own fewer than 10 lots as owning low wealth. Accordingly, we define individuals who own fewer than 10 lots as subject to the lowest tax bracket and hence the applicable pair is (0–6%, less than 10).

[18] Our five shareholding tabulated ranges represent only the ownership of domestic individuals, since the ownership of foreign individuals is combined with that of foreign institutions.

4.3. Empirical specifications

This section relates our arguments to our empirical methodology by regressing share price responses to both taxable and nontaxable stock dividend announcements. The dependent variable in our regression is *CAR*, the three-day cumulative abnormal return centered on the announcement date.[19] Following prior studies (e.g., Asquith et al., 1989; Peterson et al., 1996; Rankine and Stice, 1997a), we use the market-adjusted model, which defines *CAR* as the raw return on the stock minus the return on the value-weighted market index, where the market benchmark used is the Taiwan Stock Exchange weighted stock market index.

We use the market-adjusted model because it allows us to avoid arbitrarily selecting an estimation period, as required by a traditional market model, whose parameters may be biased since firms usually experience abnormal share price performance prior to stock dividend announcements. We recognize that only the unexpected portion of a dividend announcement should induce a market response, but this problem has little effect on our results because we control for other firm characteristics (described below) that were ex ante observable and may have affected investors' assessments of the dividend amount announced.[20]

The first two independent variables of interest are *ST* and *SNT*, the amounts of taxable and nontaxable stock dividends per share, respectively. By contrasting the pricing implications of these two classes of stock dividends in the same regression, we can rule out the confounding effects of nontax factors.

We include three experiment variables to test our hypotheses. The first is *WAT*, which is equal to $DIS * 25\% * (1 - 80\%) + FIS * 20\% + ISA * 6\% + ISB * 13\% + ISC * 21\% + ISD * 30\% + ISE * 40\%$, where *DIS* is the percentage of common stock owned by domestic corporate shareholders;[21] *FIS* is that owned by foreign shareholders; and *ISA*, *ISB*, *ISC*, *ISD*, and *ISE* are those owned by domestic individual shareholders who hold fewer than 10, 10 to 50, 50 to 100, 100 to 1000, and 1000 lots and above, respectively (proxies for the individual shareholdings of investors whose effective tax rates are 0–6%, 6–13%, 13–21%, 21–30%, and 30–40%, respectively).

To support Hypothesis 1, we expect the sign of the interaction between *WAT* and *ST* to be negative because the higher the investors' tax rates, the more negatively they will assess the value of taxable stock dividends, regardless of the signaling effect.

Our second experiment variable is *MGS*, the proportion of shares held by management. Hypothesis 2 argues that *MGS* positively affects the market valuation of taxable stock dividends, so we expect the interaction between *MGS* and *ST* to be positive. However, measuring *MGS* is a problem, since the definition of firm management can be either officers (in the case of the United States) or the controlling shareholder (in the case of East Asian countries such as Taiwan) and the most appropriate definition is an empirical issue. Accordingly, we test both definitions under different specifications. In the first specification, we define *MGS1* as the proportion of shares held by officers and in the second we define *MGS2* as the proportion of shares held by controlling shareholders.

Our third experiment variable is *O*/*C*, the ratio of the ultimate controlling shareholder's ownership rights to control rights. Our definition of controlling shareholders and procedures in determining chains of ownership closely follow those of Claessens et al. (2000) and La Porta et al. (1999), who focus on ultimate ownership. To support Hypothesis 3, we expect the interaction between *O*/*C* and *ST* to be positive, because a lower *O*/*C* weakens the strength of the signaling effect of *ST*.

To test Hypotheses 4 and 5, we set a time dummy variable *DUM*, which equals one if the observation occurred after the integrated tax system was implemented and zero otherwise. Hypothesis 4 suggests that implementation of the integrated tax system has mitigated the negative impact of *WAT*, so we expect the interaction between *DUM* and $WAT * ST$ to be positive. By the same reasoning, the integrated tax system also reduces the signaling cost borne by management. We therefore anticipate the interaction between *DUM* and $MGS * ST$ to be negative.

[19] We also repeat our empirical test by using a five-day *CAR* and the results remain similar.

[20] In addition, the dividend policies of Taiwanese firms are very flexible. A flexible dividend policy suggests that shareholders encounter difficulties in predicting dividend amounts, so a large portion of the current dividend level is likely to be unexpected.

[21] Because domestic corporate shareholders receive an 80% dividends-received deduction, their real dividend tax rate is $25\% * (1 - 80\%)$, given their 25% income tax rate.

We also include several variables to control for ex ante observable factors that can be expected to influence the market's anticipation of the stock dividend announcements (McNichols and Dravid, 1990; Rankine and Stice, 1997a, 1997b). The variable *RUNUP* is the cumulative market-adjusted return for days −105 to −7 preceding the stock dividend announcement date. Prior studies show that stock dividends are preceded by a period of positive returns, so market surprise must be smaller if stock dividends are declared after a period of positive returns and hence the coefficient of *RUNUP* is predicted to be negative. The variable *PRICE* is the natural logarithm of the closing stock price per share on day −6 relative to the announcement date.[22] If a firm with a higher price per share wants its share price to remain in the optimal trading range, it may be perceived as being more likely to declare a stock dividend and thus the market reaction would be smaller. The variable *MVE* is the natural logarithm of the closing market value of equity on day −6 relative to the announcement date. Because less information about small firms is available to market participants, firm size is negatively associated with the informativeness of announcements. The variable *HTI* is an industry dummy that equals one if the firm is in the electronics industry and zero otherwise. In Taiwan, a large portion of stock dividend declarations can be attributed to the electronics industry, so market participants may expect high-tech firms to be more likely to declare stock dividends than non-high-tech firms, decreasing their market responses.

Additional variables are included in our regression because of their potential influence on the strength of the signaling effect. The variable *LGS* is the percentage of shares held by the largest external shareholder. As noted by Faccio et al. (2001), large external shareholders serve a monitoring role and their presence may therefore weaken the ability of management to engage in expropriation (Gugler and Yurtoglu, 2003). We therefore expect the coefficient of the interaction between *LGS* and *ST* to be positive.

