Capital Gains Taxes, Pricing Spreads and Arbitrage: Evidence from Cross-Listed Firms in the U.S.*

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Abstract

This paper examines how shareholder-level taxes affect the pricing of foreign firms' cross-listed stocks in the U.S. and what role cross-country arbitrage plays in mitigating this effect. Specifically, we study how an unexpected reduction in U.S. capital gains taxes at the announcement of the 1997 budget accord changes the pricing of cross-listed shares relative to their underlying home country stocks. If the marginal investor in the cross-listed share is a U.S. taxable individual, we expect to find a significant stock price reaction to the external shock. Absent arbitrage, home country stock prices should be largely unaffected by the change in U.S. tax rates. Consistent with tax capitalization, we find that the performance of cross-listed shares in the U.S. is negatively and significantly related to dividend yield during the announcement week. Home country shares generally do not react to the announcement, creating a tax-induced pricing spread. Evidence suggests that arbitrage partially mitigates this disparity as the spread becomes smaller – and eventually disappears – when we limit the sample to the more and more liquid firms. Overall, our findings indicate that changes in U.S. tax legislation have the potential to affect asset prices in foreign markets.

Key Words: *Tax capitalization, Personal taxes, Dividends, American Depositary Receipts, Arbitrage, International finance*

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1. Introduction

This paper examines how personal taxes affect the pricing of stocks that are simultaneously listed and traded on multiple exchanges around the globe and what role cross-country arbitrage plays in the dissipation of any such effect. Specifically, we study how an unexpected reduction in U.S. capital gains taxes at the announcement of the 1997 budget accord affects the pricing of foreign firms' American Depository Receipts and other types of cross-listed shares in the U.S. relative to their underlying home country stocks.[1] If the marginal investor in either security is a U.S. taxable individual, we expect to find a statistically significant stock price reaction to the external shock.[2] Otherwise, stock prices should be largely unaffected because the proposed change in U.S. capital gains taxes does not alter the after-tax cash flow expectations of U.S. tax-exempt and foreign investors. Moreover, tax-exempt arbitrageurs may exploit any event-related price deviations from parity. Our goals are to explore the differential pricing effects between shares cross-listed in the U.S. and their underlying home market shares (and the corresponding tax-induced pricing spread), examine the mitigating role of cross-country arbitrage on the pricing spread, and measure the persistence of the pricing effect.

Whether shareholder-level taxes are impounded into equity prices is a fundamental question in finance, accounting and economics that has been the subject of an ongoing debate. Though most would agree that prices impound *entity-level* taxes, even the theoretical pricing impact of *investor-level* taxes is unclear.[3] If individual investors indeed react to dividend or capital gains taxation, then share prices are sensitive not only to firm payout policy (e.g., dividends,

[1] Hereafter, we refer to a foreign firm's U.S. cross-listed equity as "ADR", regardless of whether it is an actual American Depositary Receipt or a direct listing (see Section 2.1. for institutional details).
[2] We use the term "marginal" investor, although identifying a marginal investor is not critical to our analysis. If prices are set by the "aggregate average response" of investors, then our maintained hypothesis becomes that U.S. taxable individuals form a large enough portion of the investor pool to have an effect on price.
[3] For example, there is a raging debate regarding how or whether firms' cost of equity capital on its marginal investment project is affected by shareholder-level taxes (see Blouin, 2005; Zodrow, 1991; Sinn, 1991 for a discussion of the New versus Traditional Views).

repurchases or liquidating dividends) but also to changes in the tax rates. To date, empirical evidence on the relation between investor-level taxes and prices has been mixed and leads Shackelford and Shevlin (2001) to conclude that the implicit null throughout this stream of literature (i.e., marginal investors do not pay taxes) is far from rebutted.

We contribute to this literature by looking at the impact of capital gains taxes on ADR prices. Earlier papers have focused on companies from a single country (e.g., Amoako-Adu et al., 1992; Lang and Shackelford, 2000) or have examined special occasions in the lifespan of an entity (e.g., Landsman and Shackelford, 1995; Guenther and Willenborg, 1999). In general, these studies provide evidence consistent with capital gains taxes affecting equity values. One overreaching concern of the extant literature, however, is whether the empirical setting has adequately controlled for risk. ADRs and their home country stocks offer a unique setting to investigate a change in U.S. shareholder taxes because the underlying cash flows are identical between the securities, but the marginal investors could be different, thus allowing for a difference-in-differences approach where prices of the underlying shares serve as a perfect match. This research design largely excludes competing risk-based stories.

Another motivation for our paper is to understand the role of personal taxes and arbitrage in explaining the existence of pricing spreads between ADRs and their underlying securities. Prior studies merely acknowledge the potential role of taxes in creating such a spread. For instance, Froot and Dabora (1999) assemble some descriptive evidence for differences in after-tax cash flows to investors in "Siamese twin" stocks. Gagnon and Karolyi (2004), who study a broad range of market-based, information-based and trading-based barriers to arbitrage, recognize the potential role taxes may play in pricing spreads, but do not provide direct evidence on the existence of tax-induced spreads. In fact, they conclude that the static nature of their analysis

"may mask large and interesting patterns in price deviations from parity … that can arise around specific episodes" (p. 30). We overcome this limitation by using an unexpected legislative proposal as the potential source for a tax-induced pricing spread. To our knowledge we are the first broad-based study to focus on a particular event in order to better understand pricing disparities between ADRs and underlying stocks.

We employ an event study methodology around the May 1997 budget accord. Without prior notice, the Clinton administration proposed to cut the long-term capital gains tax rate from 28% to 20%, leaving the dividend tax rate unchanged. Like Amoako-Adu et al. (1992) and Lang and Shackelford (2000), we use dividend yield as our proxy for a security's sensitivity to the reduction in capital gains taxes and assume that high-dividend yield firms have less of their shareholders' profits taxed as capital gains relative to low-dividend yield firms.

We begin by examining the price reaction of ADRs. If the marginal investor is a U.S. taxable individual, we expect ADR prices to react to the proposed tax rate cut. No such response is expected in the underlying stock (unless the marginal investor is a U.S. individual) causing the two prices to diverge. Thus, by investigating returns in the ADR's underlying stock and testing for the existence of a pricing spread we are able to draw inferences about the investor clientele of the two share types that essentially represent claims on the same fundamental cash flows. We next examine the volume reaction to the event and the persistence of the price effect to better understand the movement of equity prices toward a new equilibrium. Evidence of an abnormal return that persists over some window would be consistent with investor level taxes having an equilibrium price effect. In an attempt to shed light on the role of cross-country arbitrage, we then explore whether arbitrage (using liquidity as a proxy) is systematically associated with the price reactions of the ADR and the underlying stock. In theory, arbitrage should mitigate the

one-sided price reaction and cause the two prices to quickly revert to parity. Contingent on whether we find the price reaction in the U.S. to prevail or not, we can draw inferences on how a macro-economic shock in the U.S. geared toward a well-defined clientele (i.e., U.S. taxable individual investors) affects international asset prices.

We find that in the event week, ADRs' stock return performance is significantly and negatively related to dividend yield. Based on the inter-quartile range, no or low dividend yield firms outperform high dividend yield firms by about 120 basis points during the event period. No such pattern is generally apparent for the underlying securities in the ADR's home country, creating a tax-induced pricing spread of up to 114 basis points. Our results are robust to various sensitivity tests and corroborate earlier findings that ADRs' home country markets play a more important role in price discovery than U.S. markets. Volume tests suggest that our effects are not attributable to a short-term liquidity shock as we do not find evidence of abnormal volume around the event. The persistence tests show positive cumulative abnormal returns for non-dividend paying firms for about 30 days after the event, suggesting that the change documented price reaction to the budget accord was impounded into price. Consistent with cross-country arbitrage partially mitigating the effect, the spread between ADRs and home country shares becomes smaller and eventually dissipates when we limit the sample to the more liquid firms. Since the price reaction to the U.S. tax event appears to be impounded in the underlying home country shares of highly liquid firms, we conclude that perceived changes in U.S. investor-level taxes are transferred into international asset prices.

The paper proceeds as follows: Section 2 provides background information on ADRs, the 1997 U.S. budget accord, and based on the competing theories of investor level taxes develops our hypotheses. In Section 3 we discuss sample selection and present descriptive statistics.

Section 4 outlines the empirical design and reports results on the stock price and volume reaction immediately surrounding the event. In Section 5 we explore the role of liquidity and cross-country arbitrage on the ADR and home country stock price reaction. Section 6 concludes.

2. Background and Hypotheses Development

2.1. Cross-listed Equities

Foreign incorporated firms cross-list on U.S. exchanges most commonly in the form of American Depositary Receipts and direct listings.[4] The former are U.S. negotiable certificates representing underlying shares in a company incorporated outside the U.S. Depository banks (e.g., Bank of New York) immobilize shares of the home country stock with a custodian in the home country and issue U.S. dollar denominated depositary receipts as claims against the immobilized shares. They also convert the proportional share of dividends and other payments into U.S. dollars before transferring them to the shareholders.[5] These securities were developed to make it easier and more cost effective for U.S. investors to purchase shares in non-U.S. firms. Indeed, prior research shows that U.S. investors own a substantial portion of American Depositary Receipts, suggesting that the marginal investor may be a U.S. taxable individual (Callaghan and Barry, 2003; Ammer et al., 2004; Bradshaw et al., 2004).

Canadian firms exclusively utilize direct listings. The shares traded in the U.S. represent the identical shares on the Canadian exchange, and like American Depositary Receipts, the cross-

[4] Other forms include Global registered shares and New York registered shares, both of which are rare.
[5] For U.S. investors, ADRs and directly owned foreign securities are taxed similarly. Dividend payments are subject to applicable foreign withholding taxes, which are generally not waived for U.S. tax-exempt investors. Taxable U.S. investors are subject to the U.S. dividend tax, but are eligible for a credit up to the amount of the foreign withholding tax. In addition, the dividend received deduction is not applicable to foreign investments. With respect to capital gains, ADRs and directly owned foreign securities are taxed identically to U.S. equity investments. See Callaghan and Barry (2003) for an in depth discussion of ADR taxation.

border transactions involve a transfer agent. Under the Multi-Jurisdictional Disclosure System, Canadian firms have modified SEC reporting requirements in the U.S. that lower the costs of direct listing (see Frost and Kinney, 1996, for discussion of disclosure requirements). Prior research has documented an increase in U.S. shareholders after cross-listing for directly listed Canadian firms, suggesting that the marginal investor may be a U.S. taxable individual (Ammer et al., 2004).

An ADR represents the same cash flows as its underlying home country stock. Thus, with the exception of currency risk, there is no difference in the riskiness between the two securities. To the extent that both the ADR and the underlying security are fully fungible and that markets are efficient, the prices of the two securities should equate (after adjusting for the ADR bundling ratio and exchange rates). Pricing spreads between the two sets of securities allow for arbitrage, but involve some risks or costs. There exist two types of arbitrage: convergence and instrument. First, an investor may engage in "convergence arbitrage" and profit from pricing spreads by taking a long (short) position in the ADR when the ADR is priced lower (higher) than the underlying security in the home country and reverse the transaction after prices have converged. This strategy is not without risk because convergence may not occur in any predictable way and foreign exchange rate risk remains. In addition, investors will incur trading costs. Second, an investor may engage in "instrument arbitrage" and profit from pricing spreads by switching between shares across markets (Kim et al., 2000). For example, assuming the ADR is priced lower than the home country security, an investor would take a long position in the ADR *and* a short position in the underlying stock, go through the ADR conversion process to cancel the ADR and convert it to the underlying home country stock (which takes about a day and is subject to a conversion fee), which is then used to settle the short position. This form of arbitrage

requires round-trip transaction costs and is not riskless given that the transactions do not occur simultaneously.[6] Although both of these strategies are not (risk-free) *arbitrage* in a strict technical sense, we use the term "arbitrage" (similar to Pontiff, 1996) to refer to taking a position in a mispriced asset and/or taking the opposite position in its related security.[7]

Prior studies provide evidence of substantial and systematic price differences in cross-listed shares by either examining firms in a few selected countries (e.g., Maldonado and Saunders, 1983; Kato et al., 1991; Wahab et al., 1992; Park and Tavakkol, 1994), a single company (Miller and Morey, 1996; Puthenpurackal, 2004) or the special case of dual-listed firms like Unilever N.V. and Unilever PLC (e.g., Rosenthal and Young, 1990; Froot and Dabora, 1999; de Jong et al., 2004). Based on a sample similar to ours, Gagnon and Karolyi (2004) document pricing spreads between ADRs and underlying stocks to generally fall between 20 to 85 basis points, but in the extreme ranging up to a premium (discount) of 66% (87%). None of these papers, though, empirically assess the direct role that taxes play in the formation of such a spread.

2.2. Event – 1997 Budget Accord

We investigate returns around the May 1997 budget accord, which brought about a reduction from 28% to 20% in the long-term capital gains tax rate on U.S. investors, but no change in the dividend tax rate. It is important to understand when market expectations about capital gains rates may have changed in the time period leading up to the rate reduction. It is reasonable to believe that the market did not predict a capital gains reduction because neither President

[6] Practically speaking, this type of arbitrage is not always successful. For example, in trying to exploit pricing discrepancies, Headwaters Capital of Sausalito, California, sought to take a long position in the ADRs of Terra Networks, a Spanish Internet portal company, in the U.S. and a short position in ordinary shares in Spain. However, at the time, Terra's ADR securities were not very liquid (i.e., they were hard to come by). The broker successfully placed the sell order in Spain for the home country stock but was unsuccessful in purchasing the corresponding ADRs, leaving Headwaters' arbitrage incomplete (see "Headwaters wins in arbitration", The Wall Street Journal, April 20, 2004).

