The Nature of Corporate Income Tax Under a Full Imputation Tax Regime: A Test of Functional Fixation

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1. INTRODUCTION

Accounting studies have traditionally relied upon the efficient market hypothesis (EMH) to examine the relationship between security prices and accounting numbers (e.g., Ball and Brown, 1968; Morse, 1981; and Patel and Wolfson, 1984). The EMH argues that investors are able to 'look beyond' accounting numbers. While some studies have observed market efficiency (e.g., Archibald, 1972; Ball, 1972; and Beaver and Dukes, 1973), recent empirical evidence has revealed anomalies that are inconsistent with the EMH.[1] Among these anomalies, the functional fixation hypothesis (FFH) asserts that investors will interpret accounting numbers mechanically without taking into

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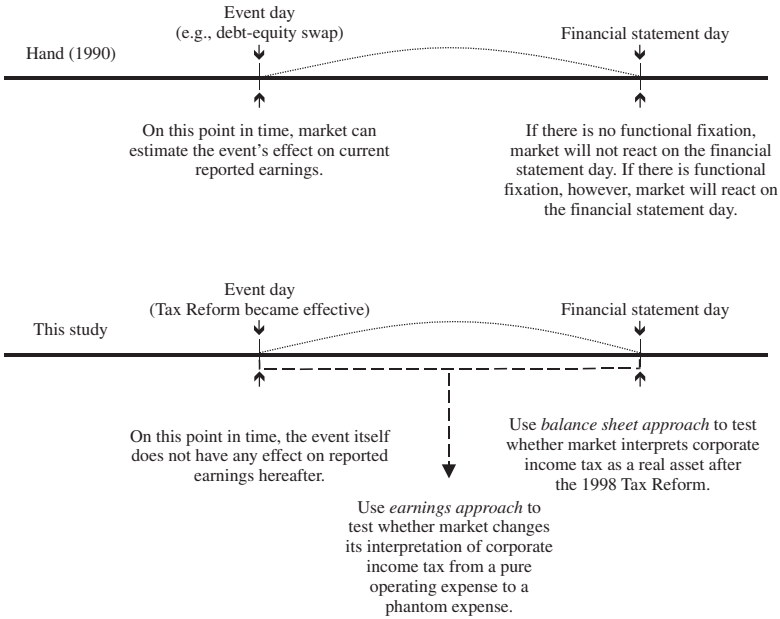
consideration the underlying accounting rules used to generate the information. Previous studies of the FFH have used transactions such as changes in depreciation method (Archibald, 1972), bond refundings (Dietrich, 1984), valuations of oil and gas property (Harris and Ohlson, 1990) and debt-equity swaps (Hand, 1990). Since these scenarios are *voluntary* and *firm-specific*, they may not be able to capture capital market behavior. Therefore, such empirical results are limited, and may not provide a sufficiently confirmatory foundation upon which to argue that the *overall* market is functionally fixated. To overcome this problem, Chen and Schoderbek (2000) test FFH using a *mandatory* and *nationwide* event, the 1993 US tax rate increase, and provide evidence to support FFH.

These FFH studies usually choose an event occurring at a specific point in time prior to the financial reporting date, with the subsequent effects on earnings being estimated on the event day. Therefore, a 'short window' interval is typically used. Normally, the transaction or event being examined has a relatively major effect on unexpected earnings, but no or minimal effect on subsequent cash flows. Since there is an inherent time lag in financial reporting of the event, people invariably investigate FFH by testing whether any continuing reaction exists within the capital market to the 'past' event reported in the time-delayed financial statement. The upper part of Figure 1 demonstrates the fundamental concept of this line of research.

In contrast, the *mandatory* and *nationwide* event chosen in our study is Taiwan's 1998 Tax Reform, which switches from the *classical tax system* to an *integrated tax system*. A particular feature of this Tax Reform is that it does not involve complex transactions and accounting rules, but simply changes the nature of corporate income tax from a pure operating expense to an individual shareholder's tax credit (see Section 2 for details). This *change in nature* provides us with three important contributions to the FFH literature. First of all, it allows a more direct and intuitive test of investors' functional fixation behavior. If the market is not functionally fixated on earnings numbers, it should be able to recognize that corporate income tax has become a 'phantom expense' and thus, following the Tax Reform, constitutes a 'valuable asset' to shareholders. No prior studies have ever examined FFH using such an intuitive and

Figure 1

Comparison of Research Paradigm Between FFH Literature and This Study



direct event. Due to the special features of the 1998 Tax Reform, we adopt the association study approach to test the appropriateness of our arguments. In particular, we use the *earnings approach* to verify the 'phantom expense' feature of corporate income tax, and adopt the *balance sheet approach* to examine whether Taiwan's capital market interprets corporate income tax as a valuable asset. It should be noted that, since there is no theoretical foundation or basis upon which we can formulate the 'expected' corporate income tax, it would be inappropriate for us to examine the relationship between 'unexpected' corporate income tax and returns using a short window. We therefore adopt a long window interval to test our 'phantom expense' hypothesis. As illustrated in the lower part of Figure 1, our research paradigm differs from those of previous FFH studies (e.g., Hand, 1990; and Chen and Schoderbek, 2000).

In addition, the 1993 tax rate increase examined in Chen and Schoderbek (2000) differs from our Tax Reform event in that it does not change the nature of any accounts involved (i.e., deferred tax assets and liabilities) and thus has no direct wealth effect on shareholders. Since the change in nature of corporate income tax is different from the 1993 tax rate increase, their impacts on the capital market may also be disparate. Therefore, our study tests FFH from a perspective which has never been examined before.

Finally, this study also contributes to the FFH literature by providing evidence from a capital market which differs significantly from those of the US and Europe. In particular, Taiwan's capital market structure, the level of governmental regulation, and the behavior of investors may be markedly different from those of the US and the European markets. For example, unlike the markets of the US and Europe, stock dividends distributed from retained earnings in Taiwan are subject to individual income taxes. Moreover, as Fan and Wong (2002) indicate, in Taiwan, the average level of voting rights of the ultimate owner (defined as a shareholder who has at least 5% of the firm's total voting rights and is not controlled by anybody else) is around 21%. This differs from most US firms, which are typically characterized by widely diffuse ownership and control.

We believe that the ongoing development of international aspects of FFH may benefit from evidence obtained from diverse economic environments. This study aims, therefore, to add to the FFH literature by enlarging the understanding of FFH in an international context. In light of the increasing spread of globalization and the importance of Taiwan in the emerging markets of the Asia-Pacific region,[2] such an understanding is important to both investors and academics the world over.

The empirical results from both the earnings and balance sheet approach suggest that Taiwan's stock market is *not* functionally fixated on bottom-line numbers; instead, it perceives the change in nature of corporate income tax as a result of the 1998 Tax Reform. These results are robust when we extend the test time intervals. When compared with Chen and Schoderbek (2000) and other prior studies, the rejection of FFH in our paper suggests that investors in the capital markets may or may not be functionally fixated on earnings numbers, depending on the

characteristics of the event being examined (i.e., whether there is a change in the nature of the accounts involved).

The remainder of this paper is organized as follows. Section 2 briefly introduces the background of Taiwan's 1998 Tax Reform. Section 3 describes the research design and data. Section 4 presents and discusses the empirical results. A final summary and conclusion are provided in Section 5.