Moreover, we include *RE*, which is the ratio of retained earnings to capital surplus divided by 100. The variable *RE* is used to measure the retained earnings slack relative to the capital surplus slack. This controls for the market's anticipation about which type of stock dividend the firm will declare. By including the interaction between *RE* and *ST* in the regression, we control for the signaling effect arising from retained earnings reduction.[23] We expect the coefficient of this interaction to be negative. We present our regression model as follows:

$$\begin{aligned} CAR_{it} = {} & \alpha_0 + ST_{it}\cdot(\beta_1 + \beta_2\cdot WAT_{it} + \beta_3\cdot MGS_{it} + \beta_4\cdot O/C_{it} + \beta_5\cdot DUM_t\cdot WAT_{it} \\ & + \beta_6\cdot DUM_t\cdot MGS_{it} + \beta_7\cdot LGS_{it} + \beta_8\cdot RE_{it}) \\ & + SNT_{it}\cdot(\delta_1 + \delta_2\cdot WAT_{it} + \delta_3\cdot MGS_{it} + \delta_4\cdot O/C_{it} + \delta_5\cdot DUM_t\cdot WAT_{it} \\ & + \delta_6\cdot DUM_t\cdot MGS_{it} + \delta_7\cdot LGS_{it} + \delta_8\cdot RE_{it}) \\ & + \eta_1\cdot RUNUP_{it} + \eta_2\cdot PRICE_{it} + \eta_3\cdot MVE_{it} + \eta_4\cdot DUM_t + \eta_5\cdot ST_{it}\cdot DUM_t \\ & + \eta_6\cdot SNT_{it}\cdot DUM_t + \eta_7\cdot HTI_i + \eta_8\cdot WAT_{it} + \eta_9\cdot MGS_{it} + \eta_{10}\cdot O/C_{it} \\ & + \eta_{11}\cdot LGS_{it} + \eta_{12}\cdot RE_{it} + \varepsilon_{it}. \end{aligned} \tag{4}$$

Our regression is estimated with ordinary least squares using Newey and West's (1987) method to calculate heteroskedasticity-consistent standard errors. Except for the dummy variables and *RUNUP*, *PRICE*, and *MVE*, the remaining variables use the numbers for the end of the most recent year preceding the stock dividend announcement dates.[24]

5. Empirical results

5.1. Basic results

Panel A of Table 3 presents descriptive statistics of our regression variables for three subsamples (*taxable only cases*, *nontaxable only cases*, and *simultaneously both cases*, denoted *TOC*, *NTOC*, and *SBC*,

[22] If the closing price of day −6 is missed, we replace it with the price of the next day closest to day −6, such as that of day −5, and so forth.

[23] Prior studies propose the retained earnings hypothesis, arguing that stock dividends signal future firm performance by voluntarily reducing the existing pool of distributable funds that decrease the firm's ability to make future cash distributions (McNichols and Dravid, 1990; Peterson et al., 1996; Rankine and Stice, 1997a).

[24] For experiment variables with the expected coefficient signs, we adopt a one-tailed *t*-test to increase the test power in determining their statistical significance.

respectively). Panel B of Table 3 presents the differences and related significances of these variables among our three subsamples. As shown in Panel A, the *SBC* subsample has a higher mean and median of *CAR* than the *TOC* and *NTOC* subsamples, which suggests that investors prefer firms to declare a mix of both types of dividends than to declare only single specific type of dividends.[25]

Moreover, Panel A shows that, compared with *TOC* and *SBC*, the *NTOC* subsample has lower means and medians of the variables *MVE*, *PRICE*, and *RE*. This suggests that *NTOC* firms have features (i.e., smaller size, lower stock price, and lesser accumulated profits) causing them to be neglected, so they may use nontaxable stock dividends to trigger the attention of the capital market. In addition, *TOC* firms have a higher mean and median of *MSG2* than *NTOC* firms. Because the signaling effect of taxable stock dividends makes sense only when managers have high proportions of shareholdings, the higher *MSG2* of *TOC* firms suggests that taxable stock dividends are used as a signal, since managers are unlikely to voluntarily incur taxes without good reason. It is noteworthy that the mean and median of *RUNUP* are negative for all three subsamples, inconsistent with the findings of previous studies.

Panel B shows that the differences in these variables among the three subsamples are generally significant at conventional levels. This suggests that it is important for our empirical tests to control for the effects of these variables. Moreover, untabulated results show that firms that issue new shares have higher growth opportunities (measured by the market-to-book ratio) and declare more taxable dividends and fewer cash dividends preceding the year of the new issuance. This is consistent with our inference that firms pay taxable stock dividends to signal to the market their abundance of profitable investment projects to raise more capital.

5.2. Regression results

Table 4 reports our regression results for Eq. (4). The results of model (1) show that announcements of *ST* and *SNT* both lead to positively significant market reactions (the *p*-values are 0.0102 and 0.0001, respectively), but the former is smaller than the latter (the coefficients are 0.0099 and 0.0281, respectively) and their difference is significant at the 1% level (the Wald test *F*-value is 11.0962). The smaller market reaction to *ST* suggests the negative pricing implication of dividend taxes. On the other hand, given the negative effect of taxes, the market reaction to *ST* is still positive, which suggests that *ST* has other positive information content that offsets the negative impact of taxes. This is consistent with our arguments that taxable stock dividends result in both a negative tax effect and a positive signaling effect, while the latter dominates the former. The results of model (1) provide preliminary evidence of the existence of tax and signaling effects for taxable stock dividends, as our hypotheses propose.

In model (2), we test our first three hypotheses and use *MGS1*, the proportion of shares owned by officers, to investigate the effect of signaling. The results show that $ST * WAT$ is negative and significant at the 5% level, consistent with Hypothesis 1, that taxes affect the market valuation of stock dividends if they are taxable as cash dividends. Furthermore, although the coefficient of $ST * MGS1$ is positive, it is not significant at conventional levels. This suggests that the market does not view firm officers as having the power to make decisions, since in Taiwan the ultimate controlling shareholder usually really governs the company. On the other hand, consistent with Hypothesis 3, the coefficient of $ST * O/C$ is positive and significant at the 1% level. This result reinforces the dominant position of the controlling shareholders, since the effect of *O*/*C* reflects their influence.

In model (3), we reestimate model (2) by replacing *MGS1* with *MGS2*. The results show that, in addition to $ST * WAT$ and $ST * O/C$, $ST * MGS2$ is also significant and all their signs are consistent with our hypotheses, while $SNT * WAT$, $SNT * O/C$, and $SNT * MGS2$ are insignificant. This suggests that *MGS2* better captures the market's recognition of a firm's true management. We therefore use it in the analyses of models (4) and (5).

[25] The negative mean and median of *CAR* for the *TOC* subsample may be due to higher shareholder weighted average tax rates, since the median of *WAT* is higher (although insignificant) for this subsample than for the other subsamples. Since a descriptive statistics analysis such as ours does not control for the effects of other potential explanatory variables, the actual relation between *CAR* and *ST* must be determined by the regression results. Untabulated results show that the Pearson correlation between *CAR* and *ST* is positive (0.2211), which is consistent with the positive regression coefficient of *ST* on *CAR*, as reported in Table 4.

