THE DIVIDEND PUZZLE: THE INFLUENCE OF TAXES, TICK SIZE AND SHORT-TERM TRADING ON EX-DIVIDEND DAY PRICES IN CANADA

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Abstract: We differentiate among some of the contending hypotheses about ex-dividend day pricing by studying share price behavior in Canadian markets around the ex-dividend day during the period 1977-2000. Over this time, the tax regime switched from favoring capital gains to favoring dividends, and in 1996 exchanges decimalized and reduced minimum tick sizes. We rule out both tax and tick-size effects on ex-day behavior. In other words, no support is found for tax-induced pricing and therefore consequently dividend clienteles or for the Bali and Hite (1998) pricing model. We find some evidence that short-term trading may be a factor in the ex-dividend day price behavior.

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One of the ongoing puzzles of empirical finance is the ex-dividend behavior of stock prices. In a frictionless world devoid of taxation and transaction costs, the expected ex-dividend day opening price of a share is the last closing cum-dividend price less the amount of the declared dividend. What we observe, though, is that on average the ex-dividend price falls by less than the amount of the dividend. The first question is thus why does this happen? A second interrelated question is that given a seeming market preference for capital gains over dividends, why is the incomplete price adjustment not arbitraged away? An interesting feature of ex-dividend behavior is that (with a few exceptions) it is observable in developed markets around the world. Consequently, any explanations cannot be restricted to a unique market microstructure, tax regime or other friction. The best rationalization of ex-dividend pricing is the one that applies to all markets.

MOTIVATION

Two hypotheses have been proposed for explaining the incomplete price drop-off, and three reasons proffered as to why in the face of what seems to be exploitable risk-free profits the pricing discrepancy persists. The oldest and best-known explanation is the tax argument of Elton and Gruber (1970).

Taxes

Elton and Gruber (1970) propose that after-tax pricing dominates the market and show that buyers and sellers are indifferent between trading cum-dividend and ex-dividend when

$$\frac{P_{cum} - P_{ex}}{D} = \frac{1 - t_d}{1 - t_g}$$

where P_{cum} is the stock price cum-dividend, P_{ex} is the expected price on the ex-dividend day, D is the amount of the dividend per share, t_g is the capital gains tax rate and t_d is the tax rate on dividends. Clearly, when dividends are more heavily taxed than capital gains, that is $t_d > t_g$, the drop-off ratio is less than one indicating the ex-day price is higher than it should be. Because capital gains did carry a greater tax burden than dividends in the U.S. (and other countries) when their research was done and for most years thereafter, the tax-based ex-day pricing explanation became widely accepted.

According to Elton and Gruber (1970), we can observe the tax effect because of dividend clienteles: investors in high tax brackets will hold low dividend yield stocks to reduce their tax liability and vice versa. Therefore, price adjustments should take place to the extent that the ex-dividend relative price drop should increase with dividend yield. In fact, the price drop-off ratio is found to be positively correlated with the dividend yield to the extent that the highest yielding stocks have a full ex-day drop-off.

That taxes influence investor behavior is hard to refute. Differential taxation of the components of investment return influences investor portfolio holdings (Chaplinsky and Seyhun, 1990; Blose and Martin, 1992). The ex-day creates trading in countries with differential taxes (U.S.: Lakonishok and Vermaelen, 1986; Canada: Booth and Johnson, 1984) but not in tax-free Hong Kong (Frank and Jagannathan, 1998). Whether taxes are the prime mover of prices is another matter. For example, tax law changes that affect the relative tax burden of dividends and capital gains should show pronounced and lasting impacts on ex-day price adjustments. However, the evidence is mixed. A caveat is in order when assessing the results of the before-after tax change literature since the time spans of the before and/or after samples tend to be relatively short. As Eades et al. (1994) and Boyd and Jagannathan (1994) have shown, ex-day excess returns vary over time implying that shorter time sample findings will be sensitive to the period picked regardless of the tax regime.

The ex-price drop-off may change in the direction expected (Lamdin and Hiemstra, 1993, Grammatikos, 1989, Koski, 1996, Bell and Jenkinson, 2002, Elton, Gruber and Blake, 2005, Lasfer and Zenonos, 2003, and Graham, Michaely and Roberts, 2003), not change (Michaely, 1991) or alter only temporarily (Hubbard and Michaely, 1997). Moving beyond equities, Green and Rydquist (1999) find support for the tax-based argument in their study of Swedish lottery bonds that trade in a market where there are limitations to short-term arbitrage and where capital gains are tax-disadvantaged relative to dividends.

