A Re-examination of Ex-Dividend Day Price Movements: Evidence from ADR Market

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Abstract

This paper re-examines the tax-induced behavior on ex-dividend days for American depositary receipts (ADRs) since ADRs provide us unique settings where all ADR investors are subject to identical foreign tax rate for a given cash distribution. We can partition ADR samples by foreign tax liability levels to compare the excess returns on ex-dividend days for each sub-sample to versify the tax effect hypothesis. The purpose of this study is to analyze the influence of foreign tax costs and transaction costs on abnormal returns during ex-dividend periods.

This paper employs a sample of 6,461 cash dividend distributions of 528 firms from 42 different countries from 1988 to 2004. The results exhibit prominent excess returns exactly on ADR ex-dividend days. Since double taxation, U.S. tax and foreign withholding tax, may apply on the ADR dividend income, the tax effect is apparent on ex-dividend day. Besides, the results of regressions exhibit that abnormal returns on ex-dividend day are positively associated with foreign tax costs, the products of foreign tax rates and dividend yields, as well as transaction costs. Because foreign dividend income liability is composed of foreign tax rate and dividend yield, our finding supports tax-induced ex-dividend day trading activity that is constrained by transaction costs.

Key words: ADR, taxation, ex-dividend, American depositary receipt

1. Introduction

In perfect capital market with no transaction cost, no trading barriers, and no uncertainty, the share price following a dividend should fall by exactly the amount of the dividend paid on each share. However, it is well known that share prices do not fall by the full amount of dividend on average. A large literature has developed interpreting this fact as reflecting tax considerations (e.g., Elton and Gruber (1970), Eades, Hess, and Kim (1984), Poterba and Summers (1984), Lakonsihok and Vermaelen (1986), Barclay (1987), Shaw (1991), Michaely (1991), Lasfer (1995), Lasfer (1996), Bartholdy and Brown (1999), McDonald (2001), Dhaliwal and Li (2006)). The line of research explored the effects of dividend income tax on investor behaviors around ex-dividend days (ex-days). They proposed that taxable investors would accelerate their sales before ex-dividends days and delay their purchases until ex-dividend days. Hence, excess returns and trading volume occurred during ex-dividend periods.

Some studies obtained considerable evidence of tax-induced investor behavior around ex-dividend days. Barclay (1987) indicated that stock prices fell by the full amount of the dividend on ex-dividend days prior to the adoption of dividend income taxes in 1913. Lafer (1995) found significant ex-dividend day returns in the pre-1988 period when the differential taxation of dividends and capital gain was high, while ex-day returns were insignificantly negative in the post-1988.

In contrast, Shaw (1991) explored the significant excess return and volume around ex-dividend days of master limited partnerships (MLPs), although the dividends of MLPs are nontaxable to unit holders. Frank and Jagannathan (1998) investigated that the average stock price drop on ex-dividend days appeared smaller than the dividend amount, even though neither dividends nor capital gains are taxed in Hong Kong. The results cast serious doubt on the validity of tax-effect explanation. Dubofsky (1992), Bali and Hite (1998), as well as Jakob and Ma (2004) proposed that discrete tick (price discreteness), in stead of tax factors, played critical role in the ex-dividend day price drop.

To comprehend the ex-dividend price anomaly, this paper re-examines the

trading behavior around ex-dividend days in the American depositary receipt (ADR) stock exchange since ADRs provide us unique setting to test tax-based effect on ex-day prices. ADRs are securities traded on U.S. exchanges that represent ownership of the foreign companies outside U.S.. The countries from which the equity securities that underlie ADRs were issued apply foreign tax rate on ADR dividend payments, and the rates vary across countries. Hence, this study can employ ADR data to separate ex-day abnormal returns based on foreign tax rate and investigate the relations between abnormal returns and foreign tax rate. Our analysis differs from previous studies in the sense that this study relies on the effect of incremental foreign tax rate on ex-day abnormal returns.

The fact of identical foreign tax rate for a given dividend distribution adds another advantages for us to use ADR data to explore tax-induced investor behavior around the ex-dividend day. Under U.S. regulations, U.S. stock investors are exempt from dividend income tax or subject to differential marginal tax rate of dividend income in accordance with investors' status and earnings. Different from dividend income tax of U.S. stocks, various ADR investors are subject to identical foreign withholding tax rate for a given cash distribution. The tax-exempt institutions in U.S. status have the same obligations to pay for the foreign withholding taxes as the others. All ADR investors are subject to identical foreign withholding taxes associated with ADR dividend and the withholding tax rate depends on foreign tax status, rather than U.S. tax and tax-exempt status. The foreign tax rate for a given dividend distribution is known and constant across all the ADR investors regardless of the U.S. status. To explore the tax effect hypothesis, this study can compare the excess return around ex-dividend days for ADRs issued by different countries, which apply varying foreign tax rate levels.

One may doubt that foreign tax credit can eliminate the foreign dividend income tax for ADRs. However, foreign tax credits are limited in amount and taxpayer qualifications under U.S. regulations. Although ADR investors are entitled to a foreign tax credit to reduce the double taxation of ADR dividend incomes, the credit amount is limited in Internal Revenue Code Section 904. In general1, foreign tax credit for taxes withheld by the foreign jurisdiction provides dollar-for-dollar

reduction and is bound in U.S dividend income tax liability. As long as the foreign tax rate exceeds the investors' U.S. marginal tax rate, the excess portion is not available to offset the U.S. tax liability. As a result, ADR investors' effective tax rate is greater than U.S. investors' marginal tax rate. This creates a tax penalty on ADR dividends relative to capital gains since ADR dividend income is subject to double taxations. The magnitude of the penalty is a function of foreign tax levied on the ADR dividends relative to the U.S. effective tax rate on dividend income and capital gains.

In the respective of tax qualification limitations, tax-exempt organizations under U.S. regulations are not required to apply to foreign tax credit.[1] This also creates another incremental tax liability on ADR dividends for tax-exempt entities. Thus, foreign dividend income tax prevents tax-exempt entities from holding the securities before ex-dividend period and participating in cash distributions. Limitations of foreign tax credit enables us to examine the tax-induced trading activity around ex-dividend periods by analyzing the relations between varying foreign tax rate levels and ex-day abnormal returns.

Callaghan and Barry (2003) focused on tax-induced excess trading volume from the ADR market and documented that abnormal volume was an increasing function of foreign withholding tax rate and decreasing function of transaction costs. However, little work has been done on tax-induced ADR abnormal returns around ex-dividend days in their research. The purpose of this study is to analyze the determinants of ADR abnormal returns around ex-dividend days. This study further versifies that excess returns on ex-dividend days depend on incremental tax liability under foreign tax jurisdiction. Since foreign tax liability are composed of foreign tax rate and dividend yields, this study examine whether or not excess returns on ex-dividend days are positively related to dividend yields and foreign dividend

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[1] Tax-exempt organizations include corporations organized under Act of Congress, title holding corporations for exempt organizations, teacher's retirement fund associations, benevolent life insurance association, mutual ditch or irrigation companies, mutual or cooperative telephone companies, cemetery companies, state chartered credit unions, mutual reserve fund, mutual insurance companies or associations, cooperative organizations to finance crop operations, employee funded pension trusts, black lung benefit trusts, withdrawal liability payment funds, title holding corporations or trusts with multiple parents, state-sponsored high-risk health coverage organizations, state-sponsored worker's compensation reinsurance organizations, religious and apostolic associations, cooperative service organizations of operating educational organizations, child care organization, farmers' cooperative associations.

income tax rates. In addition to foreign tax liability, transaction costs affect the choice of holding security and engaging in cash distributions. Therefore, this study employs transaction cost, foreign dividend income tax rate and dividend yield to examine the determinants of abnormal returns on ex-dividend days.