[7] We thank Jason Paltrowitz, Vice President of Broker & Institutional Marketing at the Bank of New York ADR Division, for informative discussions on the institutional details regarding arbitrage between ADRs and their home country stocks.

Clinton's 1996 reelection campaign nor his March 1997 introduction of the 1998 budget endorsed such a reduction. In fact, in March 1997, William Archer, the House Ways and Means Committee Chair at the time, indicated no greater than a 50% chance that a 1997 tax bill would include such a reduction (Tax Notes, March 24, 1997). There was little release of information regarding the budget discussions until April 30, when information suggesting a balanced budget was imminent. Finally, on May 2 there was an announcement of an agreement between President Clinton and Congress members to both balance the budget and reduce the capital gains tax rate. Although the actual rates were not specified until August, prior research has focused on May 2 as an event date because the announcement of the budget accord provided the market with new and fairly certain information regarding a decrease in the capital gains tax rate. Indeed, prior research finds that most of the uncertainty regarding the reduction is resolved around this event period (Lang and Shackelford, 2000).

ADRs and their home country stocks offer a unique setting to investigate a change to U.S. shareholder taxes because the underlying cash flows are identical, but the marginal investors could be different. Furthermore, the 1997 announcement of the intended decrease in the capital gains tax rate creates a powerful event setting because it was both a surprise and unconfounded by information relating to other changes in tax legislation. If we have successfully identified both a period where the market has been surprised by the news of the tax rate cut and a sample potentially affected by it, then we would anticipate that those firms who have a higher proportion of profits taxed as capital gains (dividends) react more (less) strongly to the announcement.

2.3. Hypotheses Development

Klein (1998, 1999) develops a general equilibrium-pricing model that is sufficiently rich to test the competing theories of how investor-level taxes (and hence changes in these taxes) affect

equity prices, which include tax capitalization, lock-in and tax irrelevancy (see appendix for a full discussion of the model). In the model, price is determined by the present value of after-tax cash flows resulting from both dividends and capital appreciation/depreciation. The effects of incorporating capital gains taxes in the model are twofold.[8] First, the taxes on expected future capital appreciation are "capitalized" into the price of the asset (i.e., price is decreasing in expected tax liabilities). Second, is the lock-in effect, which suggests that tax liabilities on past appreciation increase investors' pre-tax rates of return on the firm's stock. Since "locked-in" shareholders (i.e., those with unrealized capital gains) constrict the share supply by holding out for higher returns, prices must rise in order for the market to clear (consistent with a traditional price pressure story). Considering these two effects in conjunction with our event (i.e., a reduction in the expected capital gains rates) implies that it is uncertain how a change in the capital gains tax rate would impact equilibrium prices. In fact, if investors are either tax-exempt or taxed identically on dividends and capital gains, then the change in capital gains tax rates would have no effect on the price of the security (tax irrelevance).

Klein (1998, 1999) illustrates that the relation between capital gains taxes and price is conditional on the marginal seller's unrealized gain (or loss), expected future capital gains, anticipated holding period, and marginal tax rates. Unfortunately, none of these is unobservable. In an effort to find a proxy for cross-sectional variation in capital appreciation, we rely on the dividend yield. To the extent that prices are formed based on a weighted average of after tax cash flows coming from both capital gains and dividends (Poterba and Summers, 1985), the higher the proportion paid in dividends, the lower the proportion paid in capital gains. Figure 1 details our hypotheses, which are developed below.

[8] In the remainder of this section, we describe the effects of the Klein model assuming capital appreciation. However, the model does allow for the tax benefits of capital depreciation.

Our null hypothesis of tax irrelevance (Miller and Scholes, 1978) is consistent with the marginal investor of the ADR not being a U.S. individual investor and/or equity prices not reacting to taxes because the proposed change in U.S. capital gains taxes does not alter their after-tax cash flow expectations.

H_{0a}: There is no significant return in the event period for the ADR or the underlying stock.

H_{0b}: There is no significant difference in the returns between dividend and non-dividend paying ADRs and underlying stocks in the event period.

Under the assumption that the marginal investor in the ADR is a U.S. individual investor, we develop our first set of alternative hypotheses based on the theory of tax capitalization. Consistent with the idea that ADRs are likely to have at least one shareholder who anticipates incurring capital gains, we expect that a reduction in the capital gains tax rate will increase security prices because the present value of the future capital gains tax liability has been reduced. Yet share prices for firms expecting to pay proportionately more of their profits paid in capital appreciation (i.e., having low dividend yields) should react more positively in the event week.

The underlying stock is unlikely to have a U.S. individual investor as the marginal investor and therefore should exhibit no reaction. Absent capital market frictions or restrictions, however, any change in ADR prices should immediately and completely lead to parallel changes in home country stock prices resulting in a new price equilibrium for ADRs and underlying stocks (after adjusting for the ADR bundling ratio and exchange rates). Transactions costs, short selling restrictions, taxes, or market inefficiency could prevent or delay prices from reaching the new equilibrium, which could result in temporary tax-induced spreads between the ADR and underlying stock prices. This intuition leads into our hypotheses under the tax capitalization theory.

H_{1a}: During the event week, there is a significant positive return for the ADR, which is decreasing in dividend yield, but no significant return for the underlying stock.

H_{1b}: There is a significant positive return in the event week, which is decreasing in dividend yield, for both the ADR and the underlying stock.

Our second set of alternative hypotheses are based on the lock-in effect, whereby a reduction in the capital gains tax rate reduces the reservation price of the holders of the ADRs, which will cause an increase in volume and downward price pressure:

H_{2a}: During the event week, there is a significant negative return for the ADR, which is increasing in dividend yield, but no significant return for the underlying stock.

H_{2b}: There is a significant negative return in the event week, which is increasing in dividend yield, for both the ADR and the underlying stock.[9]

Since the lock-in effect results from shareholders demanding higher pre-tax returns due to taxes, the reduction of the capital gains tax rate should generate a sell-off by these shareholders leading to a surge in volume that depresses prices. The lock-in hypothesis assumes that during the event week, investors would have known that the reduction in capital gains tax rates would apply to their sales of securities during the event week.

If we find that prices move consistent with the theory of tax capitalization or lock-in, then the next question is whether these new prices persist. Under the lock-in effect, the price reduction is nothing more than a short-term liquidity shock that should quickly reverse. On the other hand, tax capitalization theory implies that there is a new equilibrium price. However, arbitrageurs will immediately begin to take advantage of any pricing spread between the ADRs and underlying stocks. As such, it is an empirical question as to whether the reduction in U.S. capital gains taxes affects prices beyond the event window.

[9] Both H_{1b} and H_{2b} are also consistent with the marginal investor of the underlying stock being a U.S. taxable individual, which we believe is unlikely.

3. Data and Descriptive Statistics

3.1. Sample Selection and Description

The sample selection is designed to identify ADRs and their underlying securities with sufficient trading activity in the two years surrounding the Congressional passage of the May 1997 budget accord. Since we are looking at the effect of tax rule changes on contemporaneous ADR and home market returns, we want to avoid stale or inefficient prices due to non-trading, one-sided trading or low trading volume. To ensure that results are not confounded by newly listed firms and delisting firms, we require a sample with a reasonably long trading history before and after the event.

We draw the initial sample from the intersection of foreign firms with U.S. prices on CRSP and home country stock prices on Datastream. First, to identify American Depositary Receipts, we use CRSP share codes (first digit of SHRCD equal to 3). Next, we identify Canadian direct cross-listings by means of the Compustat country of incorporation (FINC equal to 9), and then match to CRSP via the CRSP/Compustat merged file. Finally, we merge our set of foreign firms with available U.S. prices on CRSP to the Datastream universe and confirm the inclusion of these firms in the Citibank Universal Issuance Guide (www.citibank.com/adr) or the Bank of New York's Complete DR Directory (www.adrbny.com). This yields 179,557 pairs (ADR and underlying stock) of daily returns between May 1, 1996 and April 30, 1998 representing 431 individual firms.

Next, we require that firms be listed and actively traded in the U.S. during our five-day event period (April 30 to May 6, 1997), which reduces the sample to 318 firms with 152,955

observations.[10] In an attempt to ensure informative prices, we further eliminate (1) firms that recently initiated an ADR exchange listing in the U.S. (i.e., exchange listing date after May 1, 1996, or U.S. stock price data must exist for at least one year at the time of the event), (2) observations with only one-sided trading (i.e., for each trading day, volume and price data must exist in the U.S. *and* the home country), and (3) observations based on U.S. trading volume of less than US$ 50,000. The first criterion is necessary because an exchange listing in the U.S. is a special event in the lifespan of a foreign corporation (see Leuz, 2003 or Karolyi, 2004 for an overview). Firms initiating a U.S. cross-listing experience abnormal returns at the listing announcement as well as during the pre- and post-listing period (e.g., Karolyi, 1998; Errunza and Miller, 2000; Sarkissian and Schill, 2004). Furthermore, the effects are most pronounced in the first year immediately surrounding the cross-listing. This criterion eliminates 13,240 observations and 40 firms. Criteria (2) and (3) omit stale prices and assure some minimal level of liquidity to allow price formation.[11] The sample selection procedure yields a final sample of 98,389 return pairs representing 266 firms.

Table 1 Panel A provides an overview of the sample composition. For each sample country, we report the number of firms, dividend paying firms, observations and dividend paying daily observations. Aside from the Canadian firms, which are approximately 35% of our sample, only four countries compose 5% or more of the total observations (i.e., Australia, Japan, Mexico, and the United Kingdom).

[10] We define a firm as actively traded if U.S. price and volume data exist on four out of the five event days. If we limit our sample to firms with consecutive trading during the event (i.e., five out of five days), we lose another 42 firms. Using this smaller sample does not affect our main findings. All results are similar and the inferences remain unchanged. However, the smaller sample produces slightly weaker results in the liquidity analyses. If, on the other hand, we do not impose any trading restrictions during the event period, the sample size increases by 23 firms, and all the results are very similar to those reported in the text.

[11] We do not eliminate any observations during the event window based on U.S. trading volume since low trading activity may also reflect information with regard to the effect under study. See also Section 4 where we examine the trading volume reaction to the event as well as Section 5 where we assess the impact of liquidity on our results.

Table 1 Panel B reports descriptive statistics of our sample firms. DIVYLD and YLD_DUM are the continuous dividend yield (calculated as the sum of the last twelve months of dividends scaled by daily stock prices) and the dichotomous dividend-paying indicator (equal to one for dividend paying firms), respectively.[12] About two thirds of our observations are from firms that paid dividends over the last fiscal year. VOL_ADR and VOL_HOME represent daily US$ trading volume (in thousands) for a firm's ADR in the U.S. and the underlying stock in the home country. In both markets, volume is highly skewed, but generally higher in the firm's home country. We discuss the remaining firm characteristics, which will be used in our liquidity tests to partition the sample, in Section 5.

3.2. ADR Returns, Home Market Returns and Return Spreads

In our analyses we use either the return of a firm's ADR in the U.S. (RET_ADR), the return of its underlying security in the home country (RET_HOME) or the difference between the two as our dependent variable (SPREAD = RET_ADR – RET_HOME). We compute each return as the daily change in stock price based on closing prices in local currency (dividend and split adjusted).[13]

The observations in the event period are of special concern. In many countries the five trading days from April 30 to May 6, 1997, coincide with one or more national holidays (e.g., Cinco de Mayo in Mexico, Constitution Memorial Day in Japan or May Day Bank Holiday in the UK). So, for many sample firms we have to discard one or more event day observations with valid RET_ADRs because of missing RET_HOMEs. In these cases, we add event-period

[12] We scale the dividends by the daily stock price five days before the event, as we wanted to avoid any spurious correlations by using the stock price in the event week.

[13] In contrast to Gagnon and Karolyi (2004), we do not attempt to correct our return metrics for non-synchronous trading between the U.S. and foreign markets. First, our event window covers a five-day period, which allows for some spillover effects. Second, when we include lead and lag values of the independent variables in our analyses, the unreported results remain virtually unchanged. Finally, the inclusion of country-fixed effects should account for any systematic biases due to partially or non-overlapping trading hours.

RET_ADRs from one-sided trading in the U.S. to the next RET_ADR with home country trading data available.[14]

A variable used in later analyses is PDIFF, the difference between contemporaneous ADR and underlying stock prices. It is measured as the natural log of the ratio of the ADR price to the underlying stock price, both denominated in US$. As many ADRs do not map one-to-one into home country stocks, we multiply the underlying stock price by its bundling ratio.[15] This metric is intended to account for cross-autocorrelation between RET_ADR and RET_HOME and should help control for prices' tendency to revert towards parity (Gagnon and Karolyi, 2004).

Table 1 Panel B reports that RET_ADR and RET_HOME are similar with a mean of about 10 basis points and standard deviations of roughly 3%. This translates into a tight SPREAD distribution with 80% of the observations having a return spread within ± 2%. However, not all return pairs are so close. PDIFF has a similar distribution. While the average price differential is 34 basis points, some companies are traded in the two markets at prices far from parity.[16] Since market efficiency implies that extreme observations form part of the effect researchers are trying to capture (Kothari et al., 2005), we refrain from any data trimming. However, when, for sensitivity purposes, we winsorize extreme observations (± 0.025%), the return boundaries quickly shrink to a reasonable range (from -23% to +29%; see also Section 4.3 for results using the winsorized sample).

[14] This adjustment is consistent with RET_HOME immediately after the international holiday incorporating all the information that is embedded in RET_ADR over the two trading days (the holiday and the day after). Results throughout the paper are not sensitive to the inclusion of this ADR return.

[15] Canadian shares require no adjustment since they trade on a one-to-one basis in the U.S. For all other firms we obtain ADR bundling ratios from either the Bank of New York ADR database or the JP Morgan Global Issuance file.