The strongest substantiation in favor of the tax induced pricing hypothesis is Barclay's (1987) finding that prior to the enactment of U.S. federal income tax, stocks fall by the full amount of the dividend. On the other hand, (1) ex-day pricing of non-taxable distributions is not compatible with a tax interpretation (Eades et al., 1994), (2) the 1986 U.S. tax reform equalizing the tax on dividends and capital gains for ordinary investors reduced the incomplete drop-off but did not eliminate it (Fedenia and Grammatikos, 1991; Lamdin and Hiemstra,

1993); Cloyd, Li and Weaver (2006) report similar findings to the 2003 U.S. tax reform equalizing the tax rates on dividends and capital gains, (3) the influence of something more important than taxes on dual class shares exists (Hubbard and Michaely,1997), and (4) the explanation does not "travel well" outside of the U.S. The ex-day drop-off is smaller than is consistent with the tax regimes in Canada (Lakonishok and Vermaelen, 1983; Booth and Johnson, 1984), the U.K (Lasfer, 1995), Israel (Sarig and Tolkowsky, 1997), Denmark (Jacob and Akhmedov, 2006), some Finnish shares (Hietala and Keloharju, 1995), and most interestingly Hong Kong, which does not tax either dividends or capital gains (Frank and Jagannathan, 1998). The Italian and Japanese markets have unique ex-day influences that are strong enough to inhibit generalizations to those markets (for Italy see Michaely and Murgia, 1995 and for Japan see Kato and Lowenstein, 1995).

Without a tax-based preference for capital gains, the dividend clientele explanation for the incomplete ex-day price adjustment remaining visible becomes untenable. And we offer additional evidence below that taxes cannot be the driving force of ex-dividend pricing.

Short-Term Trading

While accepting tax-based pricing, Kalay (1982) argued that the tax-clientele hypothesis is inconsistent with no-arbitrage equilibrium. Roundabout ways of converting dividends into capital gains, arbitrage by those who are indifferent between dividends and capital gains, and dividend capture (buying cum-dividend and selling ex-dividend, the same as arbitrageurs) by corporate investors and others because of favorable tax treatment of dividends should all operate to erase an observable tax effect. In addition, there are some large traders such as pension funds, mutual funds and owners of tax sheltered retirement plans who are indifferent between capital gains and dividends and, while not interested in arbitrage, might be willing to delay or advance trades by a day or two to take advantage of after-tax pricing. These pressures to eliminate tax-induced pricing have become known as the short-term trading hypothesis. Lakonishok and Vermaelen (1986) find that trading volume increases around the ex-dividend day for high-yield and liquid stocks, which they interpret as evidence of short-term trading. Eades et al. (1994) and Naranjo et al. (2000) find that ex-day returns on high yield stocks vary over time in a manner consistent with corporate dividend capture. Kadapakkam (2000) examines ex-day behavior after the introduction of electronic settlement that facilitates arbitrage trades. He finds support for the short-term trading hypothesis. Prices adjust to a full ex-dividend drop-off and more in the most liquid highest yielding stocks, which are the type that arbitrageurs and dividend capturers are most likely to trade, and an incomplete drop-off is found in stocks that are less likely to be traded. Using theoretical equilibrium arguments, Boyd and Jagannathan (1994) predict a convex relationship between percentage price drop and dividend yield. They predict that as transaction costs fall, the incentives for arbitrage and dividend capture increase. Hence, a reduction in transaction costs should lead to a higher ex-day drop-off as well as an increase in trading volume before and after the ex-day. Other research findings supporting short-term trading can be found in Karpoff and Walking (1988, 1990) and Liljeblom, Loflund and Hedvall (2001).

Notice that the short-term trading hypothesis is answering the second question regarding the arbitraging away of the incomplete price adjustment. But it has nothing to say about why there is an incomplete price adjustment to start with. Although it is usually tied in with tax-induced pricing, as long as the market has a preference for capital gains over dividends for whatever non-tax reason, the short-term trading hypothesis remains a plausible explanation for why some stock exhibit full price adjustment while others do not.

Minimum Tick Size

An extension of and competitor to the short-term trading hypothesis is the minimum tick size (minimum price change allowed by the exchange) effect introduced by Bali and Hite (1998). They start with a tax-induced preference for capital gains and incorporate arbitrage but their model leads to market equilibrium only when the ex-dividend price falls to the tick below the dividend. For instance, suppose that the cum dividend stock price is $10, the dividend is 50¢, and the minimum tick size is 10¢. Ex-dividend price will be $9.60 and consequently the drop-off ratio will be less than one. The price drop-off is 40¢ or 80 per cent of the dividend. If the dividend was 20¢, ex-dividend day price is expected to be $9.90 or a fall-off of only 50 per cent of the dividend. A $1 dividend leads to a $9.10 price or a 90 per cent drop. Because the magnitude of the dividend and dividend yield are highly positively correlated, we observe drop-off increasing with yield, an effect that has nothing to do with dividend clienteles or short-term trading.