This paper uses a sample of 6,461 cash dividend distributions of 528 firms from 42 different countries from 1988 to 2004. We apply the statistics from traditional method, cross-section method, and sign test method to examine the magnitude of excess returns. Our results exhibit the prominent excess returns exactly on ADR ex-dividend days. Since double tax, U.S. tax and foreign withholding tax, may apply on the ADR dividend income, the tax effect is apparent on ex-dividend day. Although we do not indicate the foreign tax rate as the monotonically increasing function of abnormal returns, the results of regressions present that the ex-day abnormal returns are positively associated with foreign tax costs, the product of foreign tax rates and dividend yields, as well as transaction costs. It slightly supports the tax-induced ex-day trading activity that is constrained by transaction costs. For robust check, we compare the ex-dividend ADR abnormal returns between stock dividends and cash distributions, since U.S. apply dividend income tax on cash distributions, rather than stock dividends. Inconsistent with the tax effect hypothesis, the results exhibit the greater ex-day ADR abnormal returns of stock dividends than those of cash dividends. The market react more to stock dividends than cash dividend on ex-dividends days, although U.S. tax employ heavier income taxes on cash dividends. Our findings imply that tax factors cannot provide the complete evidence to explain the excess returns on ex-dividend days.

2. The model

Elton and Gruber (1970) and Kalay (1982) argue that market will value a dollar of dividends less than a dollar of capital gains because investors, who receive dividends, must pay taxes due on the dividends. Hence, the ex-day prices of ADRs will on average fall by less than the amount of the taxable dividend since ADRs are subject to dividend income tax under U.S and foreign regulations. In other words, we may observe abnormal returns on ex-days. To formalize this reasoning, we define the

after-tax rate of return on ADR i as:

$$\tilde{R}_{i,t}^{\tau} \equiv \frac{\tilde{P}_{i,t} - P_{i,t-1}}{P_{i,t-1}}(1-\tau_{i,g}) - \frac{D_{i,t}}{P_{i,t-1}}(1-\tau_{i,d}-\tau_{i,f}) \qquad \text{(i)}$$

where $\tilde{R}_{i,t}^{\tau}$ is the after-tax rate of return on day t to the marginal investor in ADR i

under U.S. regulations, $\tilde{P}_{i,t}$ is the price of ADR i at the end of day t, $\tau_{i,g}$ and $\tau_{i,d}$

are the present value of the capital gain and dividend income tax rate of the marginal

investor for ADR i under U.S. tax regulations, $\tau_{i,f}$ is the excess value of

withholding foreign dividend income tax rate relative to the U.S. dividend income tax

liability for the ith ADR, $D_{i,t}$ is the dividend paid on day t. Taking expectations of

equation (i) and rearranging terms we obtain:

$$E(\tilde{R}_{i,t}^{\tau}) = E(\tilde{R}_{i,t})(1-\tau_{i,g}) - \frac{D_{i,t}}{P_{i,t-1}}(\tau_{i,d}+\tau_{i,f}-\tau_{i,g}) \qquad \text{(ii)}$$

where $E(\tilde{R}_{i,t}) = \dfrac{E(\tilde{P}_{i,t}) - P_{i,t-1} + D_{i,t}}{P_{i,t-1}}$ is the expected pre-tax rate of return on day t

for ADR i. If expected after-tax rates of return are constant over time,

$E(\tilde{R}_{i,t}^{\tau}) = E(\tilde{R}_{i}^{\tau})$, for all t. Equation (ii) can be written as:

$$E(\tilde{R}_{i,t}) = \gamma_{0,i} + \gamma_{1,i}d_{i,t} \qquad \text{(iii)}$$

where:

$$\gamma_{0,i} = \frac{E(\tilde{R}_{i,t}^{\tau})}{(1-\tau_{i,g})}, \qquad \gamma_{1,i} = \frac{(\tau_{i,d}+\tau_{i,f}-\tau_{i,g})}{(1-\tau_{i,g})}, \qquad d_{i,t} \equiv \frac{D_{i,t}}{P_{i,t-1}}$$

Equation (iii) captures the essence of tax hypothesis in its simplest form. Because

dividend yields $(d_{i,t})$ are zero on all days except the ex-day, the tax effects of

dividends will only be reflected in the ex-day returns. If the marginal investor's tax

rate on dividend income, including U.S. and foreign taxation $(\tau_{i,d}+\tau_{i,f})$, is greater

than the present value of the capital gains tax rate $(\gamma_{1,i} > 0)$, the investor will require

a tax premium $(\gamma_{1,i}d_{i,t})$ in the form of a higher pre-tax return on the ex-dividend day.

Consequently, the required pre-tax rate of return is equal to its non ex-day expected rate of return $(\gamma_{0,i})$ plus a tax premium $(\gamma_{1,i}d_{i,t})$, in which the tax factor $\gamma_{1,i}$ is positive function of foreign withholding tax rate $\tau_{i,f}$. Hence, ADR returns appear substantially great on ex-dividend days as suggested by the following hypothesis:

H$_1$: ADR abnormal returns exist on ex-dividend days.

As the foreign withholding tax rate $\tau_{i,f}$ is greater for ADR i than the other ADRs, tax factor $\gamma_{1,i}$ expand and the investor will demand greater tax premium in the form of a higher pre-tax return on the ex-dividend day. The interactions of tax factor $\gamma_{1,i}$ and dividend yield $d_{i,t}$, the tax costs, attribute to ADR excess returns on ex-dividend day. Post-tax rate of return is the function of tax factor $\gamma_{1,i}$, and dividend yield $d_{i,t}$, namely, tax costs $(\gamma_{1,i} \times d_{i,t})$. Since ADR issued from various counties are subject to different foreign tax rate $\tau_{i,f}$ in tax factor $\gamma_{1,i}$ components, greater foreign tax rate $\tau_{i,f}$ results in heavier tax costs, which expand the after-tax rate of return. To analyze the determinants of ex-day abnormal returns, this paper offers the following hypotheses:

H$_2$: ADR abnormal returns are positively associated with the withholding foreign tax rate.

H$_3$: ADR abnormal returns are positively associated with the dividend yield.

H$_4$: ADR abnormal returns are positively associated with the withholding foreign tax cost, the product of foreign tax rate and dividend yield.

3. Data

To test tax-induced trading activity, we constructed a sample of ADR distribution from the Center for Research in Securities Prices (CRSP) databases, consisting of all regular cash distributions over the period 1988 to 2004. The CRSP database provides information necessary to identify the events (ex-dividend days) and to obtain the information of daily rates of returns for each firms.

Callaghan and Barry (2003) investigate the relations of tax-induced trading volume from 1988 to 1995 and only obtain the tax rate from World Corporate Tax Guide (Ernst and Young (1995)). Since we expand the sample from 1988 to 2004, we employ the tax rate from the two editions of World Corporate Tax Guides (Ernst and Young (1995) and Ernst and Young (2002)). Because the foreign tax rate may vary with the tax regulation changes, we divide our sample into two periods. The first period is from 1988 to 1998 and the second period is from 1999 to 2004. Tax rates in the first and second periods are based on the data listed in Ernst and Young (1995) and Ernst and Young (2002) World Corporate Tax Guides, respectively.

To include the ADRs with complete data about rates of returns and tax rates, this paper summarizes 6,461 cash distributions of 528 firms from 42 different countries and treats each distribution (or ex-dividend day) as a single observation. The final sample is composed of 379 NYSE-listed, 7 AMEX-listed, 142 NASDAQ-listed ADRs with 4,541, 112, and 1,108 cash distributions respectively. Table 1 presents the sample composition by exchange, country and foreign tax rate.