Table 3
Descriptive statistics.

	ST	*SNT*	*CAR*	*WAT*	*MSG1*	*MSG2*	*O/C*	*RUNUP*	*PRICE*	*MVE*	*LGS*	*RE*
Panel A												
(A) Taxable only cases (n = 112)												
Mean	1.704	0.000	−0.004	0.218	0.015	0.154	0.879	−0.005	1.604	3.961	0.022	5.256
Median	1.300	0.000	−0.004	0.231	0.002	0.095	0.957	−0.027	1.553	3.965	0.006	0.072
Standard deviation	1.350	0.000	0.042	0.073	0.025	0.161	0.173	0.199	0.338	0.567	0.035	32.090
25% quartile	0.780	0.000	−0.024	0.155	0.001	0.021	0.845	−0.130	1.359	3.599	0.000	0.015
75% quartile	2.050	0.000	0.020	0.274	0.018	0.226	0.998	0.132	1.776	4.227	0.031	0.295
(B) Nontaxable only cases (n = 81)												
Mean	0.000	0.920	0.003	0.219	0.010	0.095	0.832	−0.070	1.351	3.822	0.034	0.002
Median	0.000	1.000	0.001	0.223	0.002	0.065	0.934	−0.048	1.328	3.816	0.014	0.001
Standard deviation	0.000	0.537	0.042	0.068	0.020	0.094	0.217	0.258	0.247	0.399	0.071	0.005
25% quartile	0.000	0.500	−0.026	0.172	0.000	0.023	0.731	−0.243	1.157	3.534	0.000	0.000
75% quartile	0.000	1.000	0.027	0.263	0.011	0.150	1.000	0.105	1.464	4.062	0.041	0.004
(C) Simultaneously both cases (n = 329)												
Mean	1.129	0.806	0.007	0.221	0.016	0.130	0.811	−0.006	1.551	3.959	0.030	0.018
Median	1.000	0.800	0.006	0.226	0.004	0.074	0.937	−0.023	1.550	3.920	0.013	0.007
Standard Deviation	0.802	0.575	0.049	0.068	0.028	0.144	0.258	0.209	0.270	0.494	0.048	0.078
25% Quartile	0.500	0.400	−0.023	0.160	0.001	0.016	0.716	−0.143	1.356	3.612	0.000	0.004
75% Quartile	1.500	1.000	0.037	0.270	0.017	0.202	0.998	0.108	1.756	4.239	0.036	0.015
Panel B (*p-values in parentheses*)												
Differences in means												
(A) − (B)	1.704	−0.920	−0.007	−0.001	0.004	0.059	0.047	0.065	0.252	0.139	−0.012	5.254
	(0.000)***	(0.000)***	(0.272)	(0.935)	(0.208)	(0.004)***	(0.094)*	(0.050)*	(0.000)***	(0.060)*	(0.126)	(0.143)
(A) − (C)	0.575	−0.806	−0.011	−0.003	−0.001	0.024	0.068	0.001	0.053	0.002	−0.008	5.238
	(0.000)***	(0.000)***	(0.031)**	(0.715)	(0.626)	(0.142)	(0.010)**	(0.957)	(0.095)*	(0.970)	(0.115)	(0.003)***
(B) − (C)	−1.129	0.114	−0.004	−0.002	−0.006	−0.035	0.021	−0.064	−0.199	−0.137	0.004	−0.016
	(0.000)***	(0.106)	(0.455)	(0.819)	(0.081)*	(0.038)**	(0.504)	(0.020)**	(0.000)***	(0.021)**	(0.545)	(0.069)*
Differences in medians												
(A) − (B)	1.300	−1.000	−0.005	0.008	0.000	0.030	0.024	0.021	0.225	0.150	−0.008	0.070
	(0.000)***	(0.000)***	(0.450)	(0.864)	(0.185)	(0.037)**	(0.539)	(0.101)	(0.000)***	(0.065)*	(0.183)	(0.000)***
(A) − (C)	0.300	−0.800	−0.010	0.005	−0.002	0.021	0.021	−0.004	0.003	0.045	−0.008	0.065
	(0.000)***	(0.000)***	(0.045)**	(0.851)	(0.419)	(0.175)	(0.169)	(0.803)	(0.389)	(0.875)	(0.097)*	(0.000)***
(B) − (C)	−1.000	0.200	−0.006	−0.003	−0.002	−0.008	−0.003	−0.025	−0.222	−0.104	0.001	−0.005
	(0.000)***	(0.017)**	(0.399)	(0.795)	(0.032)**	(0.376)	(0.588)	(0.089)*	(0.000)***	(0.054)*	(0.781)	(0.000)***

The results of model (4) show that $ST * DUM * MGS2$ is significant and negative. However, $ST * DUM * WAT$ is insignificant. This may be because the primary beneficiary under the integrated tax system is domestic individual shareholders, but the measurement of *WAT* considers other classes of shareholders, who are not or only slightly influenced by this new tax system. To address this problem, we substitute *WAT* in $ST * DUM * WAT$ with *IAT*, where *IAT* is the average tax rates of domestic individual shareholders, defined as $ISA * 6\% + ISB * 13\% + ISC * 21\% + ISD * 30\% + ISE * 40\%$, and repeat our estimate.

Model (5) shows that $ST * DUM * IAT$ is positive and significant, as Hypothesis 4 predicts. Moreover, $ST * WAT$, $ST * MGS2$, $ST * O/C$, and $ST * DUM * MGS2$ remain significant with signs that are consistent with our hypotheses. We also try other specifications, measuring *WAT* with only the shareholdings of foreign shareholders or only those of domestic corporate shareholders, but we find no significant results. Accordingly, the implementation of the integrated tax system reduces the dividend tax burdens of shareholders, but only those who benefit under this tax reform.

Regarding the influence of the largest external shareholders, $ST * LGS$ is positive in all specifications but significant only in model (2). This suggests that the more shares held by the largest external shareholders, the more credible the signaling of taxable stock dividends, but this relation is weak and may be sensitive to empirical specifications. In addition, the coefficient of $ST * RE$ is negative in all specifications but significant only in model (2). This provides partial evidence that the slack of retained earnings measured by *RE* is negatively related to signaling cost. Surprisingly, the coefficient of $SNT * RE$ is also negative and significant in almost all settings. This may be because a higher *RE* causes the market to anticipate the distribution of taxable stock dividends due to the slack of retained earnings. Hence the distribution of nontaxable stock dividends is likely to be explained by the market as a negative signal, where a firm avoids distributing taxable stock dividends because its management is not confident of the firm's future growth.