2. TAIWAN'S 1998 TAX REFORM

(i) Background

Prior to the 1998 Tax Reform, Taiwan adopted the classical tax (or two-tier) system, with earnings from investments in corporate equities first being taxed at the corporate level, and after-tax earnings being subject to an additional individual income tax once they had been distributed to individual shareholders. Nevertheless, the Taiwanese Government began to consider rigorously the adoption of an integrated tax system as a result of a number of severe distortions resulting from the classical system, and the potential economic benefits of integration.[3]

The integrated system had first been proposed in 1968 by an *ad hoc* Tax Reform Commission under the Executive Yuan. However, since the system was not prevalent internationally at that time, the proposal was not actively pursued. In 1985, a proposal was again put forward by an *ad hoc* Economic Reform Commission under the Executive Yuan for the implementation of an integrated system. However, since the real tax burden on businesses was not particularly heavy at that time due to the widespread use of preferential tax treatments (e.g., the five-year corporate income tax exemptions, investment tax credits and accelerated depreciation), and because the integrated system would have led to a massive decline in tax revenues, the implementation of the integrated system was again postponed.

Although a separate Tax Reform Commission was set up by the Ministry of Finance in 1987 to investigate a second round of tax reform, this proposal was also postponed due to concerns over the potential dramatic decline in tax revenues. Following his election as Taiwan's president in 1996, President Lee

announced his strong support for the implementation of an integrated system. After two years of protracted discussion and debate, the revised Income Tax Law was eventually passed by the Legislative Yuan on 25 December, 1997, and the new integrated system became effective on 1 January, 1998.

(ii) The Wealth Effect of the Integrated Tax System on Shareholders

The *full imputation credit* prototype forms the core of Taiwan's integrated tax system.[4] Under this new system, the corporate income tax rate remains at 25%, whilst individual income taxes range between 6% and 40%. Individual shareholders are allowed a tax credit against their individual income tax for any dividend income tax paid at the corporate level. Dividends paid to corporate shareholders are exempt from corporate income tax, and the imputation credit will be passed on, in its entirety, to individual shareholders. It is this full imputation feature that changes the nature of corporate income tax from a pure operating expense to a 'phantom expense', because it becomes a deductible item against shareholders' individual income taxes. To better explain the idea, we define *EBT* as a firm's positive pretax earnings and define t_f as the firm's effective tax rate. In order to explore the effects of different tax systems on individual shareholder's income tax expenditure for a given period, *ceteris paribus*, we further define an individual shareholder's tax rate as t_i, and the firm's dividend payout ratio as d. Therefore, a shareholder's income tax payment under different tax systems can be formulated as:

$$\textbf{Under a Classical tax system}: \quad d \cdot \mathrm{EBT} \cdot (1 - t_f) \cdot t_i, \qquad (1)$$

$$\textbf{Under the Full imputation system}: \quad d \cdot (\mathrm{EBT} \cdot t_i - \mathrm{EBT} \cdot t_f) = d \cdot \mathrm{EBT} \cdot (t_i - t_f) \cdot \qquad (2)$$

Equation (2) indicates that condition $t_i > t_f$ leads to income tax payments, while condition $t_i < t_f$ leads to tax refunds under the full imputation system. Therefore, the wealth effect of the integrated system can be measured by the difference between equations (1) and (2):

$$\text{Wealth effect } (\mathbf{W}) = d \cdot \text{EBT} \cdot t_f \cdot (1 - t_i) \geq 0, \text{ for all } t_i \text{ and } t_f.$$

It is apparent that a shareholder's income tax payments are always higher in equation (1) (i.e., the classical system) than in equation (2) (i.e., the full imputation system). Two important facts can be obtained from the wealth effect **W**. First of all, since $t_f \cdot$ EBT is exactly the corporate income tax, it constitutes a valuable asset to a shareholder's pocket. In other words, a shareholder's cash inflow will increase by a fraction of the total corporate income tax, where the fraction equals $d \cdot (1 - t_i)$. Second, the wealth effect also confirms our earlier argument of the changing nature of corporate income tax from a pure operating expense to a 'phantom expense'. Suppose firm A has EBT \$100 in 1998 with a corporate tax rate $t_f = 25\%$. As a result, firm A will pay \$25 corporate income tax to the government. If the annual dividend payout ratio d equals 0.5 and shareholder's marginal tax rate t_i equals 40%, then under the new integrated tax system, the total income tax a shareholder should pay would be \$20 (i.e., $0.5 \times \$100 \times 40\%$). Since the \$25 corporate income tax provides a tax credit of \$12.5 (i.e., $\$25 \times 0.5$), the shareholder needs to pay only an extra \$7.5 (i.e., $\$20 - \$12.5$) in income tax. This additional tax payment is also equal to \$7.5 (i.e., $0.5 \times \$100 \times [40\% - 25\%]$) using equation (2). In this example, half of the total corporate income tax becomes a 'phantom expense' in 1999 when dividends are paid,[5] and the other half turns out to be a 'phantom expense' in subsequent years when the retained part of 1998 earnings are distributed. Obviously, this \$25 corporate income tax is a 'pure' operating expense and provides no tax credit to the shareholders under the classical tax system.

3. RESEARCH DESIGN AND DATA

(i) Hypotheses and Model Specifications

(a) Using the Earnings Approach to Test the 'Phantom Expense' Hypothesis

If the stock market is not functionally fixated on earnings numbers, it should be able to differentiate the nature of corporate income tax

both pre- and post-Tax Reform, since corporate income tax has become a 'phantom expense' as a result of the 1998 Tax Reform, but the GAAP still treats it as an operating expense. This leads to our *phantom expense (PE) hypothesis*. This hypothesis is tested using the return model (or the earnings approach) suggested by Beaver (1998) and Kothari and Zimmerman (1995):[6,7]

$$R_{it} = b_0 + b_1 \cdot \frac{EBT_{it}}{P_{it-1}} + b_2 \cdot \frac{TAX_{it}}{P_{it-1}} + b_3 \cdot BM_{it} + b_4 \cdot ASSET_{it} + b_5 \cdot DR_{it} + \varepsilon_{it}, \quad (3)$$

where:

R_{it} = firm i's stock return per share for period t,
EBT_{it} = firm i's pretax earnings per share for period t,
TAX_{it} = firm i's corporate income tax per share for period t,
P_{it-1} = firm, i's beginning stock price per share for period t,
BM_{it} = the natural logarithm of firm i's ratio of year-end common equity to market value,
$ASSET_{it}$ = the natural logarithm of firm i's average total assets at time t,
DR_{it} = firm i's year-end debt-to-asset ratio, measured by average total liabilities divided by average total assets,
ε_{it} = the residual term.

The independent variables included in model (3) are chosen because prior empirical studies have demonstrated that security returns are affected by accounting earnings (Easton and Harris, 1991; and Kothari and Zimmerman, 1995), firm size (Watts and Zimmerman, 1986; and Chaney and Jeter, 1992), and book-to-market ratio (Fama and French, 1992; and Penman, 1996). In order to test the *PE hypothesis*, we first examine whether the coefficient of TAX/P in model (3) is significantly less than zero prior to the Tax Reform. After the Tax Reform, however, since equation (2) has shown that condition $t_i > t_f$ leads to income tax payments and condition $t_i < t_f$ leads to tax refunds, the sign of TAX/P depends on marginal investor's individual tax rate t_i.