Table 1 Sample Description
Panel A: Sample composition by exchange

Exchange	Distributions	Firm number	Proportion
NYSE	4,541	379	70%
AMEX	112	7	2%
NASDAQ	1,808	142	28%
Total	6,461	528	100%

Panel B: Sample composition by country and foreign tax rate

Country	Distributions	Firm number	Foreign tax rate	
			1988-1998	1999-2004
ANGOLA	2	1	10%	10%
ARGENTINA	137	16	0%	0%
AUSTRALIA	365	23	15%	30%
AUSTRIA	1	1		25%
BELGIUM	4	1		25%
BRAZIL	138	12	15%	0%
CHILE	470	28	24%	19%
CHINA	118	17	10%	10%
COLOMBIA	20	1	8%	7%
DENMARK	29	3	15%	28%
FINLAND	51	8	15%	29%
FRANCE	193	28	15%	25%
GERMANY	66	16	10%	20%
GREECE	22	5	0%	0%
HONG KONG	73	9	0%	0%
HUNGARY	7	1	20%	20%
INDIA	49	11		0%
INDONESIA	30	3	15%	20%
IRELAND	117	7	0%	20%
ISRAEL	131	9	25%	25%
ITALY	138	16	15%	27%
JAPAN	794	36	15%	20%
KOREA	52	8	15%	0%
LUXEMBOURG	35	3	8%	25%
MEXICO	271	29	0%	0%
NETHERLANDS	265	19	15%	25%
NEW ZEALAND	106	9	15%	30%
NORWAY	82	13	15%	25%
PERU	39	3	0%	0%
PHILIPPINES	35	1	35%	0%
POLAND	1	1		15%
PORTUGAL	28	3	25%	25%
RUSSIA	19	3	15%	15%
SINGAPORE	1	1	0%	0%
SOUTH AFRICA	351	23	15%	0%
SPAIN	266	9	15%	18%
SWEDEN	133	21	15%	30%
SWITZERLAND	48	11	35%	35%
TAIWAN	6	5		30%
TURKEY	2	1		15%
UNITED KINGDOM	1,735	110	15%	0%
VENEZUELA	31	3	0%	34%
Total	6,461	528		

4. Analyses and Results

4.1 Abnormal returns on ex-dividend periods for ADR cash distributions

To examine the tax-induced price effect surrounding the ex-dividend periods, this paper employs the standard event study methodology to explore the abnormal returns following the Foerster and Karolyi (1999). This paper defines the ex-dividend dates (event dates) of cash distributions as day 0, the estimation interval as the periods from day –260 to day –11 and the ex-dividend interval as the periods from day -10 to

day 10. We utilize the data in estimation interval to measure the parameters in market models as equation (1):

$$R_{i,t} = \alpha_i + \beta_i R_{crsp,t} + \varepsilon_{i,t} \qquad (1)$$

where $R_{i,t}$ is the rates of returns on day t for ADR i. $R_{crsp,t}$ is the rates of returns on day t for the CRSP weighted index, which measure the ADR market index. After the regression (1) is performed in estimation interval, we get parameters $\hat{\alpha}_i$, $\hat{\beta}_i$ and calculate the expected returns, $E(R_{i,t}) = \hat{\alpha}_i + \hat{\beta}_i R_{crsp,t}$. We then calculate the actual returns minus expected returns to measure the abnormal return $AR_{i,t}$ for ith firm on day t during the ex-dividend periods as equation (2). Besides, the cumulative abnormal returns over the ex-dividend period for ADR i from the day -10 to T_2 $CAR_{i,\tau}(-10, T_2)$ are represented by equations (3).

$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{crsp,t}) \qquad (2)$$

$$CAR_{i,\tau}(-10, T_2) = \sum_{\tau=-10}^{T_2} AR_{i,\tau} \qquad (3)$$

We observe the pattern of abnormal return and cumulative abnormal return around the ex-dividend days. This paper further examines whether the negative excess return occur prior ex-dividend days and positive excess return exist on ex-dividend days to confirm the "tax effect" of ADR cash distributions. To test whether the abnormal return on event day t is statistically different from zero, this paper applies three methods: (1) traditional method, (2) cross-sectional method, and (3) sign test method to examine statically significance of abnormal returns to test the hypothesis H_1.

(1) Traditional method

Traditional method assumes that the variance of abnormal returns in event intervals can be estimated by the variance of returns in the estimation interval. The

t-statistics in traditional method is calculated as equation (4):

$$t_0 = \frac{\overline{AR_{it}}}{\frac{1}{N}\sqrt{\sum_{i=1}^{N}\hat{\sigma}^2_{ARit}}} \sim N(0,1) \qquad (4)$$

Where:

$$\overline{AR_t} = \frac{1}{N}\sum_{i=1}^{N} AR_{it}$$

$$\sigma^2_{AR_{it}} = \sigma_i^2 \left\{ 1 + \frac{1}{T_1} + \frac{\left(R_{crsp,t} - \overline{R}_{crsp}\right)^2}{\sum_{t=-260}^{-11}\left(R_{crsp,t-} \overline{R}_{crsp}\right)^2} \right\}$$

$$\sigma_i^2 = \left(\frac{1}{T_1 - 2} \sum_{t=-260}^{-11} \hat{\varepsilon}_{it}^2 \right)$$

$$\overline{R_{crsp}} = \frac{1}{250}\sum_{t=-260}^{-11} R_{crsp,t}$$

$$T_1 = 250$$

(2) Cross-sectional method

Brown and Warner (1985) indicate the variations of stock returns should be different between estimation intervals and event intervals, since stock returns face the structural change in event periods. Brown and Warner (1985) propose to ignore the residual variance of individual security information in market model and use the cross-sectional variance of stock returns from the sample during the event intervals. The t statistics in cross-sectional method can be calculated in equation (5):

$$t_{CS} = \frac{\overline{AR_t}}{\sqrt{\frac{1}{N(N-1)} \sum_{i=1}^{N} (AR_{it} - \sum_{i=1}^{N} \frac{AR_{it}}{N})^2}} \sim N(0,1) \qquad (5)$$

(3) Sign test method

Traditional method and cross-sectional method are parametric statistics methods, so this paper also selects non-parametric methods-sign test to examine the significance of abnormal returns. The t statistics in sign test method can be calculated in equation (6):

$$t_{ST} = \left| P - \frac{1}{2} \right| \left[\frac{\left(\frac{1}{2}\right)^2}{N} \right]^{-\frac{1}{2}} \qquad (6)$$

where P is the proportion of the positive abnormal returns. The sign test emphasize whether the proportion of the positive abnormal returns are significantly more than 0.5.

Average abnormal returns and average cumulative abnormal returns from -10 days to +10 days around the ex-dividend day for our sample firms are presented in Figure 1 and Figure 2. Abnormal returns dramatically jump on ex-dividend days in Figure 1. Since double tax, U.S. tax and foreign withholding tax, may apply on the ADR dividend income, the tax effect is apparent on ex-dividend days. Except for negative abnormal returns on day -10 and -9, unobvious abnormal returns occur on day (-8,-1) and day (+1,+10) around the ex-dividend day. Also, the pattern of cumulative abnormal return substantially run up on ex-dividend days, and weekly increase prior to and post ex-dividend days in Figure 2. This suggests the tax-motivated trading activity on ex-dividend day.