Regarding variables that control for the effect of market anticipation, although the signs of *PRICE*, *RUNUP*, and *HTI* are negative, as expected, only *PRICE* is significant at the 10% level in model (1); *RUNUP* and *HTI* are insignificant in all specifications. The sign of *MVE* contradicts our expectations but the coefficient is insignificant. These results demonstrate that *ST* and *SNT* are surprises to the market; otherwise most of the market anticipation variables would be significant.

Furthermore, $ST * DUM$ and $SNT * DUM$ are both significant in model (3) but become insignificant after we consider the effect of the integrated tax system on interactions between stock dividends and *WAT* or *MGS2* in models (4) and (5). As a result, the structural changes in *ST* and *SNT* in model (3) arise from the tax changes and the resulting changes in the effects of *WAT* and *MGS2*, rather than from other nontax factors such as behavioral reasons or the Asian financial crisis, which took place during our sampling period.

In the Appendix A, we examine whether our results are robust to different models to estimate *CAR*. Specifically, we repeat our tests by using the market model and the mean-adjusted return model with different estimation periods, either prior or post to the announcement date, and our conclusions remain unchanged. Accordingly, our results are robust to the way we estimate *CAR*.

Notes to Table 3

In this table *CAR* is the three-day cumulative abnormal return centered on the announcement date; *ST* and *SNT* are the amounts of taxable and nontaxable stock dividends, respectively; *WAT* is the weighted average tax rate of shareholders, which equals $DIS * 25\% * (1 - 80\%) + FIS * 20\% + ISA * 6\% + ISB * 13\% + ISC * 21\% + ISD * 30\% + ISE * 40\%$, where *DIS* is the percentage of common stock owned by domestic corporate shareholders, *FIS* is that owned by foreign shareholders, and *ISA*, *ISB*, *ISC*, *ISD*, and *ISE* are those owned by domestic individual shareholders who hold fewer than 10, 10–50, 50–100, 100–1000, and 1000 lots and above, respectively; *MGS1* is the proportion of shares held by officers; *MGS2* is the proportion of shares held by the ultimate controlling shareholder; *O/C* is the ratio of the ultimate controlling shareholder's ownership rights to control rights; *RUNUP* is the cumulative market-adjusted return for days −105 to −7 preceding the stock dividend announcement date; *PRICE* is the natural logarithm of the closing stock price per share on day −6 relative to the announcement date; *MVE* is the natural logarithm of the closing market value (in millions of Taiwan dollars) of equity on day −6 relative to the announcement date; *LGS* is the percentage of shares held by the largest external shareholder; and *RE* is the ratio of the book value of retained earnings to that of capital surplus divided by 100. The *p*-values of the differences in means and medians are shown in parentheses. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4
Regression results of Eq. (4).

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Intercept	0.0046	−0.0015	−0.0306	−0.0326	−0.0342
	(0.8459)	(0.9620)	(0.3452)	(0.3148)	(0.2910)
ST	**0.0099**	0.0012	0.0184	0.0223	0.0220
	(0.0102)**	(0.9154)	(0.1329)	(0.0507)*	(0.0453)**
*ST * WAT*		**−0.0580**	**−0.1203**	**−0.1459**	**−0.1498**
		(0.0460)**	**(0.0008)*****	**(0.0003)*****	**(0.0001)*****
*ST * MGS1*		**0.0705**			
		(0.1465)			
*ST * MGS2*			**0.0513**	**0.0664**	**0.0674**
			(0.0042)***	**(0.0008)*****	**(0.0004)*****
*ST * O/C*		**0.0257**	**1.4006**	**1.4048**	**1.4892**
		(0.0068)***	**(0.0648)***	**(0.0563)***	**(0.0460)****
*ST * DUM * WAT*				**0.0597**	
				(0.1452)	
*ST * DUM * IAT*					**0.0652**
					(0.0491)**
*ST * DUM * MGS2*				**−0.0364**	**−0.0413**
				(0.0742)*	**(0.0295)****
*ST * LGS*		0.0866	0.0774	0.0788	0.0866
		(0.0928)*	(0.1384)	(0.1298)	(0.1018)
*ST * RE*		−0.0003	−0.0002	−0.0002	−0.0002
		(0.0688)*	(0.2773)	(0.3583)	(0.3701)
SNT	0.0281	0.0236	0.0230	0.0157	0.0153
	(0.0001)***	(0.1445)	(0.1495)	(0.3791)	(0.3996)
*SNT * WAT*		0.0296	−0.0141	0.0315	0.0314
		(0.6349)	(0.8081)	(0.6424)	(0.6440)
*SNT * MGS1*		−0.1829			
		(0.1675)			
*SNT * MGS2*			0.0191	0.0207	0.0203
			(0.5227)	(0.5540)	(0.5664)
*SNT * O/C*		0.0008	0.8271	0.6205	0.6685
		(0.9645)	(0.5962)	(0.6868)	(0.6638)
*SNT * DUM * WAT*				−0.0766	
				(0.3795)	
*SNT * DUM * IAT*					−0.0702
					(0.3750)
*SNT * DUM * MGS2*				0.0011	0.0035
				(0.9842)	(0.9491)
*SNT * LGS*		0.0069	−0.0082	−0.0226	−0.0226
		(0.8707)	(0.8344)	(0.6056)	(0.6143)
*SNT * RE*		−0.3887	−0.5392	−0.5736	−0.5806
		(0.1084)	(0.0302)**	(0.0180)**	(0.0168)**
RUNUP	−0.0085	−0.0118	−0.0093	−0.0097	−0.0092
	(0.5948)	(0.4764)	(0.5855)	(0.5675)	(0.5902)
PRICE	−0.0097	−0.0076	−0.0089	−0.0090	−0.0087
	(0.0908)*	(0.1769)	(0.1331)	(0.1387)	(0.1543)
MVE	0.0007	0.0011	0.0032	0.0033	0.0035
	(0.7542)	(0.6228)	(0.1416)	(0.1397)	(0.1200)
DUM	0.0076	0.0127	0.0144	0.0140	0.0143
	(0.3562)	(0.1213)	(0.0764)*	(0.0857)*	(0.0808)*
*ST * DUM*	−0.0011	−0.0055	−0.0072	−0.0143	−0.0133
	(0.8079)	(0.2035)	(0.0851)*	(0.2129)	(0.1134)
*SNT * DUM*	−0.0133	−0.0141	−0.0158	0.0008	−0.0025
	(0.0527)*	(0.0437)**	(0.0269)**	(0.9629)	(0.8646)
HTI	−0.0038	−0.0020	−0.0048	−0.0053	−0.0054
	(0.4993)	(0.7190)	(0.3791)	(0.3292)	(0.3171)
WAT		0.1257	0.1606	0.1579	0.1579
		(0.0470)**	(0.0105)**	(0.0104)**	(0.0107)**
MGS1		−0.1685			
		(0.2269)			