If the marginal investor's t_i is equal to the effective corporate tax rate, the coefficient of TAX/P in model (3) should be zero after the Tax Reform. In contrast, if the marginal investor's t_i is less (greater) than the effective corporate tax rate, the coefficient of TAX/P in model (3) should be positive (negative) after the Tax Reform. Since Taiwan's nominal corporate income tax rate is 25% and the individual income tax rate ranges between 6% and 40%, we may obtain positive, zero or negative TAX/P coefficients, depending on the marginal investor's t_i. In this situation, we cannot test our *PE hypothesis* using data obtained directly after the Tax Reform. However, because the wealth effect (**W**) indicates that shareholder's income tax payments are always higher under the classical system than under the full imputation system, this provides us with a feasible way of testing the *PE hypothesis* through an examination of whether the coefficient of TAX/P in model (3) is greater after the Tax Reform than before it.

It should be noted that if there are other omitted variables, which are not included in model (3) but are highly correlated with TAX/P, the coefficient of TAX/P might be biased. However, as long as the assumption that the relationship between TAX/P and other omitted variables remain unchanged both before and after the Tax Reform, we can still test the *PE hypothesis* using the above 'pre-/post- TAX/P coefficient comparison' approach.

(b) Using the Balance Sheet Approach to Test the 'Valuable Asset' Hypothesis

One major line of empirical study examines whether certain accounting disclosures are value-relevant in explaining firms' stock prices (e.g., Amir and Lev, 1996; Amir, Kirschenseiter and Willard, 1997; Ayers, 1998; Barth, 1991; Barth, Beaver and Landsman, 1996; Eccher, Ramesh and Thiagarajan, 1996; Nelson, 1996; and Hughs, 2000). The fundamental research paradigm usually regresses firms' equity market values on basic accounting variables (e.g., earnings and book value), control variables (e.g., firm size, debt, growth opportunity), and the variable(s) of interest.[8] For example, Venkatachalam (1996) investigates the incremental association of the fair value of risky derivatives disclosed under the *Statement of Accounting*

Standards No. 119 using a regression of firms' stock prices on several on and off balance sheet items. A significant coefficient on the fair value of derivatives suggests that the disclosure is value-relevant to equity valuation.

As discussed in Section 2, since the 1998 Tax Reform increases shareholders' wealth through tax credits, it also changes the nature of corporate income tax to a valuable asset. Therefore, if the stock market recognizes the existence of property rights resulting from tax credits, equation (2) implies that the market should also be able to take this wealth benefit into consideration in determining firms' stock prices. This provides us with a good opportunity to examine whether the disclosure of corporate income tax is value-relevant after the Tax Reform. This leads to our *valuable asset (VA) hypothesis*. Following Beaver's (1998) and Kothari and Zimmerman's (1995) price model (or the balance sheet approach) and prior value relevance studies' paradigm, we use the following regression to test the *VA hypothesis*:

$$P_{it} = b_0 + b_1 \cdot EBT_{it} + b_2 \cdot TAX_{it} + b_3 \cdot TA_{it} + b_4 \cdot TL_{it} + \varepsilon_{it}, \quad (4)$$

where:

P_{it} = firm i's year-end stock price per share at time t,
EBT_{it} = firm i's before-tax earnings per share for period t,
TAX_{it} = firm i's corporate income tax per share for period t,
TA_{it} = firm i's year-end total assets per share at time t,
TL_{it} = firm i's year-end total liabilities per share at time t,
ε_{it} = the residual term.

In order to examine the validity of the hypothesis, we can investigate whether the coefficient of TAX in model (4) is insignificantly different from zero prior to the Tax Reform and whether it is significantly greater than zero after the Tax Reform. In similar fashion to the test of *PE hypothesis*, if the problem of omitted variables exists, we can still test our *VA hypothesis* by examining whether the coefficient of TAX in model (4) is larger after the Tax Reform than before it.[9] After considering the potential heteroskedasticity problems in regression residuals, we use the White's (1980) test to examine heteroskedasticity in equation (4). Where appropriate, the

White's (1980) heteroskedasticity-consistent standard errors are used to test the significance of the estimated coefficients.[10]

(ii) Sample and Descriptive Statistics

The sample used to test the above hypotheses consists of 133 calendar-year firms listed on the Taiwan Stock Exchange, whose fiscal data are available from the *Taiwan Economic Journal (TEJ) Database*. All firms should have a positive corporate income tax and an EPS in both 1997 and 1998. Annual calendar year buy-and-hold returns are used, and earnings and price data are adjusted for stock dividends and stock issues.[11] Table 1 summarizes the descriptive statistics and correlation matrix of all the variables used in the analyses.

Panel A of Table 1 indicates that there is a substantial reduction in average R, from 0.3185 in 1997 to −0.1001 in 1998. This may stem from two possible sources: a drop in the firms' average EPS (note that the average EPS for 1997 and 1998 were \$0.0822 and \$0.0467, respectively) or other non-fundamental factors (e.g., the Asian financial crisis). These non-fundamental factors influence our hypothesis testing in two ways. Firstly, they may adversely affect the statistical test power because the association between earnings and returns may change. Secondly, we could be faced with the problem of omitted variables in estimating model coefficients. However, as long as these non-fundamental factors are not correlated with TAX, the estimates of the coefficient of TAX in all models should remain unbiased.

Panel B of Table 1 shows that the correlations between TAX and EBT are almost identical in two sample years (0.7020 in 1997, and 0.7041 in 1998). Therefore, the multicollinearity problem may affect our analysis results. In model (4), for example, the *VA hypothesis* predicts that the TAX coefficient will be zero prior to the Tax Reform. If the empirical results show an insignificant coefficient, it may be argued that this insignificance stems from multicollinearity. However, if the empirical results also show a positive TAX coefficient after the Tax Reform, it is reasonable to assume that the insignificant TAX coefficient prior to the Tax Reform was not due to multicollinearity. In other words, as long as the empirical findings can support all our

Table 1

Descriptive Data for All Variables (1997 vs. 1998, $n = 133$ firms)

Panel A: Descriptive Statistics:

Year: 1997	*R*	*EPS*	*TAX*	*EBT*	*BM*	*ASSET*	*DR*
Mean	0.3185	0.0822	0.0124	0.0946	−0.9195	22.8656	0.40146
Median	0.1247	0.0609	0.0112	0.0735	−0.9497	22.5725	0.36073
Maximum	2.3209	0.4574	0.0492	0.4903	0.1160	27.6083	0.95608
Minimum	−0.3784	0.0071	0.0000	0.0071	−2.3210	20.3267	0.09475
Std. Dev.	0.5564	0.0690	0.0097	0.0754	0.4970	1.4144	0.19839

Year: 1998	*R*	*EPS*	*TAX*	*EBT*	*BM*	*ASSET*	*DR*
Mean	−0.1001	0.0467	0.0086	0.0554	−0.6305	23.0400	0.3866
Median	−0.1643	0.0398	0.0067	0.0469	−0.5862	22.7792	0.3326
Maximum	1.1686	0.1315	0.0294	0.1549	0.4890	27.6917	0.9454
Minimum	−0.8480	0.0002	0.0003	0.0005	−2.1279	20.3207	0.0609
Std. Dev.	0.3226	0.0299	0.0065	0.0341	0.5186	1.4027	0.2021