[16] When we calculate firm average values of PDIFF, we get results that closely resemble those presented by Gagnon and Karolyi (2004): our inter-quartile range is 85 basis points with extreme observations trading at a discount (premium) of up to 76% (76%) in the U.S. compared to their home market shares.

3.3. Market and Currency Controls

In our analyses we control for three market forces: the U.S. stock market (US_MKT), the stock market in the country of the underlying security (HOME_MKT) and exchange rate fluctuations (FX). US_MKT is the daily CRSP value-weighted market return. HOME_MKT and FX are the daily changes in the relevant home country market indices and the foreign exchange rates (foreign currency relative to US$), respectively. Non-U.S. data and exchange rates are collected from Datastream. Table 1 Panel B provides descriptive information on the three market characteristics. They are on average slightly positive and the inter-quartile range never exceeds 100 basis points.

Next, we investigate univariate relations between the return variables, the market forces and the dividend paying characteristics. Table 1 Panel C presents Pearson and Spearman rank correlation coefficients and p-values. The correlation between RET_ADR and RET_HOME is only about 0.63 suggesting that market and institutional forces affect ADRs and the underlying stocks differently. Notice that RET_ADR is correlated similarly with both US_MKT and HOME_MKT; whereas, RET_HOME has a much higher correlation with HOME_MKT than US_MKT suggesting only a subordinate pricing role for US_MKT in the ADRs' country of origin. Note further that the negative correlation between FX and RET_ADR follows from ADRs being quoted and traded in US$; all else equal, an increase in exchange rates decreases the US$ value of a security denominated in foreign currency. Finally, SPREAD is not associated with a firm's propensity to pay dividends (DIVYLD and YLD_DUM).

3.4. Specification of Empirical Model

To test our competing hypotheses of the price effects of reducing capital gains tax rates, we build on a model by Lang and Shackelford (2000), who interact a dividend-paying indicator (a

proxy for a firm's sensitivity to the rate reduction) with an event indicator and include the U.S. market return as a control for general market conditions. We modify this model for our setting in several ways. First, we use a continuous dividend yield in place of a dichotomous indicator in order to capture the variation across the dividend paying firms in our sample. In addition, we add the home country market index (HOME_MKT) since ADRs react to stock market fluctuations in their country of origin, where substantial information with respect to price discovery is produced (e.g., Froot and Dabora, 1999; Eun and Sabherwal, 2003). Next, we include two additional control variables: exchange rate fluctuations (FX) and lagged price differences (PDIFF) based on prior research on the return spread of cross-listed firms (Froot and Dabora, 1999; Kim et al., 2000; Patro, 2000; de Jong et al., 2004; Gagnon and Karolyi, 2004; Grammig et al., 2005). Furthermore, based on Gagnon and Karolyi (2004) we also include lagged log price differentials of the ADR and underlying stock (PDIFF) in our model to control for mean reversion across the two sets of prices. Finally, we include country-fixed effects to control for systematic country-level biases (e.g., time zone differences, varying transaction costs between national exchanges or different legal and institutional environments).

The empirical model is as follows:

$$\text{Dependent Variable}_{i,t} = \beta_0 + \beta_1 \text{DIVYLD}_{i,t} + \beta_2 \text{EVENT}_t + \beta_3 \text{EVENT}_t * \text{DIVYLD}_{i,t} + \beta_4 \text{US\_MKT}_t + \beta_5 \text{HOME\_MKT}_{i,t} + \beta_6 \text{FX}_{i,t} + \beta_7 \text{PDIFF}_{i,t-1} + \sum \beta_j \text{Country Controls}_i + \varepsilon_{i,t}. \quad (1)$$

We define the dependent variable either as RET_ADR, RET_HOME, or the difference between the two (SPREAD). *i* and *t* represent firm and time indicators. EVENT is a binary indicator set equal to one if the observation date is on or after April 30 through May 6, 1997, the five trading days surrounding the passage of the budget accord. The remaining variables are as described above. We estimate all models using OLS with heteroscedasticity corrected standard errors that are clustered by firm to control for within firm correlation among variables.

When RET_ADR is the dependent variable, our main prediction based on tax capitalization (lock-in) stipulates a negative (positive) sign on the interaction term between EVENT and DIVYLD (β_3), consistent with non or low dividend yield firms outperforming (underperforming) high dividend yield firms during the event. We expect a positive (negative) sign on EVENT (β_2), consistent with non-dividend paying firms exhibiting positive (negative) abnormal returns under tax capitalization and lock-in, respectively. However, this coefficient should be interpreted with caution. Given that we include US_MKT as a control, β_2 and β_3 will not capture the entire event week return because the U.S. market as a whole will have reacted to the event.[17] When using RET_HOME as the dependent variable, we expect to find no difference related to the firm's payout policy. Taken together, under our hypotheses of tax capitalization (lock-in), we predict a negative (positive) sign on β_3 for the SPREAD specification. Depending on the degree of arbitrage, under tax capitalization (lock-in) β_3 in the RET_HOME and SPREAD specification is expected to become significantly negative (positive) and insignificant, respectively.

With regard to the market controls, we expect RET_ADR to be positively related to US_MKT and HOME_MKT. In the home countries, the role of the U.S. stock market is less obvious. Although there exists some evidence of a positive relation between RET_HOME and US_MKT (e.g., Kim et al., 2000; Eun and Sabherwal, 2003), we refrain from putting a signed prediction on this parameter. Since the relative importance of the US_MKT is likely to differ

[17] This prediction requires that the composite of our sample firms reacts – on average – similar to the U.S. market as a whole. About two thirds of our sample consists of dividend paying firms. Fama and French (2001) find that less than 25% of Compustat and CRSP firms pay dividends. However, they also find that dividend payers account for more than 75% of aggregate book and market values during 1993-1998. This suggests that the value-weighted U.S. market index approximately reflects our sample composition leading to the positive predicted sign on EVENT. Note however that our main hypothesis ($\beta_3<0$) does *not* rely on how our sample compares to the overall U.S. market.

between RET_ADR and RET_HOME, we predict a positive coefficient on US_MKT and a negative coefficient on HOME_MKT in the SPREAD regressions.[18]

Prior studies suggest a negative association between exchange rates (computed as discussed in Section 3.3) and ADR returns, and a positive (or insignificant) relation with home market returns (Froot and Dabora, 1999; Kim et al., 2000; Patro, 2000; de Jong et al., 2004; Gagnon and Karolyi, 2004; Grammig et al., 2005).[19] Together these effects indicate a negative relation between FX and the return spread. Furthermore, with respect to PDIFF, if prices tend to revert towards parity (e.g., due to arbitrage), we should find a negative (positive) coefficient on PDIFF using ADR returns (home market returns) as dependent variable. Together, this implies a negative effect on SPREAD.

4. Reaction to the 1997 Reduction in U.S. Capital Gains Taxes

4.1. Univariate Results

We begin by providing univariate results on the reaction to the 1997 Reduction in U.S. Capital Gains Taxes by comparing RET_ADR and RET_HOME across dividend payout policy over the five-day event period as well as the non-event period and report the results in Table 2. Recall from Section 2.3 that our hypotheses are predicated on extant theory and that our predictions regarding return reactions to a change in the capital gains tax rate range from positive to negative in the event week. When comparing the two time periods, we find that the average event period returns are statistically higher than the non-event period returns, regardless of firm

[18] For instance, Eun and Sabherwal (2003) suggest that the contribution of U.S. exchanges to the price discovery for a sample of Canadian cross-listed firms is on average 38%. They also show that U.S. prices adjust more to Canadian prices than vice versa.

[19] The positive predicted sign on FX in the RET_HOME specification assumes that our sample firms have at least some US$ exposure and that, on average, an increase in exchange rates (foreign currency to US$) is interpreted as good news by investors.

payout policy or market. However, only non-dividend paying firms' shares (i.e., those with the most potential to be affected by the change in the capital gains tax rate) give rise to a significant difference in SPREAD. Within the event week we observe that RET_ADR for non-dividend paying firms outperform RET_ADR for dividend payers by 36 basis points per day during the event. The difference between RET_HOME for non-dividend and dividend firms is much smaller and not statistically different from zero (-2 basis points). This creates a significant 38 basis point daily SPREAD associated with payout policy during the event, which is not evident in the non-event period.

Figure 2 pictorially presents the above findings. Rolling five-day averages of ADR (RET_ADR) and home country equity returns (RET_HOME) for both dividend and non-dividend firms are presented in the 30 days surrounding the event (upper two quadrants of the graph). Confirming the results in Table 2, we observe a clear upward movement in ADR returns for non-dividend paying firms after the announcement of the budget accord. Dividend paying firms are less affected by the tax rate proposal. A similar, although less pronounced pattern appears in the home returns. The differential returns behavior becomes more obvious in the two bottom quadrants, where we compare ADR with home country returns across dividend and non-dividend payers. While there is clear gap of almost 40 basis points immediately following the event for non-dividend payers, dividend paying firms' ADR and home country prices move closely together.[20] In fact, the spread for the non-dividend paying firms is in the top 2% of the distribution of five day spreads over the entire sample period. The results are magnified in

[20] In an ad-hoc manner, we attempt to ascertain whether our event creates a spread that exceeds the arbitrage tunnel by comparing our event week spread of 200 basis points to the 160 basis points average two-way costs of arbitrage in ADRs for institutional investors (see Chakravarty et al., 2004, Table 5, Panel A) plus an average conversion cost of 10 basis points (estimated by taking a nickel conversion cost as reported in Mehta, 2003, deflated by the average ADR share price in our sample). Although we do not have a specific estimate for risk, we surmise that the tax-induced spread persists because the potential net gains from arbitrage (i.e., 30 basis points) does not compensate adequately for the risk.

Figure 3, which depicts the return spread for dividend and non-dividend paying firms. Overall, these findings, in conjunction with those in Table 2, imply that prices went up around the capital gains tax reduction and that this effect was decreasing in dividend yield, consistent with our tax capitalization hypotheses. However, all results so far are based on raw returns and therefore should be interpreted cautiously. To get a clearer picture, we need to account for general market conditions around the event.

4.2. Multivariate Analysis

Based on the previous univariate findings, we surmise that non-dividend paying ADRs react more positively to the proposed decrease in capital gains tax rates than their dividend paying counterparts, consistent with tax capitalization.[21] The reaction of the underlying securities in the home market is less obvious. Absent arbitrage, we do not expect to find a reaction to the event unless the marginal investor is also a U.S. individual (unlikely). Arbitrage, though, could cause some of the effect to spillover from the U.S. to the home country (or vice versa) thereby weakening the spread results.

Table 3 reports the results of our multivariate analysis. The three columns present the coefficient estimates from regressing the dependent variable on our test variables and controls, where the dependent variable is RET_ADR, RET_HOME, and SPREAD respectively. Results show that ADR firms with no or low dividend yields outperform high dividend yield firms by approximately 1.21% during the five days surrounding the event (5% two-tailed), consistent with the tax capitalization hypothesis.[22] No such divergence is apparent when looking at RET_HOME. Together, this creates a negative and highly significant coefficient on the

[21] Despite finding evidence consistent with tax capitalization in a univariate setting, we proceed in our multivariate analyses with testing our hypotheses using two-tailed significance tests to allow for all three competing hypotheses.
[22] We assess the magnitude of the effect by computing the estimated change in ADR returns based on the inter-quartile range of the DIVYLD variable, i.e., (0.0269 – 0) * -0.0898 * 5 days = -0.0121.

interaction term in the SPREAD specification, where the effect on the dependent variable of moving from the 25th to the 75th percentile of the dividend yield distribution is about 1.14% over the event week.[23,24]

A comparison of the control variables also reveals some interesting details. First of all, except for the coefficient on US_MKT in column 2, all of the market controls and the lagged price differential behave as predicted and are highly statistically significant. Both the US_MKT, and HOME_MKT explain significant variation in RET_ADR. However, for RET_HOME, the coefficient on HOME_MKT is close to one and highly significant, whereas the coefficient on US_MKT is insignificant. In addition, FX is negatively associated with RET_ADR, but is not significantly associated with RET_HOME. These differential associations are captured in the SPREAD regression, where SPREAD is shown to be associated predominantly with currency fluctuations, but also with U.S. and local market returns. PDIFF behaves consistent with prices reverting towards parity over time. [25,26]

4.3. Robustness Tests

To investigate the sensitivity of our results, we conduct a series of robustness tests. First, we analyze the robustness of our results to various sampling and event periods: (1) we shorten the overall sampling period from event ± 12 months to event ± 3 months, and (2) we reduce the

[23] An alternative explanation for our results is that the macro-economic shock created by the reduction in the capital gains tax rates differentially alters the pricing formation process of non-dividend and dividend paying firms. We run CUSUM analyses in order to determine whether there was a structural shift in our model. Untabulated results suggest that our regression model remained stable over the entire sample period.

[24] In untabulated analyses, we also test whether the event generated any real economic effects. Since Congress enacted the capital gains reduction to stimulate the U.S. economy, we expect a favorable U.S. market reaction. We regress foreign currency, local, and U.S. market returns (our proxies for macroeconomic effects) on the event indicator, lead and lag values of the dependent variable, and the pair of market and/or currency controls not used on the left-hand side. We find no economic effect of the event on local market returns, a significant and negative effect on foreign currency returns and, as expected, a significantly positive effect on market returns in the U.S.

[25] The results also hold, albeit at slightly weaker levels of statistical significance, if we include firm-fixed effects instead of country controls.