Table 4 (*continued*)

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
MGS2			−0.0357	−0.0368	−0.0367
			(0.1936)	(0.1852)	(0.1850)
O/C		−0.0383	−2.6585	−2.4342	−2.4909
		(0.0220)**	(0.0937)*	(0.1197)	(0.1112)
LGS		−0.0179	−0.0033	0.0050	0.0008
		(0.7127)	(0.9464)	(0.9223)	(0.9882)
RE		0.0002	0.0001	9.44E−05	8.64E−05
		(0.0550)*	(0.2948)	(0.3853)	(0.4020)
Adj-R^2	0.0753	0.0969	0.0978	0.0956	0.0968
F-value	5.7124***	3.3292***	3.3526***	2.9666***	2.9942***

The regression model is $CAR_{it} = \alpha_0 + ST_{it} \cdot (\beta_1 + \beta_2 \cdot WAT_{it} + \beta_3 \cdot MGS_{it} + \beta_4 \cdot O/C_{it} + \beta_5 \cdot DUM_t \cdot WAT_{it} + \beta_6 \cdot DUM_t \cdot MGS_{it} + \beta_7 \cdot LGS_{it} + \beta_8 \cdot RE_{it}) + SNT_{it} \cdot (\delta_1 + \delta_2 \cdot WAT_{it} + \delta_3 \cdot MGS_{it} + \delta_4 \cdot O/C_{it} + \delta_5 \cdot DUM_t \cdot WAT_{it} + \delta_6 \cdot DUM_t \cdot MGS_{it} + \delta_7 \cdot LGS_{it} + \delta_8 \cdot RE_{it}) + \eta_1 \cdot RUNUP_{it} + \eta_2 \cdot PRRICE_{it} + \eta_3 \cdot MVE_{it} + \eta_4 \cdot DUM_t + \eta_5 \cdot ST_{it} \cdot DUM_t + \eta_6 \cdot SNT_{it} \cdot DUM_t + \eta_7 \cdot HTI + \eta_8 \cdot WAT_{it} + \eta_9 \cdot MGS_{it} + \eta_{10} \cdot O/C_{it} + \eta_{11} \cdot LGS_{it} + \eta_{12} \cdot RE_{it} + \varepsilon_{it}$, where in model (2) *MGS* is defined as *MGS1*, the proportion of shares held by officers; in models (3) to (5) *MGS* is defined as *MGS2*, the proportion of shares held by the controlling shareholder; *IAT* is defined as the weighted average tax rate of individual shareholders, which equals $ISA * 6\% + ISB * 13\% + ISC * 21\% + ISD * 30\% + ISE * 40\%$; and *DUM* equals one if the observation occurred after the integrated tax system was implemented and zero otherwise. The definitions of all the other variables are the same as in Table 3. The *p*-values of the regression coefficients are reported in parentheses and those of β_2, β_3, β_4, β_5, and β_6 are one tailed. The heteroskedasticity-consistent standard errors of regression coefficients are calculated with the Newey and West (1987) method. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

6. Additional analysis

6.1. Taxable stock dividends and changes in future operating performance

This section examines whether the distribution of taxable stock dividends is related to a firm's future performance. Although Kuo (2013) explores this issue, this test is unavoidable because it confirms that our findings in Table 4 are indeed attributable to the signaling effect instead of just reflecting investors' erroneous recognitions about the implications of taxable stock dividends.[26]

Specifically, to support the signaling argument, our sample should generate at least two results. First, the capital market reacts positively to announcements of taxable stock dividends, since they represent positive signaling, and this is supported by the results of Table 4. Second, the event (i.e., good future performance) that taxable stock dividends signal should be realized in the future; otherwise the positive reactions of capital market may just reflect investors' misunderstanding with respect to the implications of taxable stock dividends. The second condition suggests that the test conducted in this section is necessary, because we can claim that our study supports the signaling argument only when our sample generates results consistent with both of these two conditions.

To differentiate our study from that of Kuo (2013), we adopt a modified partial adjustment model (Fama and French, 2000) to control for nonlinearities in the rate of mean reversion and the coefficient of autocorrelation in earnings patterns. The use of the modified partial adjustment model allows us to complement Kuo (2013) by examining whether his findings continue to hold under a nonlinear model or are just specific to a linear model. Specifically, Kuo (2013) uses a linear specification similar to that of Nissim and Ziv (2001), but Grullon et al. (2005) find that the forecasting effect of dividends on firm future performance disappears when they adopt the modified partial adjustment model. This implies that Kuo's (2013) findings may be changed by using a different model.

[26] In other words, if we find that taxable stock dividends are unrelated to future firm performance, then the positive effect of *ST* on announcement market reactions, as reported in Table 4, cannot be explained only by the signaling theory, since it is also consistent with investors erroneously interpreting taxable stock dividends as a signal of future performance. This suggests the necessity to test whether taxable stock dividends are related to future performance.

Referring to Fama and French (2000), our empirical specification is

$$GR_{it} = a_0 + a_1 \cdot ST_0 + a_2 \cdot SNT_0 + (b_1 + b_2 \cdot NFD_0 + b_3 \cdot NFD_0 \cdot DFE_0 + b_4 \cdot PFD_0 \cdot DFE_0) \cdot DFE_0 + (c_1 + c_2 \cdot NCD_0 + c_3 \cdot NCD_0 \cdot CE_0 + c_4 \cdot PCD_0 \cdot CE_0) \cdot CE_0 + e_{it} \quad (5)$$

where ST_0 (SNT_0) is the amount of taxable (nontaxable) stock dividends announced in year 0 (the year of the announcement); GR_{it} is the compound growth rate for returns on assets[27] (ROA) for t years after the announcement year 0, $t = 1, 2, 3, 4$, and 5; ROA is the earnings before interest, taxes, depreciation, and amortization ($EBITDA$) scaled by the book value of total assets[28]; DFE_0 equals $ROA_0 - E[ROA_0]$, where $E[ROA_0]$ is the fitted value from the cross-sectional regression of ROA_0 on the logarithm of total assets in year −1, the logarithm of the market-to-book ratio of equity in year −1, and ROA_{-1}; CE_0 is $ROA_0 - ROA_{-1}$; NFD_0 (PFD_0) is a dummy variable that takes the value of one if DFE_0 is negative (positive) and zero otherwise; and NCD_0 (PCD_0) is a dummy variable that takes the value of one if CE_0 is negative (positive) and zero otherwise.[29]

If our signaling argument is correct, then the distribution of taxable stock dividends should be a predictor of positive earnings growth. We expect a_1 in Eq. (5) to be positive. The results are presented in Table 5.