Panel B: Correlation Matrix:

Year: 1997	*R*	*EPS*	*TAX*	*EBT*	*BM*	*ASSET*	*DR*
R							
EPS	0.6726						
TAX	0.4786	0.6275					
EBT	0.6765	0.9950	0.7020				
BM	−0.6167	−0.3026	−0.2550	−0.3094			
ASSET	−0.1243	−0.0224	−0.1558	−0.0404	−0.2217		
DR	−0.0185	−0.1028	−0.1577	−0.1142	−0.2842	0.7829	

Year: 1998	*R*	*EPS*	*TAX*	*EBT*	*BM*	*ASSET*	*DR*
R							
EPS	0.6812						
TAX	0.5472	0.5870					
EBT	0.7010	0.9882	0.7041				
BM	−0.5502	−0.2447	−0.1857	−0.2497			
ASSET	−0.3018	−0.1213	−0.1080	−0.1268	0.0398		
DR	−0.3756	−0.2052	−0.1869	−0.2153	0.0585	0.7727	

Notes:
Variables are defined as follows:
R = Firm's stock return per share.
EPS = Firm's earnings per share, deflated by beginning share price.
TAX = Firm's corporate income tax per share, deflated by beginning share price.
EBT = Firm's before-tax earnings per share, deflated by beginning share price.
BM = Natural logarithm of firm's ratio of year-end common equity to market value.
ASSET = Natural logarithm of firm's average total assets.
DR = Firm's debt-to-asset ratio (measured by the percentage of average total liabilities divided by average total assets).

hypotheses, the multicollinearity problem should not adversely affect our conclusions.

4. EMPIRICAL RESULTS

(i) Tests for the Change in Nature of Corporate Income Tax

We first test the *PE hypothesis* using the earnings approach. Table 2 indicates that in 1997 the TAX/P coefficient is negative but not significant ($b_2 = -5.3281$, t-statistic is -1.3269). In 1998, however, the coefficient is insignificantly different from zero ($b_2 = 4.1979$, t-statistic is 1.2264). We conduct our analysis to test whether the TAX/P coefficient is larger after the Tax Reform than before it. The Wald test shows that the coefficient of TAX/P in 1998 is significantly greater than that in 1997 at the 5% significance level (χ^2 statistic is 3.2595, one-tailed p-value is 0.035). Therefore, our *PE hypothesis* is supported, implying that Taiwan's stock market is not functionally fixated on bottom-line numbers; instead, it perceives the effects of the 1998 Tax Reform on the nature of corporate income tax, even though the tax is nominally reported as an operating expense in the income statement.

Table 3 summarizes the *VA hypothesis* test using the balance sheet approach. As Table 3 shows, the coefficient of TAX is not significant in 1997 ($b_2 = 6.4554$, t-statistic is 1.5194) but it is significantly greater than zero in 1998 ($b_2 = 15.4585$, t-statistic is 3.0311, two-tailed p-value < 0.01). Since the coefficient of TAX is positive in both years, we further examine whether the coefficient is larger in the post-reform period than in the pre-reform period. The Wald test shows that in 1998 the coefficient of TAX is significantly greater than that in 1997 at the 10% level (χ^2 statistic is 1.8396, one-tailed p-value is 0.0875). These results reflect the fact that Taiwan's stock market recognizes the existence of property rights resulting from the tax credits after the Tax Reform and takes this wealth benefit into firms' valuation process. Tables 2 and 3 provide joint support for our prediction that the 1998 Tax Reform changes the nature of corporate income tax, and that the stock market can respond accordingly.

Table 2

Results of Test of *Phantom Expense Hypothesis – Earnings Approach*[1] Using 1997 and 1998 Data (133 firms)

Model (3): $R_{it} = b_0 + b_1 \cdot \frac{EBT_{it}}{P_{it-1}} + b_2 \cdot \frac{TAX_{it}}{P_{it-1}} + b_3 \cdot BM_{it} + b_4 \cdot ASSET_{it} + b_5 \cdot DR_{it} + \varepsilon_{it}$

Year	*INT*	*EBT/P*	*TAX/P*[2]	*BM*	*ASSET*	*DR*	*Adj. R^2*	*p-value*
1997	2.5542 (3.9434)***	4.4109 (8.4749)***	−5.3281 (−1.3269)	−0.5421 (−8.8815)***	−0.1440 (−4.6231)***	0.5166 (2.2703)**	0.69	0.0000
1998	0.0252 (0.0678)	4.6969 (7.0996)***	4.1979 (1.2264)	−0.2474 (−7.9248)***	−0.0208 (−1.1780)	−0.2554 (−2.0506)**	0.69	0.0000

Notes:
* Statistically significant at the 0.10 level (two-tailed test).
** Statistically significant at the 0.05 level (two-tailed test).
*** Statistically significant at the 0.01 level (two-tailed test).

Variables are defined as follows:
R_t = Firm's stock annual return per share over period t.
P_{t-1} = Firm's stock price per share for period $t-1$.
EBT_t = Firm's before-tax earnings per share for period t.
TAX_t = Firm's corporate income tax per share for period t.
BM_t = Natural logarithm of firm's ratio of year-end common equity to market value for period t.
$ASSET_t$ = Natural logarithm of firm's average total assets at time t.
DR_t = Firm's debt-to-asset ratio (measured by the percentage of average total liabilities divided by average total assets at time t).
ε_t = Residual term for period t.

[1] The t-statistics are reported in parentheses.
[2] The coefficient of TAX/P in 1998 is significantly greater than that in 1997 at 5% significance level (χ^2 statistic is 3.2595, one-tailed p-value is 0.035).

Table 3

Results of Test of *Valuable Asset Hypothesis – Balance Sheet Approach*[1] Using 1997 and 1998 Data (133 firms)

Model (4): $P_{it} = b_0 + b_1 \cdot EBT_{it} + b_2 \cdot TAX_{it} + b_3 \cdot TA_{it} + b_4 \cdot TL_{it} + \varepsilon_{it}$

Year	*INT*	*EBT*	*TAX*[3]	*TA*	*TL*	*Adj.* R^2	*p*-value
1997[2]	3.4682 (0.4218)	4.1639 (6.4684)***	6.4554 (1.5194)	1.2933 (2.4540)**	−1.1766 (−2.2284)**	0.66	0.0000
1998[2]	−7.4166 (−1.2241)	5.9671 (6.1882)***	15.4585 (3.0311)***	1.3328 (3.2030)***	−1.3331 (−3.1458)***	0.76	0.0000

Notes:
* Statistically significant at the 0.10 level (two-tailed test).
** Statistically significant at the 0.05 level (two-tailed test).
*** Statistically significant at the 0.01 level (two-tailed test).

Variables are defined as follows:
P_t = Firm's year-end stock price per share at time t.
EBT_t = Firm's before-tax earnings per share for period t.
TAX_t = Firm's corporate income tax per share for period t.
TA_t = Firm's total assets per share at time t.
TL_t = Firm's total liabilities per share at time t.
ε_t = Residual term for period t.