[26] Note that we do not control for differing firm characteristics (i.e., size, financial leverage, return on assets) since our research design assures that (in the spread regressions) each company serves as its own control.

event period from a five-day to a three-day window surrounding the announcement of the budget accord (i.e., May 2 through May 6). Our a priori expectation is to find generally weaker results. If the change in tax rate proposal is at least partially preempted by the market, then a shorter sample period will increase the weight attributed to higher pre-event returns. A shorter event window, on the other hand, risks missing some of the capital market response. Results reported in table 4 indicate that our inferences are not generally affected by these alternative time frames. In the analysis shortening the overall sampling period, there is a positive stock price reaction to the event that is decreasing in dividend yield in the U.S., but not in the home market, creating a significant return spread (p-value < 1%). Reducing the event period to a three-day window does reduce the average event day differential reaction between dividend and non dividend paying firms (from -0.0898 to -0.0813) and reduce its significance level to just under 10%, consistent with the shorter event window missing part of the capital market response. However, the absence of a reaction in the home market renders the spread highly significant.

We also ensure our results are robust to alternative return measures. We begin by measuring home country returns in U.S. dollars. We know of no reason to expect this to affect our main variable of interest, however we expect it will dampen the explanatory power of FX given it merely reflects a mechanical relation of how we apply the currency translation. Table 4 shows that this alternate home country return measure does not affect our findings. In addition, to ensure our results are not driven by outliers, we winsorize the returns at the 0.025% level with no change in the inferences of our results.

Next, we consider alternative proxies for a security's sensitivity to the reduction in capital gains taxes. We replace the continuous dividend yield with a dichotomous dividend-paying indicator (YLD_DUM , which is equal to one for dividend paying firms). A priori, we expect

the differential reaction between dividend and non dividend paying firms (EVENT * YLD_DUM) to the event to weaken because the vast majority of our firms are dividend paying firms and we are losing variation across these firms. Indeed, as shown in table 4, the interaction term between EVENT and YLD_DUM remains negative for RET_ADR, but is no longer significant.[27] Furthermore, untabulated results show that our results hold when we only include those firms with non-zero dividend yields suggesting that firms with higher dividend yields had less of a reaction to the capital gains rate reduction.

Lastly, we analyze the robustness of our results across various model specifications. To control for the possibility that dividend yields may be correlated with market risk and that ADRs and home country stocks may react differently to changes in the respective local and foreign markets, we compute firm specific betas for the ADRs and the underlying securities, which we then include in our regression models.[28] In addition, to control for asynchronous trading between the U.S. and home markets and slow information diffusion across markets, we also estimate a regression model where we include one-day lead and lag values of the market controls (HOME_MKT, US_MKT and FX) (Gagnon and Karolyi 2004). Untabulated results confirm that our inferences are not materially affected by these alternate specifications.

In summary, our robustness analyses are consistent with our main findings that the ADRs U.S. stock price reaction to the announcement of the reduction in U.S. capital gains taxes is decreasing in dividend yield, consistent with tax capitalization. However, no reaction is apparent in the home country market, creating a significant pricing spread between the two markets.

[27] In comparison, Lang and Shackelford (2000) report a 4.25% event week return difference between dividend and non dividend paying firm for their sample consisting of the 2,000 largest U.S. corporations. When we limit our sample to those firms that trade every day, we document an event week return differential of approximately 4.5%.
[28] Market betas of the ADR (underlying stock) are estimated based on 100-day, one-factor market model regressions on either the U.S. stock market or the stock market in the country of the underlying security, leading to a total of four different beta factors (i.e., two for the ADR and two for the underlying security).

4.4. Volume Analysis

Our return results show that ADR firms with no or low dividend yields significantly outperform high dividend yield firms during the event week, consistent with the tax capitalization hypothesis. However, the question remains whether our event was subject to the lock-in effect as well. It is possible that both tax capitalization and lock-in effects were in play during this event and that our returns analysis simply captured the net of these effects (i.e., that price effects of tax capitalization dominated those related to lock-in). Since the price reaction of lock-in behavior at the event stems from a short-term disposition induced price pressure, we perform an analysis on volume in a further attempt to document evidence of lock-in. Although our tax capitalization hypothesis does not provide any predictions regarding the volume behavior around the event, the lock-in hypothesis predicts a significant increase in volume that is decreasing in dividend yield in the U.S. market (because the decrease in capital gains tax rates decreases investors' reservation prices for selling an appreciated stock).[29] Furthermore, since the lock-in effect only applies to shareholders subject to U.S. capital gains taxes, we do not expect to find a volume effect in the home country.

We use two measures of trading volume: (1) daily volume in either the U.S. or the home country divided by the firm-specific mean volume computed over the sampling period leading up

[29] Using a stylized trading model, Shackelford and Verrecchia (2002) study intertemporal tax discontinuities (ITDs), which result from circumstances in which different tax rates are applied depending upon an assets holding period (e.g., long-term versus short-term capital gains). In an economy where long-term capital gains tax rates are lower than short-term rates, the greater the unrealized short-term appreciation, the greater incentive to defer selling the asset until long-term qualification has occurred. Likewise, there is greater desire to defer selling securities with accrued short-term capital gains the larger the disparity between the long term and short term capital gains tax rates. However, the Shackelford and Verrecchia (2002) predictions stem from short-term liquidity shocks, namely sellers' strikes by individuals with short-term capital gains who are just on the cusp of long-term qualification, where prices must rise to clear the market. Their model is discussed in the context of rebalancing around earning announcements whereby new information is conveyed to the market. However, in our setting, any potential portfolio rebalancing is attributable to only individual investors. As such, institutional investors should be available to eliminate any potential slack in supply.

to the event, and (2), in unreported analyses, the residuals from a firm-specific regression of the above measure on U.S. and home country market volume and currency returns.

To test our predictions, we replace the return variables in equation (1) with corresponding volume measures. Since we use dividend yield as our proxy for a security's sensitivity to the reduction in capital gains taxes, if lock-in is prevalent around the 1997 budget accord, we expect an increase in volume for those firms with a higher proportion of profits taxed as capital gains. Results reported in Table 5 columns 1-3 provide no evidence of a volume response. There is no difference in volume around the event nor is there any significant difference between the ADR and the underlying security.

Recall that lock-in should be most pervasive in firms with past appreciation. As dividend yield may be a poor predictor of past price run ups, we divide our sample based on whether the firms had appreciated over the year prior to the event (194 of our firms appreciated). Once again, we find no evidence of an increase in volume around the law change. In fact, there is some evidence that appreciated ADRs actually had a decline in volume (-101.18, t=1.68) at the event. However, the U.S. response was not significantly different from the underlying home country volume as exhibited by the insignificant coefficient on the interaction term in the SPREAD regression (-76.52, t=1.09). Finally, using the continuous measure of prior appreciation merely confirms a lack of lock-in behavior. Since the lock-in hypothesis assumes that during the event week, investors would have known that the reduction in capital gains tax rates would apply to their sales of securities during the event week. Our lack of confirmatory evidence on the lock-in hypothesis could stem from the fact that there was uncertainty regarding the effective date of the rate cut.

4.5. Persistence of the Price Effect

Having documented a significant increase in price of the non-dividend paying ADRs *during* the week of the 1997 U.S. budget accord, we now investigate whether this effect persists. Evidence of an abnormal return that persists into the future is consistent with investor level taxes having an equilibrium price effect and suggests that U.S. taxes can alter a foreign firm's cost of capital. We test these claims by estimating cumulative abnormal returns over the period beginning with April 30, 1997.[30] Cumulative abnormal returns are calculated by fitting the parameter estimates from a market model that includes U.S. market, home country market and foreign exchange rate returns between April 30, 1996 and April 29, 1997 to data beginning with April 30, 1997.[31],[32]

Figure 4 depicts the results cumulative abnormal returns for the ADRs and the underlying home country stock for both dividend and non-dividend paying firms. In the first (second) panel, we plot ADR (home country) abnormal returns for non-dividend and dividend paying firms. Consistent with tax capitalization, the non-dividend paying firms significantly outperform their dividend paying counterparts during the event period (t+1 to t+5). The graph reveals that in the post-event period, abnormal returns for dividend paying ADR firms hover around zero. However, the non-dividend ADR's abnormal returns do not dip below zero until approximately 30 days after the event suggesting that the documented effect do not immediately reverse.[33] This

[30] In an effort to make sure that we had efficiently priced firms, we run this analysis on a sample of 142 firms that traded every day during our sample period. Our primary findings hold for this sub-sample of firms. See Table 6 Panel B columns 1-3.

[31] Our results are robust to estimating the model over the entire sample period and using the residuals in our analyses.

[32] Our primary results in Table 3 from our main regression specification hold when we use the abnormal returns generated in this manner as the dependent variable.

[33] In untabulated results, we assess the magnitude and statistical significance of the cumulative abnormal return over varying post-event periods. Using a series of dummy variables, we divide our post period sample into 25 trading day increments. We find that the cumulated abnormal returns for the non-dividend paying firms are significantly positive for at least one month after the event. We recognize that other events/information may be altering the

finding is more surprising in light of evidence suggesting that arbitrage generally drives away any substantial price deviations within a five day period (Gagnon and Karolyi 2004). The difference in persistence estimates (i.e., 30 days versus 5 days) is due to differences in our research designs. In terms of measuring persistence, our setting is more powerful to the extent that we identify a particular event (i.e., reduction in U.S. capital gains tax rate) that creates a pricing spread. Beginning with and after the event, we are able to track the persistence of the resulting pricing spread through time. On the other hand, Gagnon and Karolyi (2004) identify pricing spreads that result from a variety of unidentified sources, some of which may be random, adding noise to persistence tests.

cumulative abnormal returns as we extend the window. But overall, the results imply a tax-induced shift in the equilibrium price of cross-listed shares that persists beyond the initial event.

5. The Role of Liquidity in Cross-Country Arbitrage

During the five days surrounding the announcement of U.S. capital gains rate reduction, we document a significant reaction that is decreasing in dividend yield for our sample of firms trading in the U.S., but not for their home country counterparts thus creating a pricing wedge between the two securities. In theory, arbitrage should mitigate the one-sided price reaction and cause the two prices to quickly revert to parity. In this section we examine whether cross-sectional variation in sample firms' reactions to the tax event can be explained by liquidity, our proxy for arbitrage opportunities. The most liquid ADRs are those where we expect to find the strongest reaction to the tax rate proposal in the U.S. Additionally, these same firms are likely to have more actively traded shares in their home market, thus creating more opportunity for arbitrage and resulting in our prediction for a less pronounced spread.

First, we limit our analyses to the subset of firms and observations that meet certain minimum liquidity criteria as measured by average US$ trading volume of the ADR. Moving from left to right in Table 6 Panel A, we partition the sample using increasingly tighter liquidity thresholds and estimate model (1) on the respective sub-samples. We begin by performing the analysis on firms with average US$ daily volume greater than or equal to the 25th percentile of the sample distribution. Next, we restrict the high liquidity sub-sample to firms with US$ volume in the top half of the sample distribution. Finally, we reduce the sub-sample to the extremely liquid firms by restricting the sub-sample to those firms in the top 25% of the sample distribution. As the liquidity constraint is tightened, we expect to find a larger negative coefficient on the interaction (EVENT * DIVYLD) for RET_ADR and RET_HOME. Furthermore, as we limit our sample to the higher liquidity firms, we anticipate an increase in cross-country arbitrage that will lead to a more rapid convergence of RET_ADR and

RET_HOME, suggesting that the spread becomes smaller more quickly for the actively traded firms.

The results reported in Table 6 Panel A confirm our expectations. For RET_ADR, the coefficient on EVENT * DIVYLD is monotonically decreasing as we compare from the full sample (see Table 3) through the most liquid sample (-8.98, -9.39, -16.82, -21.78). At the same time, the effect of EVENT * DIVYLD on RET_HOME is monotonically decreasing as well (-0.52, -4.06, -9.65, -19.58) and becomes significant for the two most liquid sub-samples. The pattern is consistent with arbitrage causing some of the effect to spillover from the U.S. to the home country. As a result, the spread generally weakens across the sub-samples (-8.46, -5.33, -7.17, -2.20), and in fact becomes insignificant for the most liquid sub-sample of firms.

When we limit our attention to the low liquidity sub-samples (lower half of Table 6, Panel A), we do not find any significant coefficients on EVENT * DIVYLD in the RET_ADR and RET_HOME specifications for the first two partitions (below 25^{th} and 50^{th} percentile of the trading volume distribution). This is consistent with low liquidity prices not being informative enough to reflect the one-sided macro-economic shock. However, in the SPREAD specification the coefficient on the interaction term is always negative and highly significant suggesting that ADR and home country stock prices generally behave as predicted by the tax capitalization hypothesis. When using the 75^{th} percentile as cut-off value, the results in the low liquidity sub-sample across the RET_ADR, RET_HOME and SPREAD specification look as previously reported again. Overall, the results in Panel A strongly suggest a mitigating role of cross-country arbitrage in the capitalization of the proposed tax rate reduction.

We test the robustness of the documented differences across liquidity by partitioning across alterative firm-level liquidity measures into high and low liquidity sub-samples and report these results in table 6 panel B. Our first measure is based on trading activity in the U.S.; we define the high (low) liquidity sub-sample as those firms with (without) consecutive trading in the U.S. over our sample period. Our next measure is based on Amihud (2002), who proposes the ratio of absolute stock return to dollar volume as a measure of price impact of the order flow, which increases in illiquidity. We calculate this metric by averaging the daily ratios for each firm in each market (i.e., ILLIQ_ADR and ILLIQ_HOME) over the sample period. A look at the descriptive statistics (see Table 1, Panel B) shows that ADRs generally experience more liquid trading in their home markets, but that the home distribution is also more dispersed. We classify firms as more liquid firms where ILLIQ_ADR *and/or* ILLIQ_HOME are below the 33rd percentile. Finally, we partition the sample based on the proportion of a firm's stock that is held by known institutional investors.[34] We measure institutional ownership, INSTHLD, using quarterly updates in the Spectrum Database. While Spectrum reports mean institutional holdings of 12%, for more than half of the sample observations institutional holdings are no greater than 4.5% (see Table 1, Panel B). We classify firms as more liquid if their institutional ownership is above the 75th percentile of the distribution.