Figure 1 Abnormal Returns during ex-dividend periods
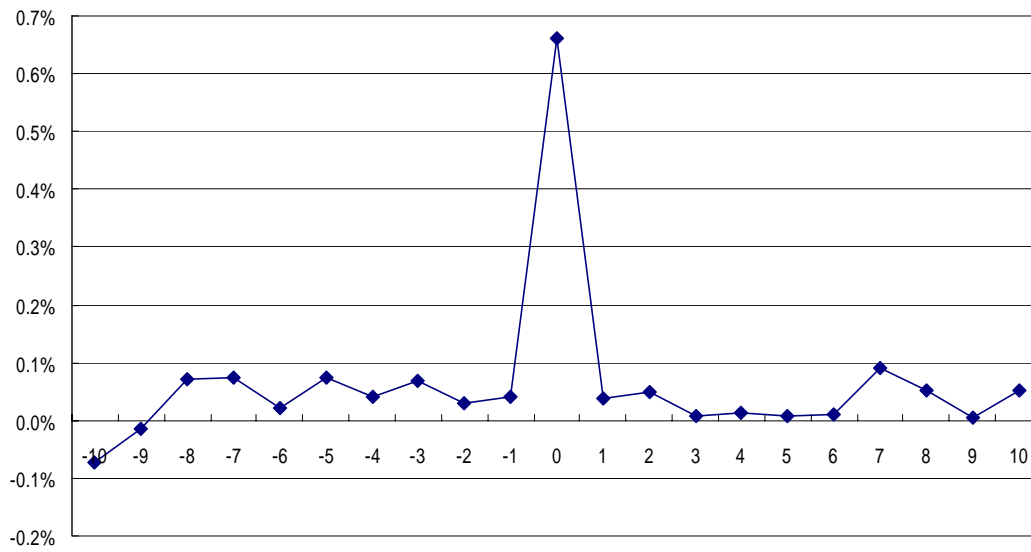
Figure 2 Cumulative abnormal returns during ex-dividend periods
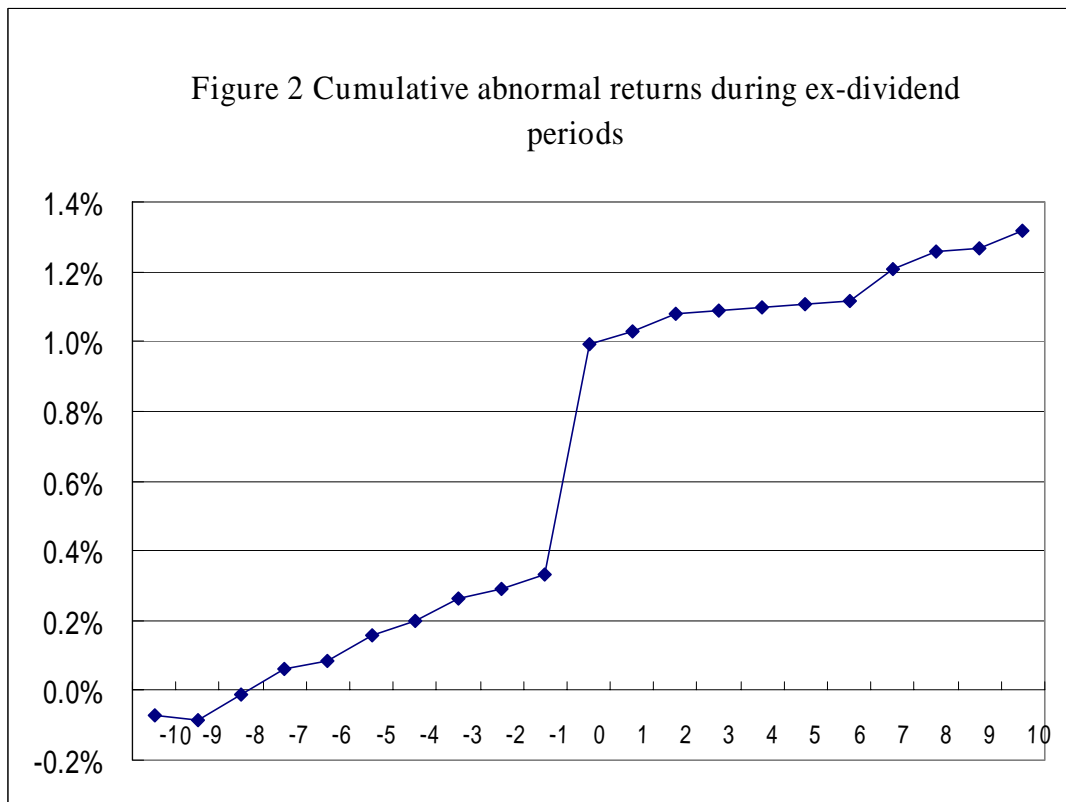
The cumulative abnormal returns over the ex-dividend period for ADR i from the day -10 to T$_2$ $CAR_{i,\tau}(-10, T_2)$ are represented as $CAR_{i,\tau}(-10, T_2) = \sum_{\tau=-10}^{T_2} AR_{i,\tau}$.

The statistical results of the abnormal returns during the ex-dividend periods are expressed in Table 2. The abnormal returns on ex-dividend are 0.6602, significantly

positive at 1% level based on the results of the t-statistics from all the three methods-traditional method, cross-sectional method and sign test method, consistent with hypothesis H_1. Even though average abnormal returns are positive on day -1, there are more negative abnormal returns than positive returns. Sign test exhibits significantly negative abnormal returns on day -1, which suggests the net sale of stock before ex-dividend days.

Table 2 Abnormal returns and cumulative abnormal returns around ex-dividend days

Day	Abnormal return (%)	Cumulative abnormal return CAR(-10,t)(%)	T-statistics-Traditional method	T-statistics-Cross-sectional method	T-statistics-Sign test method
-10	-0.0722	-0.0722	-2.3642**	-2.3420**	-5.1878***
-9	-0.0131	-0.0853	-0.4298	-0.4042	-2.3513**
-8	0.0725	-0.0129	2.3719**	2.3325**	-1.4058
-7	0.0733	0.0605	2.4002**	2.3888**	-1.1321
-6	0.0221	0.0826	0.7229	0.7184	-2.5255**
-5	0.0746	0.1572	2.4416**	2.2968**	0.1866
-4	0.0397	0.1969	1.3005	1.1876	-0.9082
-3	0.0674	0.2643	2.2070**	2.1548**	-0.7340
-2	0.0285	0.2928	0.9329	0.9181	0.4105
-1	0.0401	0.3330	1.3131	1.3218	-2.4260**
0	0.6602	0.9931	21.6151***	17.3925***	17.0813***
1	0.0371	1.0302	1.2146	1.1651*	-1.5053
2	0.0480	1.0782	1.5703	1.4776	-0.5598
3	0.0079	1.0861	0.2596	0.2455	-2.5504**
4	0.0130	1.0991	0.4238	0.4036	-2.9236***
5	0.0081	1.1071	0.2637	0.2712	-2.0776
6	0.0096	1.1168	0.3146	0.3180	-2.9734***
7	0.0921	1.2089	3.0144***	2.9426***	-0.6096
8	0.0513	1.2602	1.6792*	1.6516*	-2.4508**
9	0.0058	1.2660	0.1913	0.1926	-2.5753**
10	0.0512	1.3172	1.6766*	1.6249	-2.0776**

*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

Table 3 provides the results for the ADR abnormal returns on ex-dividend day by different country. Of the 42 countries, the abnormal returns are positive on ex-dividend day, excepting for negative abnormal returns for ADRs issued in Peru. It suggests the net purchase on ex-dividend day. This paper further selects 34 countries with more than 8 observations and calculates the T-statistic of the abnormal returns in

Table 3. The result shows that the abnormal returns are significantly positive for 25, 25 and 23 of the 34 countries in traditional, cross-sectional and sign test method. As Campbell and Beranek (1955) propose, investors may accelerate their sales before ex-dividend days and delay their purchases until ex-dividend days. The stock prices dramatically increase up, which leads to abnormal return on ex-dividend days.