As indicated in Table 5, although the coefficient of ST_0 is positive for $t = 1$, it is insignificant, while those for years $t = 2$, 3, and 4 are positive and significant at the 1%, 5%, and 10% levels, respectively, and the significance vanishes in year $t = 5$. These results suggest that the declaration of taxable stock dividends predicts positive future earnings growth for a relatively long period. These results also confirm that findings of Kuo (2013) are not specific to a linear model.

The reason why ST cannot predict short-term growth may be because firms signal the market by distributing ST to raise more equity capital to finance their growth but the effect of newly raised capital is lagged by one year, due to the lead time from capital input to output production and sales. In addition, although insignificant, the coefficient of SNT_0 is negative in all five cases, which implies that the declaration of nontaxable stock dividends is more likely to be attributed to non-signaling explanations. Overall, the results in Table 6 provide evidence that taxable stock dividends are related to future growth in earnings and confirm that the empirical findings in Table 4 are attributable to signaling effect.

6.2. Measurement of the weighted average tax rate

The definition of WAT implicitly assumes that the effective tax rates of shareholders fall into the top tax rate within the brackets.[30] To test whether our findings are sensitive to this assumption, we remeasure WAT by assuming that shareholders are subject to the middle tax rate within the brackets. That is, WAT now equals $DIS * 12.5\% * (1 - 80\%) + FIS * 10\% + ISA * 3\% + ISB * 9.5\% + ISC * 17\% + ISD * 25.5\% + ISE * 35\%$ and the calculation of IAT is adjusted correspondingly. The use of the middle tax rate for the bracket 0–6% partially mitigates the concern that we do not consider tax-exempt shareholders, because this new definition balances the effects of the highest rate, 6%, and lowest rate, 0%.

We repeat the specification of model (5) of Table 4 by using new definitions and the result remains qualitatively the same. The terms $ST * WAT$, $ST * MGS2$, $ST * O/C$, $ST * DUM * IWT$, and $ST * DUM * MGS2$ are all significant with signs that are consistent with our hypotheses and their counterparts for SNT remain insignificant. This shows that our empirical results are not sensitive to the definition of WAT.

[27] The use of a long-run measure such as GR_{it} allows us to evaluate whether the distribution of stock dividends is related to only short-term or long-term earnings growth. Rankine and Stice (1997a) adopt a similar approach and explore the relation between five-year earnings growth and stock dividends.

[28] We use return on assets rather than the traditionally used return on equity because the latter is sensitive to changes in capital structure while the former is not, given that ROA is measured by using $EBITDA$, which is not influenced by changes in interest expenses. Moreover, return on assets is less subject to manipulation, since it excludes special items such as unusual and nonrecurring items before taxes or income taxes that are usually tools for earnings management.

[29] The dummy variables and squared terms are used to capture the nonlinearities in the mean and autocorrelation of earnings. That is, the use of these variables represents the fact that large changes in earnings revert faster than smaller ones and negative changes revert faster than positive ones.

[30] For example, in the calculation of WAT we multiply ISA with 6%, which assumes that individuals whose effective tax rates fall into the 0–6% bracket are always subject to the top rate of 6%.

Table 5
Stock dividends and changes in return on assets.

Year	a_0	a_1	a_2	b_1	b_2	b_3	b_4	c_1	c_2	c_3	c_4	$Adj\text{-}R^2$
$t = 1$	−0.034	0.011	−0.008	1.189	−3.716	−0.235	−3.090	−0.407	2.726	1.128	−0.598	0.053
	(0.056)*	**(0.269)**	(0.263)	(0.230)	(0.002)***	(0.979)	(0.291)	(0.682)	(0.024)**	(0.900)	(0.834)	
$t = 2$	−0.032	0.031	−0.016	1.829	−4.159	3.724	−2.350	−2.344	4.630	−2.167	2.442	0.087
	(0.119)	**(0.001)*****	(0.129)	(0.174)*	(0.011)**	(0.699)	(0.596)	(0.099)*	(0.008)***	(0.829)	(0.582)	
$t = 3$	−0.052	0.037	−0.009	0.545	−0.165	10.029	4.440	−0.350	0.122	−7.519	−5.687	0.055
	(0.041)**	**(0.040)****	(0.492)	(0.749)	(0.950)	(0.248)	(0.383)	(0.839)	(0.965)	(0.417)	(0.246)	
$t = 4$	−0.035	0.025	−0.018	2.750	−1.935	22.243	7.075	−2.302	1.016	−22.136	−9.313	0.066
	(0.293)	**(0.098)***	(0.258)	(0.176)	(0.594)	(0.046)**	(0.346)	(0.292)	(0.793)	(0.065)*	(0.210)	
$t = 5$	−0.033	0.032	−0.015	1.515	0.023	14.009	15.689	−0.605	−1.344	−13.706	−19.819	0.048
	(0.462)	(0.121)	(0.456)	(0.659)	(0.996)	(0.340)	(0.174)	(0.862)	(0.806)	(0.382)	(0.069)*	

The regression model is $GR_{it} = a_0 + a_1 \cdot ST_0 + a_2 \cdot SNT_0 + (b_1 + b_2 \cdot NFD_0 + b_3 \cdot NFD_0 \cdot DFE_0 + b_4 \cdot PFD_0 \cdot DFE_0) \cdot DFE_0 + (b_1 + b_2 \cdot NCD_0 + b_3 \cdot NCD_0 \cdot CE_0 + b_4 \cdot PCD_0 \cdot CE_0) \cdot CE_0 + e_{it}$, where ST_0 (SNT_0) is the amount of taxable (nontaxable) stock dividends announced in year 0 (the year of the announcement); GR_{it} is the compound growth rate for the return on assets (ROA) minus one for t years after the announcement year 0, $t = 1, 2, 3, 4$, and 5; ROA is defined as the operating income before depreciation ($EBITDA$) scaled by the book value of total assets; DFE_0 is equal to $ROA_0 - E[ROA_0]$, where $E[ROA_0]$ is the fitted value from the cross-sectional regression of ROA_0 on the logarithm of total assets in year −1, the logarithm of the market-to-book ratio of equity in year −1, and ROA_{-1}; CE_0 is $ROA_0 - ROA_{-1}$; NFD_0 (PFD_0) is a dummy variable that takes the value of one if DFE_0 is negative (positive) and zero otherwise; and NCD_0 (PCD_0) is a dummy variable that takes the value of one if CE_0 is negative (positive) and zero otherwise. The heteroskedasticity-consistent standard errors of the regression coefficients are calculated with the Newey and West (1987) method. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6
The effect of foreign stock ownerships on the distribution of taxable stock dividends.