[1] The t-statistics are reported in parentheses.
[2] Since there is a heteroskedasticity problem in the regression residuals (the p-values of the White test are 0.5038 and 0.1636 for 1997 and 1998, respectively), the t-statistics reported in this table are based on OLS-estimated standard errors.
[3] The coefficient of TAX in 1998 is significantly greater than that in 1997 at 10% significance level (χ^2 statistic is 1.8396, one-tailed p-value is 0.0875).

(ii) Retesting the Hypotheses Using Time-extended Samples

In order to test for the robustness of the above empirical results, we use two time-extended samples to re-examine our hypotheses: a *1998 vs 1996* sample, comprising of 116 firms whose corporate income taxes were both positive in 1998 and 1996, and a *1998 vs 1995* sample, comprising of 82 firms whose corporate income taxes were both positive in 1998 and 1995. All of these samples are obtained from the *TEJ Database*.[12]

Panel A of Table 4 indicates that in 1996, the coefficient of TAX/P in model (3) is significantly negative ($b_2 = -6.6671$, t-statistic is -3.2287, p-values < 0.01). In 1998, the coefficient of TAX/P in model (3) is 10.3706 (t-statistic is 2.8568), which is significantly positive at the 1% significance level. According to our discussion in Section 3(*i*)(a), Panel A of Table 4 supports our *PE hypothesis*. Similarly, Panel B of Table 4 also supports our *VA hypothesis* because in 1996 the coefficient of TAX is not different from zero ($b_2 = 7.9336$, t-statistic is 1.4936) whereas it is significantly positive in 1998 ($b_2 = 29.5749$, t-statistic is 3.4485, p-value < 0.01). The Wald tests indicate that the coefficient of TAX in 1998 is significantly greater than that in 1996 at the 1% level (χ^2 statistic is 9.5910, one-tailed p-value is 0.001).

In contrast to Table 4, Panel A of Table 5 shows no negative coefficient of TAX/P in model (3) for both 1995 and 1998. Therefore, we examine whether the coefficient of TAX/P in model (3) is greater after the Tax Reform than before it. The Wald tests show that the χ^2 statistic is 6.5767 (one-tailed p-value < 0.01); our *PE hypothesis* is thus supported. On the other hand, as Panel B of Table 5 indicates, in 1995 the coefficient of TAX is 3.1442 (t-statistic is 1.5360), which is not significantly different from zero. After the Tax Reform, however, the market interprets corporate income tax as a valuable asset because the coefficient of TAX is significantly positive ($b_2 = 29.7645$, t-statistic is 2.7281, p-value < 0.01). The Wald tests indicate that in 1998 the coefficient of TAX is significantly greater than that in 1995 at the 1% significance level (χ^2 statistic is 10.2210, one-tailed p-value is 0.0007). Based on Tables 4 and 5, our *PE* and *VA hypotheses* are generally supported by the two time-extended samples.

There is one interesting finding that deserves further exploration. Let $\mathbf{S}_{98}^{97}$, $\mathbf{S}_{98}^{96}$, and $\mathbf{S}_{98}^{95}$ be the respective samples for *1998*

Table 4

Re-tests of the Nature of Corporate Income Tax – Using 1996 and 1998 data (116 firms)[1]

Model (3): $R_{it} = b_0 + b_1 \cdot \frac{EBT_{it}}{P_{it-1}} + b_2 \cdot \frac{TAX_{it}}{P_{it-1}} + b_3 \cdot BM_{it} + b_4 \cdot ASSET_{it} + b_5 \cdot DR_{it} + \varepsilon_{it}$

Model (4): $P_{it} = b_0 + b_1 \cdot EBT_{it} + b_2 \cdot TAX_{it} + b_3 \cdot TA_{it} + b_4 \cdot TL_{it} + \varepsilon_{it}$

Panel A: Earnings Approach

Year	*INT*	*EBT/P*	*TAX/P*	*BM*	*ASSET*	*DR*	*Adj. R^2*	*p-value*
1996	0.7175	2.7771	−6.6671	−0.3475	−0.0418	0.1591	0.61	0.0000
	(1.9916)*	(8.2376)***	(−3.2287)***	(−6.9991)***	(−2.2575)**	(1.2107)		
1998	−0.0988	3.5881	10.3706	−0.2489	−0.0148	−0.2783	0.72	0.0000
	(−0.7049)	(5.9215)***	(2.8568)***	(−7.7131)***	(−2.2539)**	(−3.3418)***		

Table 4 (Continued)

Panel B: Balance Sheet Approach

Year	*INT*	*EBT*	*TAX*[3]	*TA*	*TL*	*Adj.* R^2	*p-value*
1996[2]	5.0482	1.7295	7.9336	1.3573	−1.1488	0.74	0.0000
	(0.7541)	(2.7998)***	(1.4936)	(2.6566)***	(−2.1873)**		
1998[2]	−8.6983	4.5004	29.5749	1.3195	−0.2084	0.78	0.0000
	(−0.9208)	(3.3836)***	(3.4485)***	(1.9166)**	(−1.8747)*		

Notes:

* Statistically significant at the 0.10 level (two-tailed test).

** Statistically significant at the 0.05 level (two-tailed test).

*** Statistically significant at the 0.01 level (two-tailed test).

Variables are defined as follows:

R_t = Firm's stock annual return per share over period t.

P_{t-1} = Firm's stock price per share for period $t-1$.

P_t = Firm's year-end stock price per share at time t.

EBT_t = Firm's before-tax earnings per share for period t.

TAX_t = Firm's corporate income tax per share for period t.

BM_t = Natural logarithm of firm's ratio of year-end common equity to market value for period t.

$ASSET_t$ = Natural logarithm of firm's average total assets at time t.

DR_t = Firm's debt-to-asset ratio (measured by the percentage of average total liabilities divided by average total assets at time t).

TA_t = Firm's total assets per share at time t.

TL_t = Firm's total liabilities per share at time t.

ε_t = Residual term at time t.

[1] The t-statistics are reported in parentheses.

[2] Since there is heteroskedasticity problem in the regression residuals (the p-values of the White test are 0.0000 and 0.0000 for 1996 and 1998, respectively), the t-statistics reported in this table are based on White's heteroskedasticity-consistent standard errors.

[3] The coefficient of TAX in 1998 is significantly greater than that in 1996 at 1% significance level (χ^2 statistic is 9.5910, one-tailed p-value is 0.0010).

Table 5

Re-tests of the Nature of Corporate Income Tax – Using 1995 and 1998 Data (82 firms)[1]

Model (3): $R_{it} = b_0 + b_1 \cdot \frac{EBT_{it}}{P_{it-1}} + b_2 \cdot \frac{TAX_{it}}{P_{it-1}} + b_3 \cdot BM_{it} + b_4 \cdot ASSET_{it} + b_5 \cdot DR_{it} + \varepsilon_{it}$

Model (4): $P_{it} = b_0 + b_1 \cdot EBT_{it} + b_2 \cdot TAX_{it} + b_3 \cdot TA_{it} + b_4 \cdot TL_{it} + \varepsilon_{it}$

Panel A: Earnings Approach

Year	*INT*	*EBT/P*	*TAX/P*[3]	*BM*	*ASSET*	*DR*	*Adj. R*^{2}	*p-value*
1995	0.0576	0.6759	0.7440	−0.0827	−0.0166	−0.0710	0.36	0.0000
	(0.2409)	(3.8452)***	(0.5616)	(−2.5859)**	(−1.4342)	(−0.8894)		
1998	−0.1491	2.7926	12.4775	−0.2252	−0.0118	−0.2519	0.61	0.0000
	(−0.9277)	(3.4928)***	(2.8398)***	(−6.0790)***	(−1.503)	(−2.5254)**		

Table 5 (Continued)

Panel B: Balance Sheet Approach

Year	*INT*	*EBT*	*TAX*[4]	*TA*	*TL*	*Adj. R^2*	*p-value*
1995[2]	14.3622 (1.8709)*	0.5253 (1.9717)*	3.1442 (1.5360)	1.0192 (1.9168)*	−0.8814 (−1346)	0.64	0.0102
1998[2]	−6.8357 (−0.5432)	4.6615 (2.4949)**	29.7645 (2.7281)***	1.2869 (1.3980)	−1.2862 (−1.3649)	0.77	0.0000

Notes:
* Statistically significant at the 0.10 level (two-tailed test).
** Statistically significant at the 0.05 level (two-tailed test).
*** Statistically significant at the 0.01 level (two-tailed test).