Table 3 Abnormal returns on ex-dividend days by country

Country	Observations	Abnormal return (%)	T-statistics-Traditional method	T-statistics-Cross-sectional method	T-statistics-Sign test method
ANGOLA	2	2.0126			
ARGENTINA	137	0.7203	3.2826***	3.3980***	1.7942*
AUSTRALIA	365	0.8176	7.4942***	5.8054***	6.9615***
AUSTRIA	1	1.2436			
BELGIUM	4	0.1637			
BRAZIL	138	0.7729	2.6972***	2.7108***	1.7025*
CHILE	470	0.2910	2.9374***	3.1134***	1.6606*
CHINA	118	1.0027	3.0988***	2.7465***	2.2094**
COLOMBIA	20	0.4151	1.1182	1.1070	0.8944
DENMARK	29	0.1508	0.3250	0.4534	0.9285
FINLAND	51	1.0677	2.7398***	1.8522*	2.1004**
FRANCE	193	0.4989	2.8592***	3.1068***	1.3676
GERMANY	66	0.8945	3.2777***	3.1443***	2.2156**
GREECE	22	0.7002	1.2479	1.1255	1.7056
HONG KONG	73	0.9767	2.7794***	2.6960***	2.9260***
HUNGARY	7	0.4995			
INDIA	49	0.5351	0.9211	1.2505	1.0000
INDONESIA	30	0.9045	1.4119	1.7461*	0.0000
IRELAND	117	0.5534	2.4341***	2.7323***	4.1603***
ISRAEL	131	0.5154	2.3456**	1.9953**	1.4853
ITALY	138	1.0452	5.2164***	5.0921***	5.1075***
JAPAN	794	0.5659	6.7568***	6.0573***	6.5299***
KOREA	52	1.1249	2.1415**	1.5022	0.5547
LUXEMBOURG	35	0.5655	1.8486*	1.9592*	3.2116***
MEXICO	271	0.5660	3.4615***	3.6524***	2.0046**
NETHERLANDS	265	0.6536	5.3168***	4.5039***	4.1158***
NEW ZEALAND	106	0.6456	3.3565***	3.1718***	1.5541
NORWAY	82	0.7225	2.4123**	2.4098**	2.4295**
PERU	39	-0.0901	-0.1820	-0.1307	0.1601
PHILIPPINES	35	1.4825	3.7223***	2.4824**	1.8593*
POLAND	1	1.0828			
PORTUGAL	28	1.0878	2.9774***	3.0262***	2.6458***
RUSSIA	19	0.1141	0.1357	0.1547	-0.6882
SINGAPORE	1	0.2026			
SOUTH AFRICA	351	1.2471	7.4722***	5.0714***	5.2842***
SPAIN	266	0.4828	4.4465***	3.9944***	2.6978***
SWEDEN	133	1.0264	5.3572***	4.1853***	3.9020***
SWITZERLAND	48	0.4157	1.2060	1.3424	2.3094**
TAIWAN	6	0.9258			
TURKEY	2	4.3699			
UNITED KINGDOM	1735	0.5971	10.9753***	7.0625***	7.8985***
VENEZUELA	31	0.6807	1.1090	1.0447	1.9757**

*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

Panel A of Table 4 exhibits the abnormal return distributions subject to different foreign dividend tax rate. The median and the mean of abnormal returns are significantly positive in the group where foreign tax rate equals to zero. Although ADRs in the group are not subject to foreign tax rate, these ADRs are still subject to U.S. tax rate. Hence, those ADR investors may be taxable investors who would, at the margin of U.S. dividend income tax, accelerate their sales before ex-dividend days and delay their purchase until the ex-dividend days. This leads to the excess returns on ex-dividend days. The median of abnormal return are 0.0041, 0.0049, 0.0054 and 0.0071 for ADRs subject to foreign tax rate 0%, 15%, 20% and 34%, respectively. The abnormal returns appear somewhere ascendant trend as the foreign tax rate increases. However, we do not conclude that the patterns of abnormal returns increase monotonously with foreign dividend tax rate.

Table 4 Abnormal returns on ex-dividend days by foreign tax rate and dividend yield
Panel A: Abnormal returns (%) by tax rate in full sample

Foreign tax rate	Observation	Median	Mean	Minimum	Maximum	Standard Deviation	t-statistics
0%	1,543	0.0041	0.0072	-0.1820	0.6279	0.0371	7.6233***
7%	4	0.0036	0.0036	-0.0116	0.0187	0.0127	0.5669
7.5%	28	0.0062	0.0044	-0.0662	0.0348	0.0183	1.2723
8%	16	0.0042	0.0043	-0.0255	0.0477	0.0180	0.9556
10%	141	0.0056	0.0086	-0.0996	0.1632	0.0370	2.7600***
15%	2,842	0.0049	0.0068	-0.2497	0.4619	0.0274	13.2303***
18%	89	0.0026	0.0038	-0.0635	0.1037	0.0207	1.7318*
19%	233	0.0017	0.0027	-0.0951	0.0564	0.0197	2.0921**
20%	430	0.0054	0.0066	-0.0684	0.1463	0.0285	4.8021***
24%	237	0.0010	0.0031	-0.0934	0.0992	0.0209	2.2834**
25%	453	0.0043	0.0060	-0.0839	0.1247	0.0265	4.8190***
27%	69	0.0065	0.0096	-0.0506	0.0807	0.0227	3.5129***
28%	14	0.0057	0.0011	-0.0585	0.0403	0.0234	0.1759
29%	32	0.0001	0.0047	-0.0624	0.2310	0.0486	0.5471
30%	240	0.0071	0.0103	-0.1025	0.1581	0.0290	5.5023***
34%	18	0.0051	0.0027	-0.0616	0.0553	0.0385	0.2975
35%	72	0.0030	0.0092	-0.0591	0.1268	0.0304	2.5679***
Total	6,461						

*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

To avoid the results affected by the outliers, this study trims the sample at one

percentage. We dismiss the 0.1% extreme value of ex-dividend abnormal returns (the greatest 323 abnormal returns and the least 323 abnormal returns), so we can investigate the abnormal returns without the effect of outliers. Panel B of Table 4 exhibits the abnormal return distributions subject to different foreign dividend tax rate in the trimmed sample, which excludes the extreme 1% value. The mean for non-taxable group (0% tax rate) is 0.0052, much lower than 0.0072 in panel A, because this sample deletes the maximum of abnormal returns 0.6279. The mean of abnormal return are 0.0052, 0.0059, 0.0065 and 0.0076 for ADRs subject to foreign tax rate 0%, 15%, 20% and 30%, respectively. The mean and median of abnormal return appear somewhere ascendant trend as the foreign tax rate increases. However, we do not conclude that the patterns of abnormal returns increase monotonously with foreign dividend tax rate.

Panel B: Abnormal returns (%) by tax rate in trimmed sample

Foreign tax rate	Observation	Median	Mean	Minimum	Maximum	Standard Deviation	t-statistics
0.0%	1364	0.0041	0.0052	-0.0304	0.0469	0.0170	11.2970[***]
7.0%	4	0.0036	0.0036	-0.0116	0.0187	0.0127	0.5669
7.5%	27	0.0063	0.0070	-0.0180	0.0348	0.0121	3.0060[***]
8.0%	15	0.0026	0.0014	-0.0255	0.0352	0.0143	0.3792
10.0%	109	0.0049	0.0056	-0.0288	0.0467	0.0174	3.3601[***]
15.0%	2623	0.0049	0.0059	-0.0304	0.0468	0.0155	19.4948[***]
18.0%	83	0.0029	0.0053	-0.0284	0.0459	0.0142	3.4004[***]
19.0%	221	0.0017	0.0046	-0.0286	0.0466	0.0156	4.3836[***]
20.0%	365	0.0055	0.0065	-0.0304	0.0466	0.0183	6.7859[***]
23.5%	222	0.0010	0.0033	-0.0288	0.0461	0.0152	3.2348[***]
25.0%	396	0.0047	0.0057	-0.0298	0.0469	0.0172	6.5947[***]
27.0%	63	0.0061	0.0082	-0.0288	0.0463	0.0163	3.9930[***]
28.0%	13	0.0065	0.0057	-0.0203	0.0403	0.0165	1.2456
29.0%	25	0.0063	0.0038	-0.0225	0.0356	0.0168	1.1310
30.0%	211	0.0064	0.0076	-0.0290	0.0460	0.0165	6.6907[***]
34.0%	12	0.0210	0.0204	-0.0029	0.0448	0.0184	3.8406[***]
35.0%	62	0.0029	0.0058	-0.0264	0.0390	0.0165	2.7678[***]
Total	5,815						

[*]Significant at the 10% level. [**]Significant at the 5% level. [***]Significant at the 1% level.

This study selects the 4,918 ADR dividend distributions subject to foreign taxes

as the taxable sample. In panel C of Table 4, all taxable distributions subject to foreign dividend tax are partitioned into dividend yield quartiles. We observe average abnormal returns are 0.0025, 0.0032, 0.0065 and 0.0138 from the quartile 1 (the lowest quartile) to quartile 4 (the highest quartile), so abnormal returns increase with the dividend yields. The abnormal returns in the highest yield quartile appear greatest, which suggest fewer declines in nominal price for the highest yield quartile. In addition, this study further eliminates the 1% extreme value (the greatest 323 abnormal returns and the least 323 abnormal returns) to observe the pattern of abnormal returns in dividend yield quartiles in panel D of Table 4. Consistent with the results in panel C, abnormal returns appear to be a monotonic increasing function of dividend yields. The greatest (least) abnormal returns exist in the highest (lowest) dividend yield quartile. These patterns of ex-date ADR prices from 1988 to 2004 are the same as those from 1988 to 1995 in Callaghan and Barry (2003).