Dependent variable	*ST*	*ST/P*	*SNT*	*SNT/P*
	Model (1)	Model (2)	Model (3)	Model (4)
Intercept	−3.2057	0.0575	0.2289	0.0862
	(0.0000)***	(0.0933)*	(0.3559)	(0.0000)***
RUNUP	−0.7233	−0.0118	−0.0687	−0.0028
	(0.0000)***	(0.2486)	(0.5871)	(0.8673)
PRICE	0.9862	0.0047	0.2996	−0.0110
	(0.0000)***	(0.4378)	(0.0000)***	(0.0235)**
MVE	0.0718	−0.0031	−0.0611	−0.0011
	(0.0428)**	(0.1369)	(0.0156)**	(0.5404)
EPS	0.0958	−0.0005	−0.0426	−0.0048
	(0.0014)***	(0.6792)	(0.0095)***	(0.0110)**
MGS2	0.6022	0.0099	−0.5011	−0.0264
	(0.0016)***	(0.3736)	(0.0048)***	(0.0138)**
DUM	0.1111	0.0121	−0.0152	0.0129
	(0.0956)*	(0.0116)**	(0.7889)	(0.0021)***
FO	−0.1333	−0.0121	0.0514	0.0019
	(0.0403)**	(0.0027)***	(0.3695)	(0.6479)
Adj-R^2	0.5350	0.0421	0.0689	0.1460
F-value	86.6478***	4.2673***	6.5045***	13.6985***

In this table *FO* is a dummy variable that equals one if the percentage of common stock owned by foreign shareholders (*FIS*) for the observation is higher than the median of the overall sample and zero otherwise; *EPS* is earnings per share; *MGS2* is the proportion of shares held by the controlling shareholder; and *DUM* equals one if the observation occurred after the integrated tax system was implemented and zero otherwise. The definitions of all the other variables are the same as in Table 3. Here *ST/P* and *SNT/P* are *ST* and *SNT* deflated by the year-end stock price, respectively. The heteroskedasticity-consistent standard errors of regression coefficients are calculated with the Newey and West (1987) method. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

6.3. Influence of the integrated tax system on announcement effects

Market reactions to the distribution of taxable stock dividends may be different when tax policy has just changed (and firms are adjusting to the new regime) than when the current tax system has been in place for some time. Specifically, the integrated tax system was enacted on December 26, 1997, and market reactions to dividend announcements may be confounded by the enactment of the new tax policy if the announcements happened in close proximity to the enactment date. To handle this concern, we repeat our tests by excluding observations occurring in close proximity to the shift in tax policy. We repeat the regression in model (5) of Table 4 by dropping observations that occurred in one-month windows centered on December 26, 1997. Unreported results show that the exclusion of these observations does not affect our conclusion and hence our findings about the signaling argument are not confounded by the market's positive response to the enactment of the new tax regime.

6.4. Effect of foreign investors on the declaration of taxable stock dividends

This section investigates the relation between foreign stock ownerships and taxable stock dividends. Specifically, Hypothesis 1 implies that shareholders' tax rates are an important factor for firms' declarations of taxable stock dividends. If firms consider shareholder tax status in determining dividend policies, then we should find that firms with a high level of foreign shareholder ownership declare less taxable stock dividends. This is because foreign shareholders incur higher dividend tax burdens due to their higher effective tax rates and the integrated tax system is not applicable to them. Given that foreign shareholders usually have salient influence on investee firms' decisions and that firms may adjust their dividend policies to attract foreign investment, we expect that firms with a high level of foreign ownership will avoid declaring taxable stock dividends.

To test this argument, we regress *ST* on its known determinants and the variable *FO*, where *FO* is a dummy variable that equals one if the percentage of common stock owned by foreign shareholders (*FIS*)

for the observation is higher than the median of the overall sample and zero otherwise. The estimate results are shown in Table 6.

In model (1) of Table 6, the coefficient of *FO* is negative and significant at the 5% level (the *p*-value is 0.0403), consistent with our expectation that a high level of foreign share ownership leads investee firms to declare less taxable stock dividends. In model (2), we deflate the dependent variable *ST* by the year-end stock price and the coefficient of *FO* remains negative and significant at the 1% level (the *p*-value is 0.0027). In models (3) and (4), we replace *ST* with *SNT* to explore the effect of foreign investors on nontaxable stock dividends and the results show that the coefficients of *FO* are all insignificant in both models, which suggests that our findings in models (1) and (2) are attributable to the effect of taxes and are not spurious.

Overall, the results in Table 6 indicate that firms with a high level of foreign stock ownership declare less taxable stock dividends, which is not the case for nontaxable stock dividends. These results suggest that the tax disadvantages faced by foreign shareholders lead investee firms to avoid declaring taxable stock dividends.

7. Conclusions

By examining the market response to the announcement of taxable stock dividends in Taiwan, our study aims to investigate whether shareholder-level tax affects firm valuation, to isolate the negative effect of dividend taxes from the positive effect of signaling, and to explore the influence of ultimate ownership structure on the signaling effect. Since stock dividends are irrelevant to a firm's cash flows, our empirical design rules out the effect of agency story.

Consistent with our hypotheses, our empirical results show that the weighted average tax rate of shareholders negatively impacts the market reactions to announcements of taxable stock dividends. Therefore dividend taxes do affect firm value, contradicting the tax irrelevance view proposed by Miller and Scholes (1978). In contrast, the shareholdings of the ultimate controlling shareholder positively affect market reactions, while the discrepancy between ultimate shareholder cash flow rights and voting rights negatively affects market reactions. We also find that the integrated tax system diminishes the effects of dividend taxes and signaling because its reduction in dividend taxes decreases both the tax burdens of shareholders and the costs of false signaling borne by the controlling shareholder. Our findings are indeed attributable to the effect of stock dividend taxation because none of these findings holds for nontaxable stock dividends.

Our study contributes to the literature by showing the effect of shareholder-level dividend taxes on firm valuation, even for stock dividends. In addition, we find that tax is an important factor for the dividend signaling effect, which supports the tax-based signaling model. In particular, the agency conflict in Taiwan exists primarily between controlling and minority shareholders. Our results therefore provide new insights into stock dividend valuations in a different corporate governance context from that of the United States.

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Appendix A

In this appendix, we examine whether our results are sensitive to the way we calculate abnormal returns. As stated in Section 4.3, we use a market-adjusted model to estimate *CAR*, because prior studies suggest that firms usually experience abnormal share price performance prior to stock dividend announcements. However, the results in Table 3 suggest that this is not a problem for our tests, because both the means and medians of *RUNUP* are negative across cases (A) to (C) in Panel A. This motivates us to investigate whether the use of a market model changes our results. Because model (5) of Table 4 is our best estimate, we repeat our tests with this specification by using the market model to calculate *CAR*. The results are shown in Table A.1. To reserve space, Table A.1 only presents the estimated results of the experiment variables.