Table 6, panel B reports similar results across these three alternative measures of liquidity. Focusing first on the high liquidity sub-samples, as expected across all measures of liquidity the reaction in both markets (i.e., the U.S. and the home country) is significantly decreasing in dividend yield, consistent with tax capitalization and arbitrage. However, despite the significant home country reaction, there remains a significant pricing spread suggesting that arbitrage is not

[34] Institutional ownership may serve as a proxy for, not only liquidity, but also investor sophistication, lower information asymmetry, lower risk of expropriation by entrenched managers, and/or generally higher firm visibility (Gagnon and Karolyi, 2004).

complete. Turning now to the low liquidity sub-sample, the reaction in the U.S. market is decreasing in dividend yield but is not significant across any of the three measures. In comparison, oddly the reaction in the home country market is increasing in dividend yield, but it is generally not significant. Together these results are consistent with arbitrage acting to slow the price reaction to the event. Although the reactions in both markets are insignificant, given their opposite signs they net to a significant pricing spread across all three measures.

In terms of comparing the reactions across the high and low liquidity sub-samples, as expected we find a more pronounced reaction to the event for the high liquidity sub-samples in both markets across all three measures (as evidenced by EVENT * DIVYLD), although the difference not significant for the U.S. market for the first two liquidity measures. Again, this is consistent with arbitrage mitigating the one-sided price reaction by causing a spillover reaction to the event in the home country.[35]

In summary, the results reported table 6 are consistent with our measures of liquidity (i.e., average U.S. trading volume, consecutive U.S. trading, Amihud 2002 illiquidity measure, and institutional ownership) acting as a proxies for intensified arbitrage activity.[36] In addition, these results support our main results of tax capitalization occurring in the U.S. market and creating a pricing spread between U.S. and home country securities. The liquidity results further show that the effects of tax capitalization are stronger in both markets for more liquid firms, but that a pricing spread still remains. In addition, although the spread is significant for the more liquid

[35] The results are unaltered when we use US$ trading volume in each of the two markets instead of the Amihud (2002) illiquidity ratio to partition our sample.

[36] In terms of institutional ownership, to corroborate these findings, we divide INSTHLD into the taxable (i.e., banks and investment advisors) and tax-exempt institutions (i.e., foundations and pensions). Partitioning the sample based on taxable institutions yields very similar, albeit slightly weaker coefficient estimates. The proportion of tax-exempt institutions, on the other hand, is negatively correlated with INSTHLD. Results using the tax-exempt institutional ownership to partition the sample are generally consistent with this variable serving as inverse proxy for the number of taxable individuals. However, the two sub-samples are never statistically different from each other.

firms, both the magnitude and the significance level are larger for the less liquid firms. The results suggest a mitigating role of arbitrage in capitalizing the proposed tax rate reduction.

6. Conclusion

In this paper, we examine how shareholder-level taxes affect the pricing of U.S. cross-listed stocks. Building on the general equilibrium-pricing model by Klein (1999), we develop and test competing theories (i.e., tax irrelevance, tax capitalization, and lock-in effect) about how changes in personal taxes affect equity values. We use an event study methodology in the week around the May 1997 budget accord, which without prior notice proposed to reduce the U.S. long-term capital gains tax rate. Using dividend yield as a proxy for a security's sensitivity to the reduction in capital gains taxes, we find that non-divided paying ADRs outperform their dividend paying counterparts during the event week. Based on the inter-quartile range, no or low dividend yield firms outperform high dividend yield firms by about 120 basis points during the event period. No such pattern is generally apparent for the underlying securities in the ADR's home country, creating a tax-induced pricing spread of up to 114 basis points. This result is consistent with the marginal investor being a U.S. taxable individual who capitalizes personal taxes into security prices. However, consistent with cross-country arbitrage partially mitigating the effect, the spread between ADRs and home country shares becomes smaller and eventually dissipates when we limit the sample to the more liquid firms.

With respect to the persistence of the tax-induced price increase, we find that both ADR and home country prices seem to persist for a month following the event. Since the price reaction to the U.S. tax event appears to be impounded in the underlying home country shares of highly liquid firms, we conclude that perceived changes in U.S. investor-level taxes are transferred into

international asset prices. Overall, our results imply a persistent tax-induced shift in the price equilibrium of cross-listed shares that ultimately may affect cross-listed firms' cost of capital.

Our study is subject to several limitations. First, the analysis is narrowly focused on a single tax change in the capital gains tax rate. While this provides for a relatively clean setting, it does limit our ability to interpret the effects of how U.S. personal taxes affect the levels of equity pricing in a broader sense. Second, firms with cross-listings represent a special subset among the listed corporations in a country, again potentially limiting the generalizability of the results. Third, although we present results consistent with tax capitalization and with arbitrage serving a mitigating role, it is not possible to completely disentangle these two competing sources of price movements for cross-listed shares. Finally, as with all event studies, our results are contingent on the identification of an event that is unconfounded by other (non-tax) factors.

Appendix: Theory on the Effect of Investor-Level Taxes on Prices

In Klein (1998, 1999), price is the present value of the after-tax cash flows resulting from dividends and capital appreciation. A notable contribution of the Klein model is that capital gains are deemed taxed at realization rather than at recognition (or accrual).[37] Also, in contrast to prior models (Constantinides, 1983, 1984), Klein assumes that investors cannot costlessly defer capital gains taxation through short-selling.

Intuitively, in the Klein model, price is determined not only by the anticipated after-tax, risk adjusted cash flows generated between period *t* and *t+1*, but also incorporates any capital gains tax liability (benefit) related to appreciation (depreciation) from prior periods. Said another way, a firm's equilibrium price is a function of an investor's tax liability on future and past appreciation (or depreciation). To the extent that these capital gains liabilities exist (assuming appreciation), the model surmises they have two effects on price. First, taxes are said to be "capitalized" into the price of the asset; in other words, price is decreasing in future tax liabilities, which reduce the cash flows the investors will receive upon sale of the security (similar to valuing after-tax dividends). This capitalization effect, however, is decreasing in the investor's estimated holding period due to the time value of money. So, the longer that an investor intends to hold the security the lower the current value of the expected liability.

Second, and somewhat less obvious, capital gains tax liabilities on past appreciation increase the investor's required pre-tax rate of return on the firm's stock. Consider the following example. Suppose that there are two investors in a particular stock, both facing a 20% capital gains tax rate and having an after-tax liquidity need of $100. If investor A bought the stock when it was $50,

[37] In practice, a shareholder realizes a capital gains tax liability upon the sale of shares. The liability is based on the difference between the stock's sale price and the shareholder's tax basis (typically, purchase price). For parsimony, most theoretical work assumes that any appreciation is taxed every period (upon accrual of the gain) even if the shareholder continues to hold the stock.

then the stock price would need to be at least $112.50 to meet his liquidity needs. Whereas investor B, who bought the stock at $25, requires the stock price to be at least $118.75. In other words, the capital gains tax liability induces investor B to demand a higher reservation price and to be "locked-in" to his holding relative to investor A. Since there is no automatic increase in the supply of shares, the equilibrium price must rise in order for the market to clear. As such, lock-in is a liquidity effect.

In terms of the explicit model, equilibrium price (P) for a risky security held by risk adverse investors at time t is set by the following expression:

$$P_t = \frac{1}{1+r}\left[P_{t+1} - \left(P_{t+1} - P_t\right)\tau_t^{cg}\overline{B}_t + d_{t+1}\left(1-\tau_t^d\right) + \overline{\delta}_t - \psi_t \right]$$

Where:

P_{t+1} = exogenously determined stock price at time t+1

τ_t^d = dividend tax rate

τ_t^{cg} = capital gains tax rate

d_{t+1} = next period's expected dividend payment

$\overline{\delta}_t$ = tax effect of past appreciation (or depreciation)

$$= \left[w_t\left(\frac{\tau_t^{cg}(1+r-\overline{B}_t)G_t}{S_{t-1}} + \lambda_t\right) - \left(1-w_t\right)\tau_t^{cg}\overline{C}_t\left(\frac{G_t S_{t+1}}{S_t^2}\right)\right]$$

$\overline{B}_t$ = estimated selling schedule = $\left\{ \frac{\overline{A}_t}{1+r} \; if \;\; \alpha_{t+1} = 0; 1 \; otherwise \right\}$

$\overline{A}_t$ = future sales = $\sum_{t=1}^{T} \frac{\alpha_{t+2}}{\left(1+r\right)^{t-1}} \prod_{m=1}^{t-1} (1-\alpha_{m+2})$

α_t = proportion of shares held by all investors at t - 1 sold during period t

$\overline{C}_t$ = effect of increasing basis on capital gains realizations
(i.e., higher basis, lower capital gains taxes)

$$= \left\{ 1 - \frac{\overline{A}_t}{1+r} \; if \;\; \alpha_{t+1} \neq 0; 0 \; otherwise \right\}$$

G_t = accrued capital gains = $G_{t-1}(1-\overline{A}_{t-1}) + (P_t - P_{t-1})S_{t-1}$

r = after tax risk free rate

S_t = number of shares owned at time t

w_t = proportion of investors trading at time t; $w_t = 1(0)$ if all investors sell (buy)

λ_t = short - selling constraint

ψ_t = represents the market's estimation of the effects of risk on price

Price is reduced by $(P_{t+1} - P_t)\tau_t^{cg}\overline{B}_t$, the anticipated capital gains tax on appreciation over the next period. $\overline{B}_t$ represents the average investor's selling schedule (i.e., the inverse of the holding period) for the security. Thus, the longer investors plan to hold the security, the smaller the present value of the capital gains tax liability incorporated into price. Notice, if all investors either buy or do not trade the security at time *t*, $\overline{B}_t$ only depends upon the sales in the future ($\overline{A}_t$). If capital gains tax rates decrease, this term implies that prices will rise, as there will be less tax impounded into price. This effect is commonly called the capitalization of capital gains taxes (e.g., Lang and Shackelford, 2000).

However, $\overline{\delta}_t$, which details how past capital appreciation and additional purchases of the security affect price, also depends on capital gains tax rates. The first component of $\overline{\delta}_t$, called the "lock-in effect",

$$(w_t(\frac{\tau_t^{cg}(1+r-\overline{B}_t)G_t}{S_{t-1}} + \lambda_t)),$$

represents the effect that the taxation of past capital gains (G_t) has on price. If investors have unrealized capital gains, this term implies that their reservation price is increasing in capital gains taxes. Also, the longer the security has been held by investors, the greater the lock-in effect (i.e., when $\overline{B}_t$ is low). All else equal, the deferred tax liability is greater (lower) in an

appreciating security where share turnover is low (high) because investors' basis will be lower (higher). The second term of $\overline{\delta}_t$ is called the "basis effect":

$$(1-w_t)\tau_t^{cg}\overline{C}_t\left(\frac{G_t S_{t+1}}{S_t^2}\right).$$

It indicates that when shareholders buy additional shares of the security, their gain per share actually decreases thereby mitigating a portion of the lock-in effect. This "averaging effect", $\overline{C}_t$, also depends on the method of accounting for the basis of the shares. Klein's $\overline{C}_t$ assumes that the basis (i.e., the original purchase price of the share used to calculate the gain) is determined by averaging over all shares purchased rather than by specific identification as done in the U.S. Relative to the averaging method for determining basis, the specific identification method would increase the value of the deferral of the capital gains taxation by allowing shareholders to recognize a greater proportion of their gain in future.

An evaluation of terms $\overline{C}_t$ (the average basis effect) and $\overline{B}_t$ (the average holding period effect) indicates that the averaging effect is small as compared to the lock-in-effect. Because of the relation between $\overline{C}_t$ and $\overline{B}_t$, it is clear that the lock-in component of $\overline{\delta}_t$ dominates the benefit of increasing basis. As such, $\overline{\delta}_t$ decreases security prices when capital gains tax rates are cut.

Finally, a comparison of the tax capitalization effect and the lock-in effect terms implies that it is uncertain how changes in the capital gains tax rate would impact equilibrium prices. In fact, Klein's model shows that if holders of the security are either tax-exempt or taxed identically on all investment income, then a change in the capital gains rate will have no effect on the equilibrium price of the security. This tax irrelevance theory is developed in Miller and Scholes (1978).