Elton and Gruber (1970) examine all stocks listed on the NYSE from April, 1966, to March 31, 1977 and they generally find that the drop percentage in price on the ex-day is positively associated with dividend yield. For the highest dividend deciles, they document a nominal price decline that approximates the dividend, while a drop that are smaller than the dividend for other deciles. They attribute this to a clientele of tax-exempt investors holding the high yield.

In contrast to the results in Elton and Gruber (1970), more ex-day price decline is shown for ADRs with low dividend yields than high dividend yield in our findings and Callaghan and Barry (2003) findings. One possible interpretation may be that all shareholders are subject to the identical foreign tax rate for ADRs issued by the firms from the same countries. ADR investors aim the ADRs issued by specific countries to establish their international diversification without going abroad or trading shares on foreign stock exchanges. They mainly choose their preferred ADRs to form their investment portfolios. Since high yield leads to greater tax cost, ADR investors would accelerate their sales before ex-dividend days and delay their purchases until ex-dividends days. This causes the fact that abnormal return on ex-dividend days are positively related to dividend yield.

Panel C: Abnormal returns (%) by dividend yield in full sample

Quartile	N=4,918	$AR_{i,t}$	$Transaction_{i,t}$	$Yield_{i,t}$	$Tax_{i,t} \times Yield_{i,t}$
1.	Mean	0.0025	0.0088	0.0034	0.0006
(Lowest)	Median	0.0017	0	0.0035	0.0006
	Maximum	0.1632	0.6667	0.006	0.002
	Minimum	-0.2497	-0.0011	0	0
	Standard Deviation	0.0255	0.0342	0.0015	0.0003
	Observations	1,230			
2.	Mean	0.0032	0.0069	0.0095	0.0017
	Median	0.0026	0	0.0094	0.0016
	Maximum	0.21	0.321	0.0133	0.0047
	Minimum	-0.2264	-0.0019	0.006	0.0005
	Standard Deviation	0.0239	0.0203	0.0021	0.0006
	Observations	1,230			
3.	Mean	0.0065	0.0073	0.0181	0.0033
	Median	0.0057	0	0.0178	0.003
	Maximum	0.1247	0.2927	0.0235	0.008
	Minimum	-0.0966	0	0.0133	0.0009
	Standard Deviation	0.0217	0.0211	0.0029	0.0012
	Observations	1,229			
4.	Mean	0.0138	0.0080	0.0429	0.008
(Highest)	Median	0.0102	0	0.0325	0.0056
	Maximum	0.4619	0.25	0.7776	0.1614
	Minimum	-0.1282	0	0.0235	0.0018
	Standard Deviation	0.0348	0.0227	0.0446	0.0101
	Observations	1,229			

Panel D: Abnormal returns (%) by dividend yield in trimmed sample

Quartile	N=4,451	$AR_{i,t}$	$Transaction_{i,t}$	$Yield_{i,t}$	$Tax_{i,t} \times Yield_{i,t}$
1.	Mean	-0.0137	0.0059	0.0153	0.0028
(Lowest)	Median	-0.0120	0.0000	0.0112	0.0020
	Maximum	-0.0050	0.2927	0.1884	0.0565
	Minimum	-0.0304	-0.0011	0.0001	0.0000
	Standard Deviation	0.0066	0.0177	0.0146	0.0032
	Observations	1,113			
2.	Mean	0.0000	0.0060	0.0152	0.0028
	Median	0.0001	0.0000	0.0111	0.0019
	Maximum	0.0047	0.6667	0.4052	0.0729
	Minimum	-0.0050	0.0000	0.0000	0.0000
	Standard Deviation	0.0027	0.0277	0.0188	0.0040
	Observations	1,113			
3.	Mean	0.0097	0.0070	0.0173	0.0031
	Median	0.0094	0.0000	0.0143	0.0023
	Maximum	0.0159	0.6667	0.4610	0.1614
	Minimum	0.0047	-0.0002	0.0002	0.0001
	Standard Deviation	0.0032	0.0277	0.0188	0.0054
	Observations	1,112			
4.	Mean	0.0273	0.0078	0.0223	0.0041
(Highest)	Median	0.0256	0.0000	0.0173	0.0030
	Maximum	0.0469	0.1609	0.4357	0.0857
	Minimum	0.0159	-0.0019	0.0010	0.0001
	Standard Deviation	0.0084	0.0177	0.0267	0.0056
	Observations	1,113			

The difference analysis of abnormal returns according to foreign tax rate and dividend yield for the full sample is exhibited in Panel E of Table 4. The columns partition the sample by the foreign tax rate into three parts- non-taxable, low tax rate and high tax rate columns. This paper uses the median of the foreign tax rate, $Tax_{i,t} = 15\%$, as the criteria to partition high and low foreign tax parts. The rows divide the sample by the dividend yield into two parts according to the median of the dividend yield, $Yield_{i,t} = 1.3326\%$ and $Yield_{i,t} = 1.3308\%$, for the full sample and the trimmed sample, respectively. Thus, we divide our sample into six parts. Firms falling in cell (v) are classified as firms with heaviest foreign tax cost due to the

high foreign tax rate and dividend yield. We predict firms in cell (v) are most likely to have excess returns on ex-dividend days.

For full sample firms, the median of abnormal returns appear the greatest for firms with high dividend yield and high foreign tax rate. This suggests heavy foreign tax cost, the product of foreign tax rate and dividend yield, lead investors to sell ADRs before ex-dividend days to avoid the dividend distribution and repurchase ADRs on ex-dividend days, in the result of excess returns. On the other hand, firms without foreign tax costs, located in cell (i) and (ii), also contain abnormal returns on ex-dividend days because ADRs are still subject to U.S. taxation.

For trimmed sample firms, the mean and the median of abnormal returns appear the greatest (smallest) for firms with high (low) dividend yield and high (zero) foreign tax rate. This suggests heavy foreign tax cost, the product of foreign tax rate and dividend yield, lead investors to accelerate their sale of ADRs before ex-dividend days and repurchase ADRs on ex-dividend days, in the result of excess returns. On the other hand, firms without foreign tax costs, located in cell (i) and (ii), also contain abnormal returns on ex-dividend days because ADRs are still subject to U.S. taxation. Especially, ex-day abnormal returns are greater for firms located in cell (i) than those in cell (ii) since high dividend yield cause heavier U.S. tax premiums.

Panel E: Abnormal returns (%) by dividend yield and foreign tax rate

Full Sample (N=6,461)

		Foreign Tax Rate					
		Zero		Low		High	
Dividend Yield		$Tax_{i,t} = 0$		$0 \leq Tax_{i,t} \leq 15\%$		$Tax_{i,t} > 15\%$	
High	Mean	(i)	0.0130	(iii)	0.0098	(v)	0.0108
$Yield_{i,t} > 1.3326\%$	Median	(i)	0.0074	(iii)	0.0073	(v)	0.0079
	N	776		1,672		767	
Low	Mean	(ii)	0.0015	(iv)	0.0031	(vi)	0.0026
$Yield_{i,t} \leq 1.3326\%$	Median	(ii)	0.0008	(iv)	0.0026	(vi)	0.0014
	N	767		1,359		1,108	

Panel E (Continued)

Trimmed Sample (N=5,815)

Dividend Yield		Foreign Tax Rate					
		Zero $Tax_{i,t} = 0$		Low $0 \leq Tax_{i,t} \leq 15\%$		High $Tax_{i,t} > 15\%$	
High $Yield_{i,t} > 1.3308\%$	Mean	(i)	0.0077	(iii)	0.0077	(v)	0.0086
	Median	(i)	0.0066	(iii)	0.0070	(v)	0.0076
		677		1,534		699	
Low $Yield_{i,t} \leq 1.3308\%$	Mean	(ii)	0.0027	(iv)	0.0036	(vi)	0.0038
	Median	(ii)	0.0013	(iv)	0.0029	(vi)	0.0020
		687		1,244		974	

4.2 Determinants of abnormal price behavior on ex-dividend day

After examining the excess returns, this paper further employs the regressions to explore the determinants of abnormal trading activity on the ex-dividend day of cash dividend distributions. We set the ex-dividend day as day 0, and a tentative regression to address those variables could be of the following equations (7) and (8):

$$AR_{0,it} = \omega_0 + \omega_1 Tax_{i,t} + \omega_2 Yield_{i,t} + \omega_3 Transaction_{i,t} + \varepsilon_{1i,t} \qquad (7)$$

$$AR_{0,it} = \gamma_0 + \gamma_1 (Tax_{i,t} \times Yield_{i,t}) + \gamma_3 Transaction_{i,t} + \varepsilon_{2i,t} \qquad (8)$$

where:

$AR_{0,it}$ is the abnormal return of ADR i on the ex-dividend day (day 0) for ADR i at time t.