Table A.1
Regression results of Eq. (4) with different abnormal return models.

	Market model				Mean-adjusted model			
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
Estimation period	(−250, −100)	(−200, −50)	(100, 250)	(50, 200)	(−250, −100)	(−200, −50)	(100, 250)	(50, 200)
ST ∗ *WAT*	−0.1399 (0.0043)***	−0.1289 (0.0024)***	−0.1473 (0.0003)***	−0.1439 (0.0001)***	−0.1442 (0.0009)***	−0.1415 (0.0060)***	−0.1532 (0.0030)***	−0.1565 (0.0016)***
ST ∗ *MGS2*	0.0686 (0.0016)***	0.0617 (0.0016)***	0.0775 (0.0001)***	0.0778 (0.0001)***	0.0753 (0.0030)***	0.0668 (0.0052)***	0.0682 (0.0035)***	0.0691 (0.0027)***
ST ∗ *O/C*	2.0344 (0.0388)**	2.2686 (0.0036)***	1.4865 (0.0379)**	1.2136 (0.0724)*	2.7124 (0.0248)**	3.3832 (0.0003)***	2.9288 (0.0017)***	2.8013 (0.0031)***
ST ∗ *DUM* ∗ *IAT*	0.0745 (0.0305)**	0.0691 (0.0371)**	0.0745 (0.0202)**	0.0761 (0.0123)**	0.0810 (0.0486)**	0.0798 (0.0451)**	0.0791 (0.0498)**	0.0835 (0.0397)**
ST ∗ *DUM* ∗ *MGS2*	−0.0344 (0.0763)*	−0.0422 (0.0219)**	−0.0531 (0.0073)***	−0.0526 (0.0053)***	−0.0466 (0.0431)**	−0.0506 (0.0199)**	−0.0514 (0.0197)**	−0.0534 (0.0130)**
SNT ∗ *WAT*	0.0135 (0.8568)	0.0183 (0.7958)	0.0382 (0.5830)	0.0288 (0.6739)	−0.0676 (0.4238)	−0.0525 (0.5126)	−0.0363 (0.6552)	−0.0416 (0.6116)
SNT ∗ *MGS2*	0.0406 (0.2626)	0.0388 (0.2615)	0.0430 (0.2254)	0.0430 (0.2192)	0.0528 (0.2208)	0.0543 (0.1959)	0.0498 (0.2526)	0.0489 (0.2580)
SNT ∗ *O/C*	0.3023 (0.8450)	0.1169 (0.9383)	0.3463 (0.8288)	−0.4112 (0.8029)	−0.4306 (0.8219)	−0.8572 (0.6506)	−0.3108 (0.8703)	−0.7344 (0.7041)
SNT ∗ *DUM* ∗ *IAT*	−0.0209 (0.8212)	−0.0249 (0.7850)	−0.0926 (0.2725)	−0.0743 (0.3403)	−0.0362 (0.7642)	−0.0423 (0.7259)	−0.0386 (0.7003)	−0.0346 (0.7302)
SNT ∗ *DUM* ∗ *MGS2*	−0.0313 (0.5936)	−0.0090 (0.8726)	0.0008 (0.9883)	0.0025 (0.9627)	−0.0206 (0.7642)	−0.0038 (0.9552)	−0.0214 (0.7216)	−0.0132 (0.8214)
Adj-R^2	0.1000	0.1224	0.1261	0.1154	0.0679	0.0918	0.0801	0.0803
F-value	3.0040***	3.5852***	3.6798***	3.4277***	2.3148***	2.8728***	2.6194***	2.6237***

Non-experiment variables are included in the estimates but their results are not shown in this table. The variable *MGS2* is the proportion of shares held by the controlling shareholder and *IAT* is defined as the weighted average tax rate of individual shareholders, which equals *ISA* ∗ 6% + *ISB* ∗ 13% + *ISC* ∗ 21% + *ISD* ∗ 30% + *ISE* ∗ 40%. The variable *DUM* equals one if the observation occurred after the integrated tax system was implemented and zero otherwise. The definitions of all the other variables are the same as in Table 3. The *p*-values of the regression coefficients are reported in parentheses. The heteroskedasticity-consistent standard errors of regression coefficients are calculated with the Newey and West (1987) method. The superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The market benchmark used to estimate the market model is the Taiwan Stock Exchange weighted stock market index.

In Table A.1 model (1), we adopt a 150-day estimation period, which begins 250 days prior and ends 100 days prior to the announcement date (i.e., the estimation period is (−250, −100)), and the results show that the coefficients of *ST* ∗ *WAT*, *ST* ∗ *MGS2*, *ST* ∗ *O/C*, *ST* ∗ *DUM* ∗ *MGS2*, and *ST* ∗ *DUM* ∗ *IAT* are all significant, with signs consistent with our hypotheses, while the coefficients of *SNT* ∗ *WAT*, *SNT* ∗ *MGS2*, *SNT* ∗ *O/C*, *SNT* ∗ *DUM* ∗ *MGS2*, and *SNT* ∗ *DUM* ∗ *IAT* remain insignificant. In model (2), we change the estimation period to (−200, −50) and the results are similar to those of model (1). In models (3) and (4), we use the post-announcement period to estimate the market model with estimation periods (100, 250) and (50, 200), respectively. Both of them do not change our findings. Moreover, in models (5) to (8) we adopt the mean-adjusted return model to estimate *CAR* with the same estimation periods corresponding to models (1) to (4), respectively, and the results remain unchanged.

Overall, Table A.1 suggests that our results are robust to the use of either a market model or a mean-adjusted return model to estimate *CAR* and with these two models our results are insensitive to using different estimation periods. Accordingly, our findings in Table 4 are not specific to the use of the market-adjusted model to estimate *CAR*.

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Nan-Ting Kuo receives accounting Ph.D degree from National Cheng Kung University (R.O.C.) in 2011, and then joins to the National Central University (R.O.C.). Serving as an assistant professor, he teaches accounting classes in the finance department. His primary research interests are in dividend taxation and corporate governance issues.

Cheng-Few Lee serves as a Distinguished Professor of Finance in the Rutgers University (USA). He is the Editor of the Review of Quantitative Finance and Accounting (RQFA), and the Review of Pacific Basin Financial Markets and Policies. He is the Director of the Conference on Financial Economics and Accounting, and the Conference on Pacific Basin Business, Economics and Finance. He has published more than 170 articles in journals including the Journal of Finance, JFQA, Accounting Review, Journal of Accounting Research, Review of Economics and Statistics, and Management Science.