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Figure 1: Hypotheses Overview of Reaction to 1997 Reduction in U.S. Capital Gains Taxes

Case	Variables of Interest	ADR Return (RET_ADR)	Home Market Return (RET_HOME)	Return Spread (SPREAD)	Remarks
H_{0a}	Event-week return (EVENT)	Not significant	Not significant	Not significant	**Tax Irrelevance Theory** Miller and Scholes (1978, 1982) (1) Marginal investor of the ADR not being a U.S. taxable individual AND/OR (2) Equity prices not reacting to taxes.
H_{0b}	Event-week return * market's assessment of capital gains tax effect for dividend paying firms (EVENT * YLD_DUM)	Not significant	Not significant	Not significant	
H_{1a}	Event-week return (EVENT)	Positive	Not significant	Increase	**Tax Capitalization Theory** Lang and Shackelford (2000) (1) Taxes capitalized into equity prices AND (2) Marginal investor of the ADR is a U.S. taxable individual.
	Event-week return * market's assessment of capital gains tax effect for dividend paying firms (EVENT * YLD_DUM)	Negative	Not significant	Decrease	
H_{1b}	Event-week return (EVENT)	Positive	Positive	Increase or not significant	(3a) Underlying security investors are U.S. taxable individuals (unlikely) OR (3b) Underlying security quickly moves with ADR towards an equilibrium price (arbitrage).
	Event-week return * market's assessment of capital gains tax effect for dividend paying firms (EVENT * YLD_DUM)	Negative	Negative	Decrease or not significant	
H_{2a}	Event-week return (EVENT)	Negative	Not significant	Decrease	**Lock-in Effect Theory** Feldstein, Slemrod and Yitzhaki (1980), Klein (1998, 1999) (1) Lock-in effect AND (2) Marginal investor of the ADR is a U.S. taxable individual.
	Event-week return * market's assessment of capital gains tax effect for dividend paying firms (EVENT * YLD_DUM)	Positive	Not significant	Increase	
H_{2b}	Event-week return (EVENT)	Negative	Negative	Decrease or not significant	(3a) Underlying security investors are U.S. taxable individuals (unlikely) OR (3b) Underlying security quickly moves with ADR towards an equilibrium price (arbitrage).
	Event-week return * market's assessment of capital gains tax effect for dividend paying firms (EVENT * YLD_DUM)	Positive	Positive	Increase or not significant	

Figure 2: ADR and Home Market Returns for Dividend and Non-Dividend Paying Firms
(Rolling five-day averages, 30 days around event)

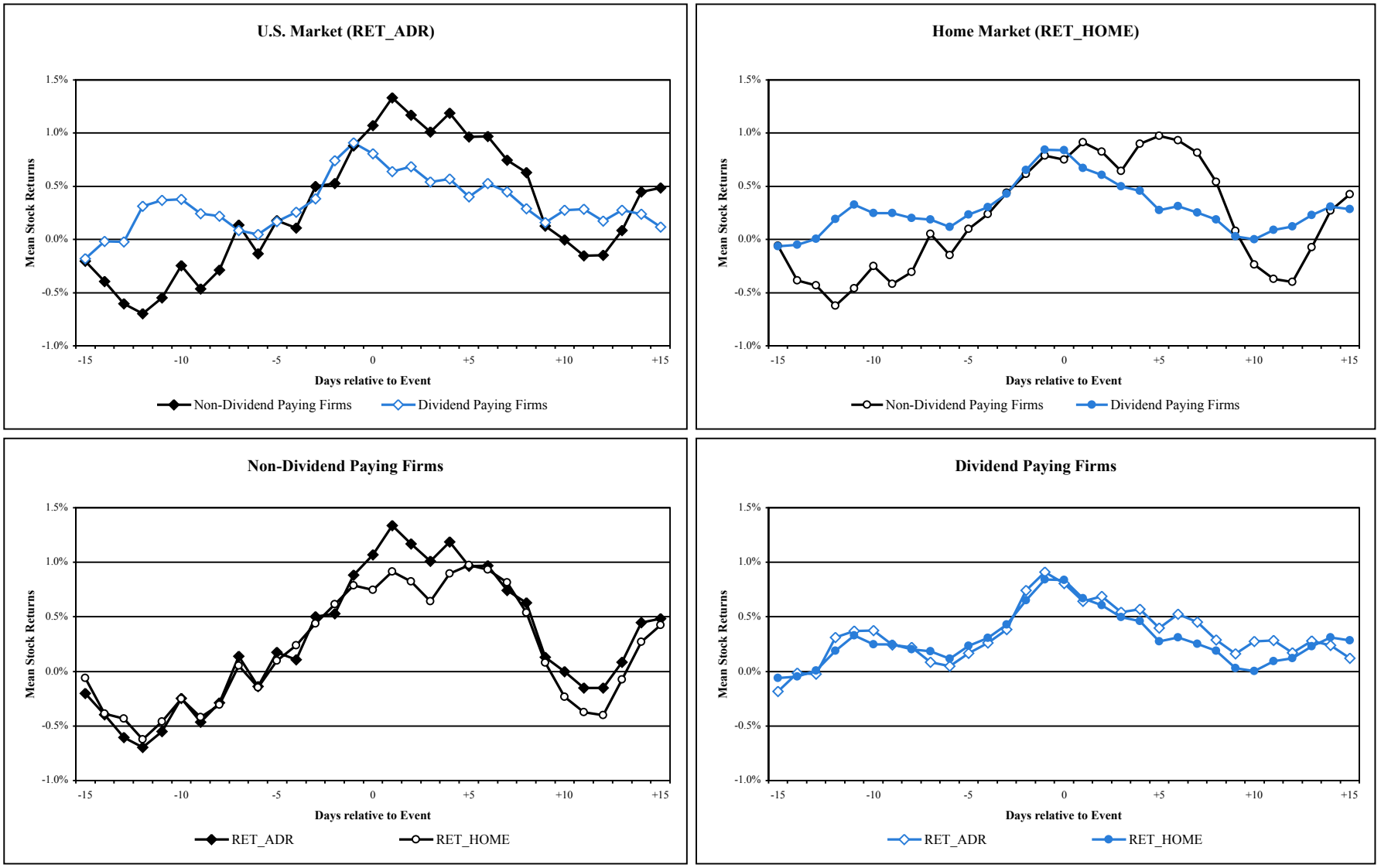

Figure 3: Return Spreads for Dividend and Non-Dividend Paying Firms
(Rolling five-day averages, 30 days around event)

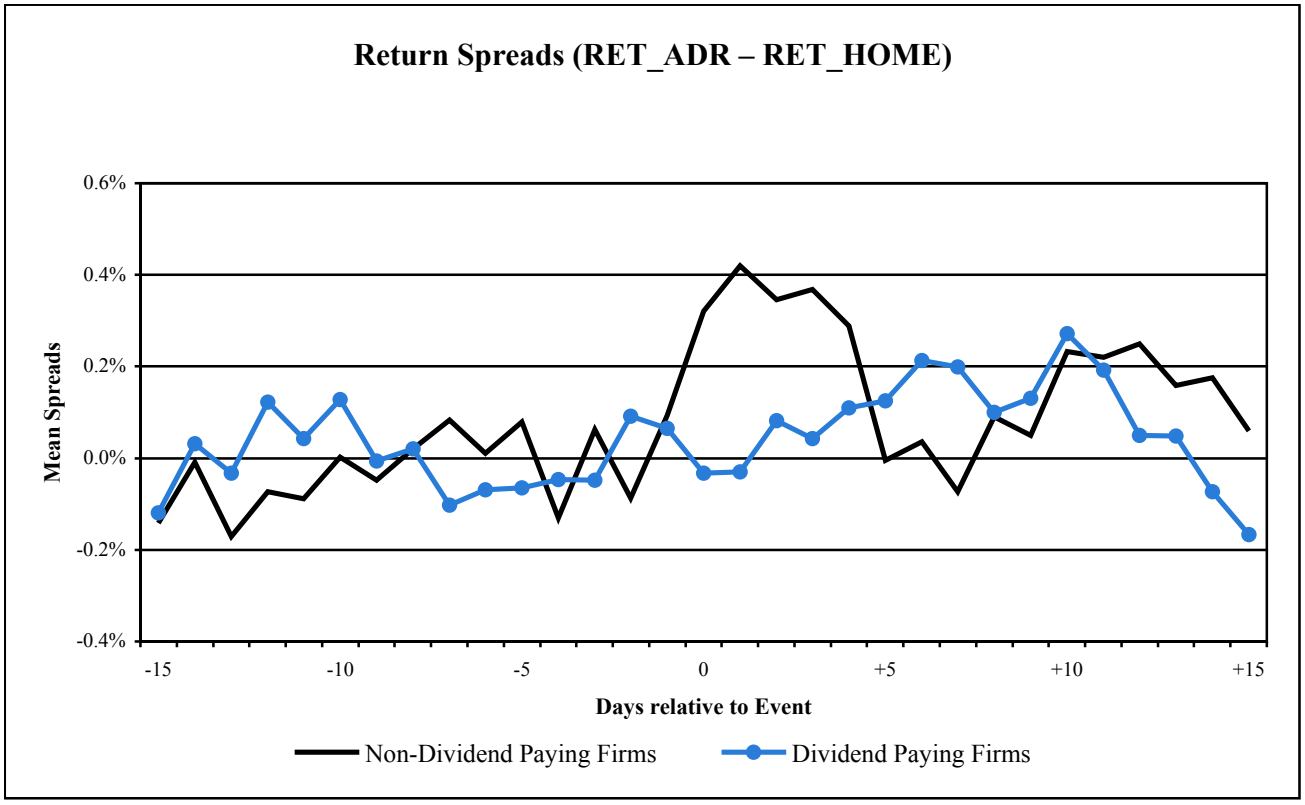

Figure 4: Cumulative ADR and Home Market Abnormal Returns for Dividend and Non-Dividend Paying Firms
(Firms with consecutive U.S. trading, daily averages, 40 days beginning at the event date)

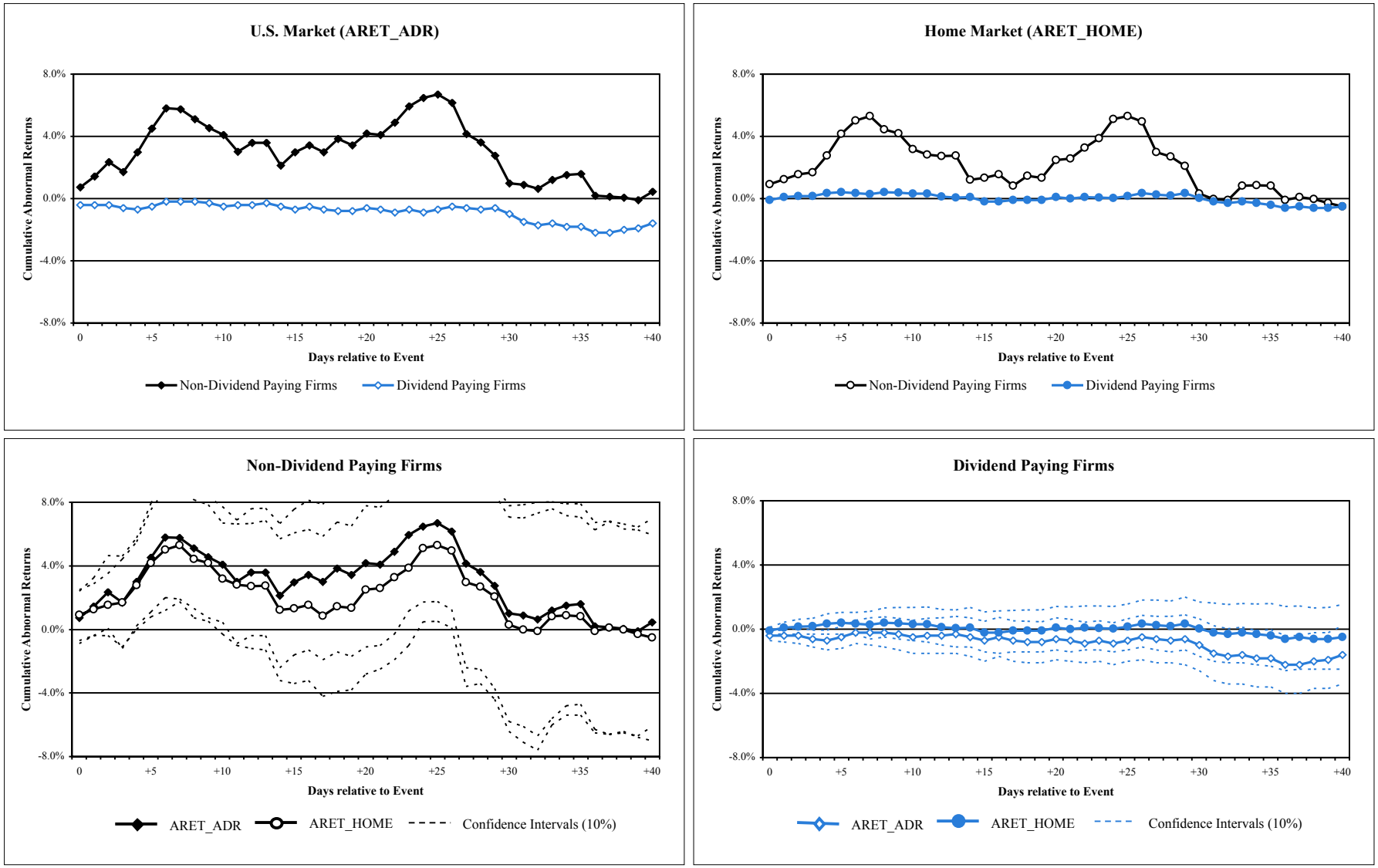

Table 1: Descriptive Statistics on ADR and Home Market Stocks

Panel A: Sample Composition by Country for Dividend and Non-Dividend Paying Firms

Country	# of Dividend Paying Firms	Total # of Firms	# of Dividend Paying Observations	Total # of Observations	Total # of Observations in % of Sample
Argentina	6	7	2,804	2,995	3.04
Australia	10	14	3,837	5,495	5.58
Brazil	0	1	0	473	0.48
Canada	34	105	12,898	34,292	34.85
Chile	12	12	4,634	4,634	4.71
China	1	2	470	924	0.94
Columbia	1	1	381	381	0.39
Denmark	2	2	825	825	0.84
Finland	1	1	486	486	0.49
France	5	6	2,351	2,821	2.87
Hong Kong	1	1	423	423	0.43
Indonesia	3	3	1,110	1,110	1.13
Israel	1	2	464	888	0.90
Italy	5	5	1,956	1,956	1.99
Japan	15	16	5,304	5,444	5.53
Korea	2	2	945	945	0.96
Mexico	9	17	3,934	7,315	7.43
Netherlands	9	9	3,548	3,548	3.61
New Zealand	3	3	1,404	1,404	1.43
Norway	2	3	608	1,095	1.11
Peru	1	1	297	297	0.30
Philippines	1	1	487	487	0.49
Portugal	2	2	685	685	0.70
South Africa	3	3	1,229	1,229	1.25
Spain	5	5	2,129	2,129	2.16
Sweden	5	5	1,874	1,874	1.90
Switzerland	1	2	340	392	0.40
United Kingdom	32	35	12,995	13,842	14.07
Total	172	266	68,418	98,389	100.00

(continued)

The sample is based on all foreign firms with a U.S. exchange listing, for which sufficient ADR price data on CRSP and home market price data on Datastream exist during the two years surrounding the 1997 reduction in U.S. capital gains taxes. We require that firms are listed in the U.S. for at least one year at the time of the event (May 2, 1997), firms' stocks actively trade in the event week, and same day ADR and home market prices are available. We exclude trading days with ADR daily volume below a minimum liquidity threshold of US$ 50,000. The table reports the number of individual firms and firm-day observations by country.