$Tax_{i,t}$ is the foreign tax rate related to dividend distribution of ADR i at time t.

$Yield_{i,t}$ is computed as the dividend for ADR i at time t divided by the price from day t-1.

$Transaction_{i,t} = \dfrac{bid_{i,t} - ask_{i,t}}{(bid_{i,t} + ask_{i,t})/2}$ is the bid-ask spread on the ex-dividend day for ADR i at time t. The bid-ask spread is the bid minus ask prices divided by the average bid and ask prices for ADR i at time t.

The average bid-ask spread represents transaction cost proxy. Since short-term

trading hypothesis emphasizes the transaction cost effect on ex-dividend investor behavior (e.g. Lasfer (1995)), this paper controls the transaction cost factors. Investors' trading activity is constrained by transaction costs. Hence, investors are willing to re-purchase the ADRs on ex-dividend days as long as the stock returns can cover the transactions cost. Since the larger transaction costs induce investors to trade in the condition of higher stock returns, we expect abnormal return are positively correlated to the transaction cost related variables. In equation (7), we regress abnormal return of ex-dividend day (day 0) on foreign tax rate, dividend yield and our proxy for transaction cost. We expect abnormal return to be positively associated with the level of foreign tax rate, dividend yield and transaction costs.

Because foreign tax costs per share are the product of foreign tax rate and cash dividend yield, the interaction between foreign tax rate and dividend yield $(Tax_{i,t} \times Yield_{i,t})$ are related proxies for the total tax cost associated with the cash distributions. Hence, we regress abnormal return of ex-dividend day on the interaction between foreign tax rate and dividend yield $(Tax_{i,t} \times Yield_{i,t})$ as well as the proxy of transaction cost. We expect abnormal return are positively related to the foreign tax cost proxy since greater tax costs cause higher ADR repurchase and excess returns on ex-dividend day in equation (8).

Ayers, Cloyd, and Robinson (2002) state that shareholder dividend taxes of the Revenue Reconciliation Act in 1993 affect stock prices. It is important for us to control the Revenue Reconciliation Act effect in stock price behavior research. The Revenue Reconciliation Act of 1993 resulted in increased U.S. ordinary income tax rates and an increased preference for capital gains relative to dividend income. Investors are more inclined to sell the stock before ex-dividend day and repurchase the stock subsequent to the ex-dividends day after the Revenue Reconciliation Act of 1993. To control the regulatory effect, this study adds the variable $RRA93$ is a dummy variable in regressions (9) and (10):

$$AR_{0,it} = \lambda_0 + \lambda_1 Tax_i + \lambda_2 Yield_i + \lambda_3 Transaction_i + \lambda_4 RRA93_i + \varepsilon_{3i,t} \qquad (9)$$

$$AR_{0,it} = \delta_0 + \delta_1 (Tax_i \times Yield_i) + \delta_2 Transaction_i + \delta_3 RRA93_i + \varepsilon_{4i,t} \qquad (10)$$

where $RRA\,93_{i,t}$ takes on a value of 1 if he distribution occurred after 1992, otherwise 0. We expect the RRA93 dummy variable (which is assigned a value of 1 for distributions affected by the Revenue Reconciliation Act) to be associated with higher levels of abnormal returns. In other words, the coefficients of dummy variables $RRA\,93_{i,t}$ are expected to be positive ($\lambda_4 > 0$ or $\delta_3 > 0$) in equations (9) and (10). Since the pattern of abnormal dramatically rise up exactly on the ex-dividend day, we regress the abnormal return of ex-dividend day on foreign tax cost, transaction cost and regulatory factors in equations (7) to (10) to explore the determinants of trading activity on ex-dividend day.

The results of equations (7) to (10) are presented in panel B of Table 5. We find that the coefficients of foreign tax rates are not significant either in equation (7) or (9), which does not supports hypothesis H_1. In equations (8) and (10), we drop the separate independent variable (foreign tax rate and dividend yield) from the regression, and instead include the product $(Tax_{i,t} \times Yield_{i,t})$ as a proxy for the total tax penalty associated with the cash distribution. In contrast to the results in equations (7) and (9), the coefficients of foreign tax cost $(Tax_{i,t} \times Yield_{i,t})$ are significantly positive with p-value ≤ 0.01. It suggests that trading activities base on foreign tax costs rather than the foreign tax rates. Even though the foreign tax rate is low, high yield results in heavy foreign tax costs. Hence, the heavy costs induce investment behavior changes during the ex-dividend periods. It explains why yields are positively and significantly associated with abnormal returns in equations (7) and (9).

In general, the coefficients of transaction cost are positive and highly significant with p-value ≤ 0.01. It implies that investors may involve in trading activities only when the returns can contain the transaction costs, which causes the positive correlations between return and transaction cost variables. On the other hand, our findings exhibit that Revenue Reconciliation dummy variable $RRA93_{i,t}$ is unrelated to the abnormal returns on ex-dividend. Overall, the regression results equations (7) to (10) supports the tax-induced ex-day trading activity that is constrained by transaction

costs. Consistent with hypothesis H$_3$ and H$_4$, ADR abnormal returns on ex-dividend days are positively related to dividend yield and tax costs.

Furthermore, this study employs the sample, in which the 1% extreme values are deleted (the greatest 323 abnormal returns and the least 323 abnormal returns) and the results are exhibited in panel B of Table 5. We also regress the ex-date abnormal returns on foreign tax cost, transaction cost and regulatory factors with the trimmed sample to avoid the effect of extreme values. Comparing the regression results between panel A and panel B, the coefficients of variables $Yield_{i,t}$, $Transaction_{i,t}$, $(Tax_{i,t} \times Yield_{i,t})$ are smaller in panel B than those in panel A of Table 5 because the trimmed sample in panel B exclude the effect of outliers.

Even though the coefficients are smaller in trimmed sample, we find that the coefficients of foreign tax rate are positive, but insignificant either in equation (7) or (9). In contrast to the results in equations (7) and (9), the coefficients of tax cost $(Tax_{i,t} \times Yield_{i,t})$ are significantly positive with p-value ≤ 0.01 in equations (8) and (10) both in panel A and panel B. It suggests that heavy costs induce investment behavior changes during the ex-dividend periods. Also, the coefficients of transaction cost are positive and highly significant with p-value ≤ 0.01 in equations (8) and (10) in panel B. The regression results in the panel B of Table 5 are consistent with tax-induced ex-day trading activity that is constrained by transaction costs.

The findings of regressions are different from the evidence in Callaghan and Barry (2003) in two respects. First, the foreign tax rate is highly associated with extraordinary ADR trading volume during two day or five day ex-dividend periods in Callaghan and Barry (2003), while we do not find the apparent relations between foreign tax rate and ADR abnormal returns exactly on the ex-dividend day. The possible interpretation may be that foreign tax rate induces the excess trading activities during ex-dividend periods, while the foreign tax rate cannot cause so distinct effect as to cause the variations in prices on ex-dividend day. Investors may consider another important factor, dividend yield, to determine their trading strategy on ex-dividend day. Second, the level of excess trading volume is more pronounced

following the increase in U.S. tax rates associated with RRA93 in Callaghan and Barry (2003), while we do not investigate the excess returns on ex-dividends after heavier burden of U.S. tax. The possible explanation may be that all ADRs face the same U.S. tax rate at the same time. The change in U.S. tax regulatory reform only cause the trading volume change between the periods prior to or subsequent to the Revenue Reconciliation in 1993, but do not cause the positive abnormal returns changes for ADRs on ex-dividend days.