Variables are defined as follows:
R_t = Firm's stock annual return per share over period t.
P_{t-1} = Firm's stock price per share for period $t-1$.
P_t = Firm's year-end stock price per share at time t.EBT_t = Firm's before-tax earnings per share for period t.
TAX_t = Firm's corporate income tax per share for period t.
BM_t = Natural logarithm of firm's ratio of year-end common equity to market value for period t.
$ASSET_t$ = Natural logarithm of firm's average total assets at time t.
DR_t = Firm's debt-to-asset ratio (measured by the percentage of average total liabilities divided by average total assets at time t).
TA_t = Firm's total assets per share at time t.
TL_t = Firm's total liabilities per share at time t.
ε_t = Residual term at time t.

[1] The t-statistics are reported in parentheses.
[2] Since there is a heteroskedasticity problem in the regression residuals (the p-values of the White test are 0.0000 and 0.0060 for 1996 and 1998, respectively), the t statistics reported in this table are based on White's heteroskedasticity-consistent standard errors.
[3] The coefficient of TAX/P in 1998 is significantly greater than that in 1995 at 1% significance level (χ^2 statistic is 6.5765, one-tailed p-value <0.01).
[4] The coefficient of TAX in 1998 is significantly greater than that in 1995 at 1% significance level (χ^2 statistic is 10.2201, one-tailed p-value is 0.0007).

vs 1997, 1998 vs 1996, and *1998 vs 1995*. Tables 2, 4 and 5 show that the coefficient of TAX/P in model (3) increases from 4.1979 in $\mathbf{S}_{98}^{97}$ to 10.3706 in $\mathbf{S}_{98}^{96}$, and 12.4775 in $\mathbf{S}_{98}^{95}$. In fact, we also observe this 'increasing coefficient' phenomenon in model (4). Since $\mathbf{S}_{98}^{96}$ may be a subset of $\mathbf{S}_{98}^{97}$, the difference between $\mathbf{S}_{98}^{97}$ and $\mathbf{S}_{98}^{96}$ represents new companies going public during 1997. Similarly, the differences between $\mathbf{S}_{98}^{96}$ and $\mathbf{S}_{98}^{95}$ may represent new companies going public in 1996. This then raises the question of whether this 'increasing coefficient' phenomenon comes from the inclusion of new public companies. Since most of Taiwan's IPOs over the past few years have involved high-tech companies, and these companies are usually subject to various tax preferences,[13] it is reasonable to assume that these new companies should have lower effective tax rate t_f. Because the lower the t_f, the lower the shareholders' tax benefits resulting from tax credits (note that the differentiation of equation (2) with respect to t_f is negative, implying that a shareholder's tax payment is decreasing in t_f), the exclusion of new high-tech companies in samples $\mathbf{S}_{98}^{96}$ and $\mathbf{S}_{98}^{95}$ should accentuate the true nature of corporate income tax after the Tax Reform. Therefore, if our conjecture is appropriate, we should be able to observe a clear difference in the response to Tax Reform effects on the change in the nature of corporate income tax between high and low t_f firms. In order to verify our 'effective tax rate effect' conjecture, we extract from our $\mathbf{S}_{98}^{97}$ sample those firms for which the 1998 effective tax rate is greater than the 75 percentile or smaller than the 25 percentile, and conduct tests using the following models:

$$\mathrm{R}_{it} = b_0 + b_1 \cdot \frac{\mathrm{EBT}_{it}}{\mathrm{P}_{it-1}} + b_2 \cdot \frac{\mathrm{TAX}_{it}}{\mathrm{P}_{it-1}} + b_3 \cdot \mathrm{D}_{it} \cdot \frac{\mathrm{TAX}_{it}}{\mathrm{P}_{it-1}} + b_4 \cdot \mathrm{BM}_{it} + b_5 \cdot \mathrm{ASSET}_{it} + b_6 \cdot \mathrm{DR}_{it} + \varepsilon_{it}, \tag{3'}$$

$$\mathrm{P}_{it} = b_0 + b_1 \cdot \mathrm{EBT}_{it} + b_2 \cdot \mathrm{TAX}_{it} + b_3 \cdot \mathrm{D}_{it} \cdot \mathrm{TAX}_{it} + b_4 \cdot \mathrm{TA}_{it} + b_5 \cdot \mathrm{TL}_{it} + \varepsilon_{it}, \tag{4'}$$

where D is a dummy variable, the value of which equals 1 (or 0) if a firm's effective tax rate is greater (or smaller) than the 75

(or 25) percentile of the overall 133 sample firms in S_{98}^{97}. All other variables are defined as before. A positive coefficient of D · TAX/P (i.e., b_3) will support our conjecture. As can be seen from Table 6, b_3 are positive in models (3′) and (4′) but are marginally insignificant at the conventional levels ($b_3 = 15.0010$ and 18.0306, t-statistics are 1.1647 and 1.0593, one-tailed p-values are 0.1244 and 0.1457 for 1997 and 1998, respectively). Therefore, our conjecture is only qualitatively supported by the empirical results.[14]

In summary, the empirical evidence reported in this section reinforces our earlier conclusions that Taiwan's stock market is not functionally fixated on bottom-line numbers, and rather, that it can take into account the tax benefits brought about by the change in nature of corporate income tax after the 1998 Tax Reform. Compared to Chen and Schoderbek (2000) and other earlier studies, the empirical evidence reported in this paper suggests that investors in the capital markets *may* or *may not* be functionally fixated on earnings numbers, depending on the characteristics of the event being examined.