Table 1 (cont.): Descriptive Statistics on ADR and Home Market Stocks

Panel B: Summary Statistics of Returns, Market and Firm Characteristics for ADR and Underlying Stocks

	Mean	Std. Deviation	Min	Q1	Median	Q3	Max
ADR and Home Market Returns:							
RET_ADR	0.10%	3.03%	-61.29%	-1.17%	0.00%	1.24%	75.86%
RET_HOME	0.11%	3.23%	-62.10%	-1.07%	0.00%	1.16%	460.62%
SPREAD	-0.01%	2.70%	-465.92%	-0.83%	0.00%	0.79%	48.98%
PDIFF	-0.0034	0.1683	-1.5278	-0.0072	0.0019	0.0151	1.8474
Market Characteristics:							
US_MKT	0.11%	0.88%	-6.53%	-0.31%	0.16%	0.61%	4.02%
HOME_MKT	0.09%	1.07%	-18.30%	-0.40%	0.12%	0.60%	16.81%
FX	0.02%	0.62%	-21.03%	-0.17%	0.00%	0.21%	37.14%
Firm Characteristics:							
DIVYLD	1.73%	2.07%	0.00%	0.00%	1.13%	2.69%	56.68%
YLD_DUM	0.6954	0.4602	0	0	1	1	1
VOL_ADR	4,853.0	19,455.1	0.2	237.3	872.0	3,208.2	3,303,425.0
VOL_HOME	21,103.5	44,916.5	0.0	368.9	3,391.6	23,614.4	2,232,993.0
ILLIQ_ADR	0.0666	0.4541	0.0000	0.0014	0.0098	0.0480	35.4610
ILLIQ_HOME	0.3185	1.8243	0.0000	0.0004	0.0025	0.0306	23.4525
INSTHLD	11.83%	15.74%	0.00%	1.03%	4.46%	18.02%	100.00%

(continued)

The sample comprises 98,389 firm-day observations from all foreign firms with a U.S. exchange listing, for which sufficient ADR price data on CRSP and home market price data on Datastream exist during the two years surrounding the 1997 reduction in U.S. capital gains taxes. RET_ADR and RET_HOME are daily stock returns (based on closing prices) for a firm's ADR in the U.S. and the underlying stock in the home country. SPREAD is the difference between RET_ADR and RET_HOME on the same day. The price difference, PDIFF, is the natural log of the ratio of the same day ADR price to the underlying stock price in the home country (adjusted for the ADR bundling ratio and translated into US$). US_MKT and HOME_MKT are the daily market returns (based on closing values) for the CRSP value-weighted market index and the respective home country market indices. FX is the daily currency return computed as the price relative of foreign exchange rates (foreign currency to US$) minus one. DIVYLD is the dividend yield calculated as last fiscal year's dividend divided by stock price. YLD_DUM is a binary indicator variable set to one if a firm paid dividends in the year prior to the event. VOL_ADR and VOL_HOME represent daily US$ trading volume (in thousands) for a firm's ADR in the U.S. and the underlying stock in the home country. ILLIQ_ADR and ILLIQ_HOME are two measures of illiquidity, proposed by Amihud (2002), that are calculated as the average ratio of daily absolute stock returns to US$ trading volume for each firm's ADR and underlying stock. INSTHLD measures the proportion of a firm's stock that is held by known institutional investors as indicated in the Spectrum Database.

Table 1 (cont.): Descriptive Statistics on ADR and Home Market Stocks

Panel C: Correlations of Key Variables (Pearson – above diagonal)/(Spearman – below diagonal)

	RET_ADR	RET_HOME	SPREAD	PDIFF	US_MKT	HOME_MKT	FX	DIVYLD	YLD_DUM
RET_ADR	1	0.6301	0.3663	-0.0249	0.2183	0.2873	-0.1201	-0.0013	-0.0070
		(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.6774)	(0.0291)
RET_HOME	0.6711	1	-0.4918	0.0393	0.1449	0.3420	0.0002	-0.0026	-0.0048
	(<.0001)		(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.9487)	(0.4237)	(0.1350)
SPREAD	0.3981	-0.2881	1	-0.0749	0.0712	-0.0877	-0.1349	0.0016	-0.0021
	(<.0001)	(<.0001)		(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.6225)	(0.5125)
PDIFF	-0.1150	0.1424	-0.3381	1	-0.0008	0.0073	-0.0155	0.0399	-0.0100
	(<.0001)	(<.0001)	(<.0001)		(0.8035)	(0.0226)	(<.0001)	(<.0001)	(0.0018)
US_MKT	0.2264	0.1772	0.0784	0.0065	1	0.4245	-0.0281	0.0068	0.0054
	(<.0001)	(<.0001)	(<.0001)	(0.0419)		(<.0001)	(<.0001)	(0.0324)	(0.0926)
HOME_MKT	0.3268	0.4159	-0.0809	0.0305	0.4303	1	-0.0452	0.0008	-0.0084
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)		(<.0001)	(0.7929)	(0.0082)
FX	-0.1138	0.0180	-0.1921	-0.0046	-0.0221	-0.0110	1	0.0062	0.0082
	(<.0001)	(<.0001)	(<.0001)	(0.1511)	(<.0001)	(0.0005)		(0.0520)	(0.0099)
DIVYLD	0.0214	0.0249	-0.0011	0.1200	0.0070	-0.0059	0.0019	1	0.4992
	(<.0001)	(<.0001)	(0.7309)	(<.0001)	(0.0274)	(0.0648)	(0.5473)		(<.0001)
YLD_DUM	0.0238	0.0274	-0.0052	0.1210	0.0078	-0.0140	0.0077	0.7252	1
	(<.0001)	(<.0001)	(0.1049)	(<.0001)	(0.0142)	(<.0001)	(0.0160)	(<.0001)	

The sample comprises 98,389 firm-day observations from all foreign firms with a U.S. exchange listing, for which sufficient ADR price data on CRSP and home market price data on Datastream exist during the two years surrounding the 1997 reduction in U.S. capital gains taxes. The table presents Pearson correlations (above diagonal) and Spearman rank correlations (below diagonal) as well as p-values (in parentheses). See Table 1 Panel B for variable definitions.

Table 2: Summary Statistics by Event Period for Dividend and Non-Dividend Paying Firms

	Variables	Prediction of Differences			Event Period (1)	Non-Event Period (2)	Difference (1) – (2)
		Tax Capi-talization	Lock-in Effect	Tax Irrelevancy			
Non-Dividend Paying Firms (a)	RET_ADR	+	–	0	1.17%	0.12%	1.05%***
	RET_HOME	?	?	0	0.82%	0.13%	0.69%***
	SPREAD	+	–	0	0.35%	-0.01%	0.36%*
	N				411	29,560	
Dividend Paying Firms (b)	RET_ADR	+	–	0	0.81%	0.08%	0.73%***
	RET_HOME	?	?	0	0.84%	0.10%	0.74%***
	SPREAD	+	–	0	-0.03%	-0.02%	-0.01%
	N				711	67,707	
Difference (a) – (b)	RET_ADR	+	–	0	0.36%*	0.04%*	
	RET_HOME	0	0	0	-0.02%	0.03%	
	SPREAD	+	–	0	0.38%**	0.01%	

The sample comprises 98,389 firm-day observations from all foreign firms with a U.S. exchange listing, for which sufficient ADR price data on CRSP and home market price data on Datastream exist during the two years surrounding the 1997 reduction in U.S. capital gains taxes. RET_ADR and RET_HOME are daily stock returns (based on closing prices) for a firm's ADR in the U.S. and the underlying stock in the home country. SPREAD is the difference between RET_ADR and RET_HOME on the same day. The table reports mean values. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 3: ADR Stock Returns, Home Market Stock Returns and Return Spreads (ADR – Home Market) around the 1997 Reduction in U.S. Capital Gains Taxes

$$\text{Dependent Variable}_{i,t} = \beta_0 + \beta_1 \text{DIVYLD}_{i,t} + \beta_2 \text{EVENT}_t + \beta_3 \text{EVENT}_t * \text{DIVYLD}_{i,t} + \beta_4 \text{US\_MKT}_t + \beta_5 \text{HOME\_MKT}_{i,t} + \beta_6 \text{FX}_{i,t} + \beta_7 \text{PDIFF}_{i,t-1} + \sum \beta_j \text{Country Controls}_i + \varepsilon_{i,t}$$

	Dependent Variables					
Independent Variables	Predicted Sign	RET_ADR	Predicted Sign	RET_HOME	Predicted Sign	SPREAD
Intercept	?	0.01	?	0.03*	?	-0.02
		(0.86)		(1.69)		(1.21)
DIVYLD	?	-0.35	?	-0.44	?	0.10
		(0.62)		(0.69)		(0.15)
EVENT	**+**	**0.12**	**0 (+)**	**0.16**	**+ (0)**	**-0.04**
		(0.84)		**(1.13)**		**(0.56)**
EVENT * DIVYLD	**–**	**-8.98****	**0 (–)**	**-0.52**	**– (0)**	**-8.46*****
		(2.34)		**(0.14)**		**(3.58)**
US_MKT	+	39.98***	?	-0.19	+	40.17***
		(15.52)		(0.08)		(16.11)
HOME_MKT	+	66.08***	+	103.54***	–	-37.47***
		(23.12)		(27.56)		(14.10)
FX	–	-51.79***	+	8.32	–	-60.11***
		(9.19)		(1.64)		(19.64)
PDIFF	–	-0.61**	+	0.87*	–	-1.47**
		(2.23)		(1.65)		(1.99)
Country Controls		Yes		Yes		Yes
Number of Firms		266		266		266
Number of Observations		98,389		98,389		98,389
R^2		10.62%		11.91%		4.80%

The sample comprises 98,389 firm-day observations from foreign firms with a U.S. exchange listing during the two years surrounding the 1997 reduction in U.S. capital gains taxes. We use the following three dependent variables: (1) RET_ADR, is the daily stock return (based on closing prices) for a firm's ADR in the U.S., (2) RET_HOME, is the daily stock return (based on closing prices) for a firm's underlying stock in the home country, and (3) SPREAD, is the difference between RET_ADR in the U.S. and RET_HOME in the home country on the same day. EVENT is a binary indicator variable set to one if the observation date is on or between April 30 through May 6, 1997. See Table 1 Panel B for a description of the remaining independent variables. The predicted signs for the main variables of interest reflect the tax capitalization hypothesis. Country indicators are included in the regressions but not reported. The table reports OLS coefficient estimates and, in parentheses, t-statistics based on heteroscedasticity corrected standard errors that are clustered by firm. For expositional purposes we multiply all coefficients by 100. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 4: Sensitivity Analyses of ADR Stock Returns, Home Market Stock Returns and Return Spreads around the 1997 Reduction in U.S. Capital Gains Taxes

$$\text{Dependent Variable}_{i,t} = \beta_0 + \beta_1 \text{DIVYLD}_{i,t} + \beta_2 \text{EVENT}_t + \beta_3 \text{EVENT}_t * \text{DIVYLD}_{i,t} + \beta_4 \text{US\_MKT}_t + \beta_5 \text{HOME\_MKT}_{i,t} + \beta_6 \text{FX}_{i,t} + \beta_7 \text{PDIFF}_{i,t-1} + \sum \beta_j \text{Country Controls}_i + \varepsilon_{i,t}$$

		Dependent Variables		
Independent Variables	N	RET_ADR	RET_HOME	SPREAD
Reduced Sample Period (+/- 3 months)				
EVENT	24,952	0.29**	0.30**	-0.01
		(2.04)	(2.17)	(0.11)
EVENT * DIVYLD		-9.61**	-2.53	-7.08***
		(2.36)	(0.68)	(3.18)
Reduced Event Window (3 days)				
EVENT	98,389	0.10	0.08	0.02
		(0.59)	(0.48)	(0.17)
EVENT * DIVYLD		-8.13*	2.29	-10.42***
		(1.66)	(0.50)	(2.84)
Home Country Returns in US$				
EVENT	98,389	0.12	0.16	-0.04
		(0.85)	(1.13)	(0.57)
EVENT * DIVYLD		-8.75**	-0.95	-7.80***
		(2.28)	(0.25)	(3.10)
Winsorized Returns				
EVENT	98,389	0.09	0.16	-0.07
		(0.68)	(1.19)	(0.98)
EVENT * DIVYLD		-8.55**	-0.84	-7.71***
		(2.24)	(0.24)	(3.47)
Dividend Indicator instead of Dividend Yield				
EVENT	98,389	0.14	0.10	0.04
		(0.67)	(0.49)	(0.40)
EVENT * YLD_DUM		-0.27	0.07	-0.34***
		(1.21)	(0.32)	(3.18)