Table 5 Regression analyzing tax and non-tax factors affecting abnormal returns

$$AR_{0,it} = \omega_0 + \omega_1 Tax_{i,t} + \omega_2 Yield_{i,t} + \omega_3 Transaction_{i,t} + \varepsilon_{1i,t} \tag{7}$$

$$AR_{0,it} = \gamma_0 + \gamma_1 (Tax_{i,t} \times Yield_{i,t}) + \gamma_3 Transaction_{i,t} + \varepsilon_{2i,t} \tag{8}$$

$$AR_{0,it} = \lambda_0 + \lambda_1 Tax_{i,t} + \lambda_2 Yield_{i,t} + \lambda_3 Transaction_{i,t} + \lambda_4 RRA93_{i,t} + \varepsilon_{3i,t} \tag{9}$$

$$AR_{0,it} = \delta_0 + \delta_1 (Tax_{i,t} \times Yield_{i,t}) + \delta_2 Transaction_{i,t} + \delta_3 RRA93_{i,t} + \varepsilon_{4i,t} \tag{10}$$

Panel A: Regression result of the full sample

N=6,461	Intercept	$Tax_{i,t}$	$Yield_{i,t}$	$Tax_{i,t} \times Yield_{i,t}$	$Transaction_{i,t}$	$RRA93_{i,t}$	R^2	Adjusted R^2
Equation	0.0011	-0.0015	0.2706		0.0881		0.0927	0.0923
(7)	(1.53)	(-0.37)	(24.25)***		(6.05)***			
Equation	0.0033			0.9770	0.1141		0.0393	0.0390
(8)	(7.85)***			(14.06)***	(7.64)***			
Equation	0.0010	-0.0015	0.2706		0.0881	0.00002	0.0927	0.0921
(9)	(1.00)	(-0.37)	(24.23)***		(6.05)***	(0.02)		
Equation	0.0034			0.9766	0.1141	-0.0001	0.0393	0.0388
(10)	(3.85)***			(14.03)***	(7.64)***	(-0.1)		

*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

Panel B: Regression result of the sample which eliminates the 1% extreme value

N=5,815	Intercept	$Tax_{i,t}$	$Yield_{i,t}$	$Tax_{i,t} \times Yield_{i,t}$	$Transaction_{i,t}$	$RRA93_{i,t}$	R^2	Adjusted R^2
Equation	0.0036	0.0037	0.0802		0.0132		0.0179	0.0174
(7)	(8.69)***	(1.61)	(9.97)***		(1.38)			
Equation	0.0047			0.3583	0.0193		0.0099	0.0095
(8)	(18.69)***			(18.69)***	(2.01)***			
Equation	0.0044	0.0036	0.0794		0.0136	-0.0009	0.0184	0.0177
(9)	(7.14)***	(1.52)	(9.86)***		(1.41)	(-1.73)*		
Equation	0.0055			0.3521	0.0196	-0.0010	0.0104	0.0099
(10)	(10.79)***			(7.17)***	(2.04)**	(-1.84)*		

*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

5. Comparison of non-taxable and taxable sample

The empirical results slightly supports that ADR abnormal returns on the ex-day for cash distributions are positively associated with tax cost. However, we do not conclude that the abnormal returns on the ex-day are monotonic functions of tax rate. To get the robust test, this study further compares the ex-dividend day returns between the non-taxable stock dividend and taxable cash distributions under U.S. tax regulations. The cash dividend is subject to U.S. tax, while the stock dividend is exempt from U.S. dividend income tax. Since the ex-dividend day pricing behavior of non-taxable stock dividends is not consistent with the tax interpretation of ex-dividend day returns, the special setting allows us to compare the ex-dividend day returns between the non-taxable stock dividend and taxable cash distributions under U.S. tax regulations. Hence, we can attribute their difference to the tax factors. The results of the comparison are exhibited in Table 6.

Because ADRs in our sample only implement 309 stock dividends from 1962 to 2004, this study selects 9,053 cash dividends and 309 stock dividends from 1962 to 2004 to compare the difference of ADR abnormal returns on ex-dividend days. Inconsistent with our expectations, Table 6 shows that the difference in abnormal returns between stock dividends and cash dividends is -0.0219. Abnormal returns on ex-day for stock dividends appear significantly higher than those for cash dividends at p-value ≤ 0.01. We partition the sample by various countries and the abnormal returns are significantly greater for stock dividends than those for cash dividends of ADRs issued from Argentina, France, Greece, Japan, Mexico, and United Kingdom. The anomalous behavior is consistent with U.S. stock behaviors on the ex-day in Eades, Hess, and Kim (1984). Eades, Hess, and Kim (1984) find out the excess returns on ex-days are 0.142 for taxable common stocks traded in NYSE, while 0.387 for stock dividends and splits. The empirical results imply that tax is not the only factors to explain the price behavior anomaly on ex-dividend day.

Table 6 Difference in abnormal returns on ex-dividend day for ADR stock dividend and cash dividend

Country	Abnormal return- Cash Dividend	Abnormal return- Stock Dividend	Difference	T statistics
ALL	0.0074	0.0293	-0.0219	-4.0114***
ARGENTINA	0.0072	0.0274	-0.0202	-2.0337*
AUSTRALIA	0.0083	0.0062	0.0022	0.3386*
FRANCE	0.0054	0.0213	-0.0159	-1.9798*
GREECE	0.0086	0.0402	-0.0317	-5.7476***
ISRAEL	0.0087	0.0042	0.0045	0.6738
ITALY	0.0107	0.0215	-0.0108	-0.6060
JAPAN	0.0064	0.0182	-0.0118	-3.4032***
KOREA	0.0112	0.0135	-0.0022	-0.1514
MEXICO	0.0120	0.0564	-0.0444	-3.5936***
NETHERLANDS	0.0070	0.0204	-0.0134	-1.1374
PORTUGAL	0.0069	0.0149	-0.0080	-0.2120
SOUTH AFRICA	0.0073	0.0117	-0.0044	0.4338
SPAIN	0.0072	0.0143	-0.0071	-1.7372
SWEDEN	0.0097	-0.0365	0.0461	3.2989
TAIWAN	0.0093	0.0151	-0.0058	-0.2304
TURKEY	0.0437	-0.0051	0.0488	1.0559
UNITED KINGDOM	0.0072	0.1309	-0.1237	-1.7317*

*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

6. Conclusions

This paper re-examines the trading behavior around ex-dividend days for American depositary receipts (ADRs) since we can partition ADR samples by foreign tax rate to analyze the ex-day investor behaviors in different foreign tax levels. The purpose of this study is to investigate ADR abnormal returns around ex-dividend days and to determine the tax effect on ex-dividend trading behaviors.

Our results exhibit the prominent excess returns exactly on ADR ex-dividend days. Since double tax, U.S. tax and foreign withholding tax, may apply on the ADR dividend income, the tax effect is apparent on ex-dividend day. Although we do not indicate the foreign tax rate as the monotonically increasing function of abnormal returns, the results of regressions present that the ex-day abnormal returns are positively associated with foreign tax costs, the product of foreign tax rates and dividend yields, as well as transaction costs. It slightly supports the tax-induced

ex-day trading activity that is constrained by transaction costs. For robust check, we compare the ex-dividend ADR abnormal returns between nontaxable stock dividends and taxable cash distributions under U.S. regulations. Inconsistent with the tax effect hypothesis, we do not conclude the greater ex-day ADR abnormal returns of cash dividends than those of stock dividends. Our findings imply that tax factors cannot provide the complete evidence to explain the excess returns on ex-dividend days.

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