5. SUMMARY AND CONCLUSIONS

(i) Summary of the Empirical Results

The main purpose of this paper is to test two competing hypotheses for describing investors' behavior (i.e., EMH vs. FFH) by examining how Taiwan's stock market interprets the nature of corporate income tax following the 1998 Tax Reform. This study contributes to the FFH literature in three ways. First of all, while prior studies have addressed FFH using voluntary and firm-specific events, which may not fully capture the security market behavior, our study tests FFH using a mandatory and nationwide event that has effectively changed the nature of corporate income tax, a setting which provides a more powerful test of FFH. Secondly, previous FFH studies have tested whether the reported event still has any information content in time-delayed financial statements. In contrast, we examine FFH using both an earnings and a balance sheet approach. Finally, this study provides evidence from a capital market

Table 6

Results of Further Test of Effective Tax Rate Effect – Using 1998 Data (66 firms)[1]

Model (3′): $R_{it} = b_0 + b_1 \cdot \frac{EBT_{it}}{P_{it-1}} + b_2 \cdot \frac{TAX_{it}}{P_{it-1}} + b_3 \cdot D_{it} \cdot \frac{TAX_{it}}{P_{it-1}} + b_4 \cdot BM_{it} + b_5 \cdot ASSET_{it} + b_6 \cdot DR_{it} + \varepsilon_{it}$

Model (4′): $P_{it} = b_0 + b_1 \cdot EBT_{it} + b_2 \cdot TAX_{it} + b_3 \cdot D_{it} \cdot TAX_{it} + b_4 \cdot TA_{it} + b_5 \cdot TL_{it} + \varepsilon_{it}$

Panel A: Earnings Approach

INT[b]	*EBT/P*	*TAX/P*	*D·TAX/P*	*BM*	*ASSET*	*DR*	*Adj. R^2*	*p-value*
0.3088	4.9260	−15.6041	15.0010	−0.2323	−0.0327	−0.1331	0.63	0.0000
(0.5305)	(4.2520)***	(−0.9483)	(1.1647)	(−5.4224)***	(−1.1913)	(−0.7115)		

Table 6 (Continued)

Panel B: Balance Sheet Approach[2]

INT	*EBT*	*TAX*	*D · TAX*	*TA*	*TL*	*Adj. R^2*	*p-value*
0.5718	3.8549	−12.2403	14.4487	0.0580	−0.1781	0.36	0.0000
(8.5693)***	(3.1097)***	(−0.7064)	(1.0613)	(0.4590)	(−1.2976)		

Notes:
* Statistically significant at the 0.10 level (two-tailed test).
** Statistically significant at the 0.05 level (two-tailed test).
*** Statistically significant at the 0.01 level (two-tailed test).

Variables are defined as follows:
R_t = Firm's stock annual return per share over period t.
P_{t-1} = Firm's stock price per share for period $t-1$.
P_t = Firm's year-end stock price per share at time t.
EBT_t = Firm's before-tax earnings per share for period t.
TAX_t = Firm's corporate income tax per share for period t.
D = Dummy variable, whose value equals 1 (0) if a firm's effective tax rate is greater (smaller) than 75 (25) percentile of overall 133 sample firms.
BM_t = Natural logarithm of firm's ratio of year-end common equity to market value for period t.
$ASSET_t$ = Natural logarithm of firm's average total assets at time t.
DR_t = Firm's debt-to-asset ratio (measured by the percentage of average total liabilities divided by average total assets at time t).
TA_t = Firm's total assets per share at time t.
TL_t = Firm's total liabilities per share at time t.
ε_t = Residual term at time t.

[1] The t-statistics are reported in parentheses.
[2] Since there is no heteroskedasticity problem in the regression residuals (the p-value of the White test is 0.3398), the t-statistics reported in this table are based on OLS-estimated standard errors.

which differs significantly from those of the US and Europe. Therefore, it adds to the FFH literature by enlarging our understanding of FFH in a multinational context.

The empirical results from both the earnings and balance sheet approaches generally support our 'phantom expense' and 'valuable asset' hypotheses. These results retain their robustness even when we extend the test time intervals. The empirical findings show that, on the whole, Taiwan's stock market is capable of recognizing the change in nature of corporate income tax and responding accordingly. In other words, Taiwan's stock market is not functionally fixated on bottom-line numbers, even though corporate income tax is nominally reported as an operating expense in the income statement.

(ii) What Do We Learn From the Study?

This study has three important implications for future empirical studies. Firstly, the rejection of FFH in our study suggests that an event may itself affect the existence of functional fixation. Since prior FFH studies have generally ignored the importance of the characteristics of the event, our study indicates that the features of the event should be taken into consideration in future FFH studies. Furthermore, since FFH predicts that investors will tend to interpret accounting information without any consideration of the accounting rules used to generate it, a complete FFH literature should include the four dimensions depicted in Figure 2. If investors do interpret accounting numbers mechanically without taking into account the occurrence of a well-known comprehensive event (such as the 1998 Tax Reform), the argument that the market really is functionally fixated can be strongly supported; however, this study finds no empirical evidence to support FFH. In light of our empirical results and Figure 2, we believe that future research should use firm-specific events along with any change in the nature of account(s) involved to provide further evidence of the existence, or non-existence, of functional fixation.

Finally, although the rejection of FFH in our study is based on data from Taiwan's stock market, we believe that the results

Figure 2
A Framework of Functional Fixation Study

		Feature of the event	
		Voluntar/Firm-specific	Mandatory/Nationwide
Effect of the event	No change in nature of account(s) involved	Archibald (1972) Dietrich (1984) Hand (1990) Harris & Ohlson (1990)	Chen & Schoderbek (2000)
	Change in nature of account(s) involved	None	*This study*

should be applicable to more mature and larger size stock markets such as North America and Europe. Since most of the major countries in the world have now begun implementing an integration tax system (within which different prototypes can be adopted), for those institutional and individual investors who plan to trade securities from foreign firms in these countries, the change in nature of corporate income tax (or any other accounts involved) should be taken into consideration in their business valuation models.

NOTES

1 These anomalies include post-earnings announcement drift (Bernard and Thomas, 1989 and 1990), market over- or under-reactions (De Bondt and Thaler, 1987; and Ou and Penman, 1989), and functional fixation (Dietrich, 1984; Hand, 1990; and Chen and Schoderbek, 2000). See Bernard (1993) for detailed discussions of these anomalies.

2 Today, Taiwan is one of the world's top 15 trading nations, and its foreign exchange reserves are among the highest in the world (by the end of February 2002, Taiwan's foreign exchange reserves amount to US$125.2 billion, ranked the third in the world). Several recent events further strengthen Taiwan's importance in the Asia-Pacific emerging market. For example, on May 19, 2000, Morgan Stanley Capital International (MSCI) raised the weighting of Taiwan shares in its MSCI *Emerging Markets Free*

Index series from 12.6% to 13.48% (the largest component in the global emerging market indexes) and in its MSCI *All Country Free Index* series from 1.16% to 1.47%. On September 15, 1999, Standard & Poor's announced the inclusion of 17 Taiwan stocks into its *S&P Asia-Pacific 100 Index*. This inclusion increases Taiwan's share to 13.64% of the overall market value of the Index. Merrill Lynch Capital Market Development initiated a US$2 billion investment in early August, 1999, to buy Taiwanese stocks in 2000. Finally, On June 6, 2000, the London-based Financial Times Stock Exchange (FTSE) included 35 Taiwan stocks in its *All-World Index*. Taiwan's weighting is the 14th largest in the *Index*, but ranks the third largest among Asian countries (behind only Japan and Hong Kong).

3 According to the US Department of Treasury (1992), the classical system has the following several drawbacks. First, because of its double taxation feature, the tax burden on dividend income is heavier than that on other kinds of income (e.g., interest and rent income). Second, the classical system motivates firms to finance their investments with debts rather than new equity because debt interest expense is tax-deductible but dividends is not. This distortion could negatively impact firms' financial soundness and hamper the development of the stock market. Finally, the classical system provides incentives for firms to retain earnings in order to favor their shareholders at higher marginal income tax rates. As a result, the classical system adversely affects firms' dividend policies.