The sample comprises a maximum of 98,389 firm-day observations from foreign firms with a U.S. exchange listing during the two years surrounding the 1997 reduction in U.S. capital gains taxes. The dependent variables either are RET_ADR, RET_HOME or SPREAD. See Table 1 Panel B for all variable definitions. We report results for the following specifications: (1) a reduced sample period that covers the six months surrounding the 1997 reduction in capital gains taxes, (2) a shortened event window beginning on the event day, May 2, through May 6 (3 trading days), (3) we translate all the local returns into US$ before estimating the regressions, (4) we winsorize the return metrics at the upper and lower .025 percentile, and (5) we replace the continuous dividend yield with a dichotomous indicator set equal to one if a firm paid dividends in the year prior to the event. The table reports only the event indicator (EVENT) and the interaction effect with dividend yield (DIVYLD), but the full set of controls is included. See Table 3 for details. The table reports OLS coefficient estimates and, in parentheses, t-statistics based on heteroscedasticity corrected standard errors that are clustered by firm. For expositional purposes we multiply all coefficients by 100. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 5: Abnormal U.S. and Home Market Trading Volume and Volume Spreads (ADR – Home Market) around the 1997 Reduction in U.S. Capital Gains Taxes

$$\text{Dependent Variable}_{i,t} = \gamma_0 + \gamma_1 \text{PART}_{i,t} + \gamma_2 \text{EVENT}_t + \gamma_3 \text{EVENT}_t * \text{PART}_{i,t} + \gamma_4 \text{US\_MKT\_AVOL}_t + \gamma_5 \text{HOME\_MKT\_AVOL}_{i,t} + \gamma_6 \text{FX}_{i,t} + \sum \gamma_j \text{Country Controls}_i + \upsilon_{i,t}$$

	Dividend Yield (PART = DIVYLD)			Positive Share Appreciation Indicator (PART = APPR_DUM)			Share Appreciation (PART = APPR)		
Variables	AVOL_ADR	AVOL_HOME	AVOL_SPREAD	AVOL_ADR	AVOL_HOME	AVOL_SPREAD	AVOL_ADR	AVOL_HOME	AVOL_SPREAD
Intercept	3.57	-0.67	4.24	-17.67	4.05	-21.72	-35.40	-41.09**	5.69
	(0.21)	(0.06)	(0.25)	(0.69)	(0.15)	(0.67)	(1.11)	(2.35)	(0.18)
PART	-413.12**	-642.44**	229.32	20.01*	-22.15	42.16	107.02**	101.60***	5.42
	(2.22)	(2.07)	(0.69)	(1.70)	(0.61)	(1.19)	(2.03)	(3.70)	(0.10)
EVENT	**-33.45**	**-21.31**	**-12.14**	**45.27**	**-0.16**	**45.43**	**-9.71**	**-0.63**	**-9.07**
	(1.45)	**(1.20)**	**(0.47)**	**(0.76)**	**(0.00)**	**(0.66)**	**(0.54)**	**(0.05)**	**(0.43)**
EVENT * PART	**383.78**	**229.56**	**154.22**	**-101.18***	**-24.66**	**-76.52**	**-80.32***	**-81.93****	**1.61**
	(0.86)	**(0.60)**	**(0.31)**	**(1.68)**	**(0.56)**	**(1.09)**	**(1.80)**	**(2.09)**	**(0.03)**
US_MKT_AVOL	89.57***	28.39	61.18***	89.31***	28.52	60.79***	98.05***	35.83**	62.22**
	(4.33)	(1.59)	(2.70)	(4.33)	(1.57)	(2.68)	(4.27)	(2.00)	(2.47)
HOME_MKT_AVOL	21.88***	95.57***	-73.69***	21.81***	95.54***	-73.73***	22.82***	96.51***	-73.69***
	(3.33)	(4.34)	(3.93)	(3.30)	(4.31)	(3.92)	(3.48)	(4.43)	(3.86)
FX	10.87	89.38	-78.51	5.00	82.69	-77.69	49.37	117.57	-68.20
	(0.06)	(0.57)	(0.42)	(0.03)	(0.53)	(0.42)	(0.26)	(0.68)	(0.36)
Country Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Firms (Observations)		262 (97,002)			262 (97,002)			262 (93,916)	
R^2	1.45%	1.06%	0.54%	1.47%	1.06%	0.58%	2.96%	1.32%	0.54%

The sample comprises a maximum of 97,002 firm-day observations from foreign firms with a U.S. exchange listing during the two years surrounding the 1997 reduction in U.S. capital gains taxes. The dependent variables either are the abnormal trading volume for a firm's ADR in the U.S. (AVOL_ADR), the underlying stock in the home country (AVOL_HOME) or the difference between the two (AVOL_SPREAD). For each firm we calculate the abnormal trading volume by dividing the daily US$ trading volume by the average US$ trading volume in the year leading to the event. We set PART equal to one of the following three variables in order to examine the volume effects of the 1997 budget accord: (1) DIVYLD is the dividend yield calculated as last fiscal year's dividend divided by stock price, (2) APPR_DUM is a binary indicator variable set to one if a firm experienced a positive stock price appreciation in the year leading to the event, and (3) APPR is the year-to-year change in stock price calculated on a daily basis. EVENT is a binary indicator variable set to one if the observation date is on or between April 30 through May 6, 1997. US_MKT_AVOL and HOME_MKT_AVOL represent the aggregate daily abnormal trading volume for the CRSP market index and the respective home country market indices. FX is the daily currency return computed as the price relative of foreign exchange rates (foreign currency to US$) minus one. Country indicators are included in the regressions but not reported. The table reports OLS coefficient estimates and, in parentheses, t-statistics based on heteroscedasticity corrected standard errors that are clustered by firm. For expositional purposes we multiply all coefficients by 100. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 6: Role of Liquidity and Arbitrage – Cross-sectional Analysis of the Reaction to the 1997 Reduction in U.S. Capital Gains Taxes

$$\text{Dependent Variable}_{i,t} = \beta_0 + \beta_1 \text{DIVYLD}_{i,t} + \beta_2 \text{EVENT}_t + \beta_3 \text{EVENT}_t * \text{DIVYLD}_{i,t} + \beta_4 \text{US\_MKT}_t + \beta_5 \text{HOME\_MKT}_{i,t} + \beta_6 \text{FX}_{i,t} + \beta_7 \text{PDIFF}_{i,t-1} + \sum \beta_j \text{Country Controls}_i + \varepsilon_{i,t}$$

Panel A: Partitioning across Average US$ Trading Volume for a Firm's ADR (VOL_ADR)

	25th Percentile as Cut-off Value			50th Percentile as Cut-off Value			75th Percentile as Cut-off Value		
Variables	RET_ADR	RET_HOME	SPREAD	RET_ADR	RET_HOME	SPREAD	RET_ADR	RET_HOME	SPREAD
High Liquidity Sub-Samples									
# Firms (Observations)		166 (74,232)			105 (49,685)			52 (25,093)	
DIVYLD	0.69*	0.70*	-0.01	0.98*	0.40	0.58	0.32	0.82	-0.50
	(1.82)	(1.85)	(0.04)	(1.68)	(0.73)	(1.20)	(0.24)	(0.63)	(0.75)
EVENT	**0.14**	**0.29***	**-0.15****	**0.25**	**0.47*****	**-0.22*****	**0.41**	**0.77*****	**-0.36*****
	(0.90)	**(1.86)**	**(2.57)**	**(1.33)**	**(2.76)**	**(2.95)**	**(1.29)**	**(2.71)**	**(3.88)**
EVENT * DIVYLD	**-9.39****	**-4.06**	**-5.33****	**-16.82*****	**-9.65***	**-7.17****	**-21.78****	**-19.58****	**-2.20**
	(2.29)	**(1.02)**	**(2.52)**	**(2.78)**	**(1.93)**	**(2.03)**	**(2.20)**	**(2.15)**	**(0.87)**
R^2	13.09%	18.35%	8.20%	14.73%	21.26%	9.69%	21.46%	27.44%	15.02%
Low Liquidity Sub-Samples									
# Firms (Observations)		100 (24,157)			161 (48,704)			214 (73,296)	
DIVYLD	-5.71*	-3.26	-2.45	-1.14	0.63	-1.77*	-0.31	-0.25	-0.06
	(1.74)	(0.99)	(0.51)	(1.07)	(0.66)	(1.74)	(0.46)	(0.38)	(0.09)
EVENT	**0.05**	**-0.10**	**0.15**	**0.03**	**-0.04**	**0.07**	**0.10**	**0.07**	**0.03**
	(0.18)	**(0.39)**	**(0.99)**	**(0.14)**	**(0.20)**	**(0.68)**	**(0.62)**	**(0.44)**	**(0.39)**
EVENT * DIVYLD	**-9.80**	**14.41**	**-24.21****	**-3.49**	**5.72**	**-9.22*****	**-7.44***	**2.26**	**-9.70*****
	(1.24)	**(1.39)**	**(2.41)**	**(0.72)**	**(1.15)**	**(2.78)**	**(1.81)**	**(0.58)**	**(3.32)**
R^2	6.40%	5.15%	3.06%	8.08%	7.82%	2.74%	8.63%	9.55%	3.69%
Diff. in EVENT * DIVYLD between Sub-Samples (t-stat)	(0.03)	(1.41)	(2.13)**	(1.52)	(2.05)**	(0.60)	(1.35)	(2.27)**	(2.22)**

(continued)

Table 6 (continued)

Panel B: Alternative Partitions across Firm Variation in Liquidity

	Number of Trading Days of a Firm's ADR (Maximum Number as Cut-off Value)			Illiquidity measured as average Price Impact in U.S. and Home Market (33rd Percentile as Cut-off Value)			Ownership by Institutional Investors (75th Percentile as Cut-off Value)		
Variables	RET_ADR	RET_HOME	SPREAD	RET_ADR	RET_HOME	SPREAD	RET_ADR	RET_HOME	SPREAD
High Liquidity Sub-Samples									
# Firms (Observations)		142 (66,078)			110 (49,728)			59 (25,015)	
DIVYLD	0.49	0.53	-0.04	0.91**	0.77	0.14	0.29	0.23	0.06
	(1.05)	(1.00)	(0.08)	(2.07)	(1.66)	(0.42)	(0.41)	(0.33)	(0.10)
EVENT	**0.27**	**0.40****	**-0.13****	**0.26**	**0.53*****	**-0.27*****	**0.74*****	**0.83*****	**-0.09**
	(1.61)	**(2.33)**	**(2.21)**	**(1.31)**	**(2.83)**	**(4.53)**	**(3.26)**	**(3.55)**	**(0.79)**
EVENT * DIVYLD	**-13.73*****	**-8.68***	**-5.05*****	**-14.36****	**-11.17****	**-3.20****	**-23.43****	**-17.86****	**-5.57***
	(2.91)	**(1.85)**	**(3.16)**	**(2.56)**	**(2.11)**	**(2.03)**	**(2.65)**	**(2.02)**	**(1.73)**
R^2	13.70%	19.49%	9.24%	22.94%	31.09%	15.53%	8.81%	10.70%	5.68%
Low Liquidity Sub-Samples									
# Firms (Observations)		124 (32,311)			156 (48,661)			207 (73,374)	
DIVYLD	-0.58	0.21	-0.79	-0.55	-1.18	0.63	-0.44	-0.22	-0.21
	(0.41)	(0.18)	(0.51)	(0.60)	(0.62)	(0.33)	(0.64)	(0.28)	(0.28)
EVENT	**-0.06**	**-0.17**	**0.10**	**0.09**	**0.02**	**0.06**	**-0.14**	**-0.11**	**-0.03**
	(0.30)	**(0.78)**	**(0.77)**	**(0.48)**	**(0.13)**	**(0.66)**	**(0.82)**	**(0.66)**	**(0.39)**
EVENT * DIVYLD	**-4.26**	**13.47***	**-17.73****	**-8.25**	**5.21**	**-13.46****	**-2.94**	**6.22**	**-9.16*****
	(0.68)	**(1.90)**	**(2.58)**	**(1.56)**	**(0.95)**	**(2.26)**	**(0.65)**	**(1.46)**	**(3.20)**
R^2	7.02%	6.17%	2.72%	6.72%	6.97%	3.64%	11.33%	12.28%	4.70%
Diff. in EVENT * DIVYLD between Sub-Samples (t-stat)	(1.10)	(2.31)**	(1.70)*	(0.78)	(2.14)**	(2.11)**	(2.04)**	(2.47)**	(1.07)

The sample comprises a maximum of 98,389 firm-day observations from foreign firms with a U.S. exchange listing during the two years surrounding the 1997 reduction in U.S. capital gains taxes. The dependent variables either are RET_ADR, RET_HOME or SPREAD. See Table 1 Panel B for all variable definitions. In Panel A, we present results for high and low liquidity sub-samples using the average daily US$ trading volume for a firm's ADR in the U.S. as the partitioning variable. We set the cut-off value equal to the 25th, 50th and 75th percentile of the volume distribution to separate between low (below cut-off value) and high liquidity firms. In Panel B, we present results using three alternative metrics to assign firms to the high liquidity sub-sample: (1) firms with consecutive trading in the U.S. (505 trading days), (2) firms where the average Amihud (2002) illiquidity measure is below the 33rd percentile in at least one market (i.e., U.S. or home country), and (3) firms where the average proportion of institutional holdings as indicated in the Spectrum Database is above the 75th percentile. The table reports only the main and interaction effects of dividend yield (DIVYLD) and the event indicator (EVENT), but the full set of controls is included. See Table 3 for details. The table reports OLS coefficient estimates and, in parentheses, t-statistics based on heteroscedasticity corrected standard errors that are clustered by firm. It also reports t-statistics from a fully interacted model comparing the coefficients on EVENT * DIVYLD across the two sub-samples. For expositional purposes we multiply all coefficients by 100. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.