4 The Ministry of Finance of ROC decided to adopt the full imputation credit prototype, instead of the *dividend exclusion* prototype favored by the US Department of Treasury's (1992) report, because of several reasons. First, under the dividend exclusion prototype, the tax of dividend income depends only on the corporate income tax rate, while other kinds of income (e.g., salary, interests, rent) are consolidated and taxed at the progressive individual income tax rate. Second, since in Taiwan the corporate income tax rate is 25% and individual shareholder's income tax rate is set between 6% and 40%, dividend exclusion prototype may lead to vertical inequity because shareholders at marginal tax rates of 6% and 40% will all be taxed at a rate of 25%. Third, differential tax treatments provided in Taiwan's *Statute for Upgrading Industry* have substantially exempted or reduced corporate income tax for certain industries. Therefore, under the dividend exclusion prototype, it is possible that income invested in a company may never be subject to any tax. Finally, because most countries that implement an integrated system have adopted the imputation system, disadvantages may arise for both outbound investment and tax negotiation if Taiwan were to employ the dividend exclusion prototype. In particular, since dividend exclusion prototype allows tax exemption to dividends received by foreign shareholders but the imputation credit prototype does not, the tax burden on outbound investment will be comparably higher than that on inbound investment. There are other integrated prototypes that have been considered but were finally abandoned. For example, the *partnership prototype* was not taken because it has never been formally adopted by any country. The *split-rate* prototype, which imposes two different tax rates for distributed and undistributed earnings (a lower rate for the former and a higher rate for the latter), has never been implemented alone. The *dividend-paid deduction* prototype has been practiced by very few countries because it may distort businesses' financial decisions.

5 According to Taiwan's Corporate Law, public firms' current-year dividends should be determined and approved by the shareholders' annual meeting held in the next fiscal year. Therefore, a public company's year t earnings is distributed as dividends in subsequent years $t+1, t+2, \ldots$, etc. This is different from the US practice, under which dividends are determined by firms' Board of Directors and paid quarterly.

6 To control for the effects of changes of EPS and TAX on security returns, we also conduct our hypothesis tests using two additional models: (a) model (3) with ΔEPS/P and (b) model (3) with ΔEPS/P and ΔTAX/P. The empirical results are consistent with the conclusions reported in Section 4.

7 This model specification does not implicitly assume that firm's dividend payout ratio equals one. The reason is as follows. Suppose d_t is the dividend payout ratio at year t and EPS_t is firm's earnings per share at year t, then under Taiwan's current practice, we can define $d_t \cdot \mathrm{EPS}_t$ as the dividend distributed from EPS_t at year $t+1$ (see note 5). Therefore, the retained part of EPS_t equals $(1-d_t)\cdot \mathrm{EPS}_t$ at the end of year $t+1$. At year $t+2$, we can further define $d_{t+1}\cdot(1-d_t)\cdot \mathrm{EPS}_t)$ as the dividend distributed from the undistributed part of EPS_t at year $t+2$, where d_{t+1} denotes the percentage of $(1-d_t)\cdot \mathrm{EPS}_t$ distributed as dividend at year $t+2$. In other words, at the end of year $t+2$, the retained part of EPS_t equals $[1-d_t-d_{t+1}\cdot 1-d_t)]\cdot \mathrm{EPS}_t$. Based on the same reasoning, we can define $d_{t+2}\cdot 1-d_t-d_{t+1}\cdot 1-d_t)]\cdot \mathrm{EPS}_t$ as the dividend distributed from the undistributed part of EPS_t at year $t+3$, where d_{t+2} denotes the percentage of $[1-d_t-d_{t+1}\cdot(1-d_t)]\cdot \mathrm{EPS}_t$ distributed as dividend at year $t+3$, and so on. Let δ be the constant discount factor, then using the above notations, we can calculate the present value of total dividends shareholders can have from EPS_t at year t as:

$$\delta\cdot d_t\cdot \mathrm{EPS}_t+\delta^2\cdot d_{t+1}\cdot((1-d_t)\cdot \mathrm{EPS}_t) + \delta^3\cdot d_{t+2}\cdot[1-d_t-d_{t+1}\cdot(1-d_t)]\cdot \mathrm{EPS}_t+\cdots = k\cdot \mathrm{EPS}_t,$$

where $k=\delta\cdot d_t+\delta^2\cdot d_{t+1}\cdot(1-d_t)+\delta^3\cdot d_{t+2}\cdot[1-d_t-d_{t+1}\cdot(1-d_t)]+\cdots$, and must be between zero and one. Since TAX_t equals EPS_t times t_f, the present value of total TAX_t which will become 'phantom expense' and provide tax credit to the shareholders should be $k\cdot \mathrm{TAX}_t$. In other words, coefficient b_2 in model (3) indeed incorporates both k and TAX_t defined in this footnote. Therefore, model (3) does not assume that firm's dividend payout ratio equals one.

8 See Holthausen and Watts (2001) and Barth, Beaver and Landsman (2001) for detailed discussions about past value relevance literature.

9 The motivation of using the 'pre-/post- TAX coefficient comparison' approach is slightly different for the *PE* and *VA hypotheses*. As mentioned above, this approach is used for testing the *PE hypothesis* to overcome (a) the indeterminable sign of the TAX coefficient due to marginal investor's various tax rates and (b) the omitted variable problem. In contrast, since equation (2) has shown that shareholders can always receive a tax credit of $d\cdot \mathrm{EBT}\cdot t_f$ (which is a valuable asset) under the imputation system, the TAX coefficient in model (4) should be positive after the 1998 Tax Reform. Therefore, the 'before-after TAX coefficient comparison' approach is used for the *VA hypothesis* only to overcome the omitted variable problem.

10 One may also pool the observations across pre- and post-Tax Reform periods and include a dummy variable $\mathrm{D_{TAX}}$, where $\mathrm{D_{TAX}}$ equals one

(or zero) if the observations belong to the post- (or pre-) Tax Reform period, to measure the incremental effect of the Tax Reform. However, this model specification implicitly assumes that the intercepts and coefficients of non-TAX independent variables (i.e., EBT, BM, ASSET, DR, TA, and TL) are the same for equations (3) and (4) during pre- and post-Tax Reform periods. Since this assumption may not be true in Taiwan, we use pre- and post-Tax Reform observations separately to provide a more powerful test of our hypotheses.

11 There is no stock split mechanism in Taiwan's stock market.

12 In Taiwan, corporate income tax has been treated as an operating expense since early 1980s. The corresponding GAAP, however, was not established until 1995 (*Statement of Financial Accounting Standards No. 22, Accounting for Income Taxes*, which requires all listed firms to disclose their corporate income taxes). Because this Statement became effective for firms whose fiscal years ended after (include) December 31, 1995, data before 1994 are not available for our analyses.

13 In Taiwan, most preferential tax treatments are prescribed under the *Statute for Upgrading Industry* and the *Income Tax Law* for various reasons (e.g., research and development, education and training, energy conservation, and encouraging savings and investment). Typical treatments include five-year exemptions from corporate income tax, investment tax credits, and accelerated depreciation.

14 We also conduct the same analyses using two sub-samples divided based on the median of 1998 effective tax rates and obtain similar results.

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