The importance of tick size remains controversial. Sarig and Tolkowsky (1997) find that the ex-day drop-off in Israel averages about one-half of the dividend although tick size is one-hundredth of a sheckel (1 sheckel ≈ US $0.25). Graham et al. (2003) and Jakob and Ma (2004) find that declining price discreteness after decimalization had no impact on the price-drop ratio. Cloyd, Li, and Weaver (2006) use a longer post-decimalization sample and find similar results for the price-drop ratio but report that ex-day abnormal returns declined significantly as a result of decimalization in 2001 providing support to the tick-size explanation.

Moreover, the Bali and Hite (1998) tick size effect argument requires a preference for capital gains over dividends or else as discussed in Appendix A the model has no equilibrium or we expect the price fall to exceed the dividend. Thus, their model is not applicable to countries with tax regimes favoring dividends or indifferent between dividends and capital gains unless the fondness for capital gains is not tax related.

A Non-Tax-Based Preference for Capital Gains

An alternative to the tax-induced preference for capital gains is advanced by Frank and Jagannathan (1998). They examine the Hong Kong stock market where neither dividends nor capital gains are taxed and document that on ex-dividend days stock prices still drop by less than the amount of the dividend. A market microstructure model is proposed where buyers and sellers find dividends to be a nuisance because of their collection and reinvestment and therefore of less value than they are to market makers. This results in sellers trading cum-dividend and buyers entering the market ex-dividend so that the cum-dividend price tends to be a bid price while the ex-dividend price will typically be an ask price. Thus, the price fall will be from bid to ask which is less than the amount of the dividend. Investors are essentially willing to pay others to collect the dividend and do this by accepting a drop-off ratio of less than one.

Some findings suggest that their model is not complete or at least is not applicable everywhere else as its basic tenet and one of its predictions are not supported by U.S. data. Koski (1996) finds that most cum-day trades occur at the ask whereas the ex-day sees a tilt toward bid price trading. Furthermore, the hypothesis predicts that cum-ex bid-to-bid or ask-to-ask prices should drop by the same amount as the dividend. In another study, Koski and Michaely (2000) find abnormal returns on bid-to-bid or ask-to-ask prices.

An explanation that we have not explored is the impact of the adjustment of limit orders on the ex-day stock price behavior. For the U.S. markets Dubofsky (1992) argues that the minimum tick size as well as the constraints imposed by the NYSE Rule 118 and AMEX Rule 132 influence ex-dividend day prices. NYSE rule 118 and AMEX Rule 132 specify that on ex-dividend days, prices in buy limit orders are adjusted downwards to the next tick below the dividend. The limit sell orders remain unadjusted. Dubofsky (1992) argues that the asymmetric adjustment results in wider bid-ask spreads and smaller price drop ratios on the ex-dividend day. Bali and Hite's (1998) model predicts that the price drop ratio should increase after decimalization in a capital gains preference scenario. On the other hand, Dubofsky (1992) predicts no change or a decrease in the price drop ratio. Jakob and Ma's (2004) findings contradict Bali and Hite (1998) and provide limited support for Dubofsky (1992).

In Canada, the limit orders are not adjusted on the ex-day. Jakob and Ma (2005) offer a microstructure explanation by showing that the smaller ex-day price drop in Canada compared to the U.S. arises because the Toronto Stock Exchange does not adjust the existing limit orders on the ex-dividend day in contrast to the automatic adjustments on the U.S. exchanges. These authors do not explicitly test for tax and short-term trading effects and conclude that the added limit buy demand in itself explains why Canadian prices do not fully adjust. However, what we concentrate on is an explanation that is applicable to all markets and clearly because of NYSE Rule 118, one-sided limit pricing adjustment cannot be the answer.

Evaluation of Hypotheses

Canadian data provides a rich source for differentiating between some of these hypotheses because of interesting institutional differences compared to the U.S. First, over the 1990s dividends carried a lighter tax burden than capital gains. If a tax effect is present, we should see ex-dividend prices falling by more than the dividend in those years and paralleling the U.S. results in earlier years. Even with some implicit advantage to capital gains, ex-day price adjustment ought to be noticeably greater during the decade of the '90s. Second, in April 1996 Canadian exchanges switched to decimal trading and reduced minimum tick sizes. If tick size is important in ex-day price formation, it should show up in a before and after analysis. Third, since effective spreads have decreased significantly after decimalization (MacKinnon and Nemiroff, 1999), the reduction in transaction costs and its impact on short-term trading should show up as well in a before and after decimalization analysis.

Dutta, Jog, and Saadi (2004) analyze the stock price behavior around the ex-dividend date in Canada during the period 1996-2003. In the first half (1996-1999) of their sample, there was a tax-based preference for dividends while in the second half (2000-2003), capital gains received favorable tax treatment. They argue that both taxes and short-term effects contribute to the ex-day effects. They do not examine any microstructure effects. We use a longer sample period from 1977-2000 during which dividends received preferential treatment over capital gains for 10 years in the 24-year sample period. During the period 1982-1984, investors were indifferent to dividends and capital gains. For the remaining 13 years of our sample, capital gains received favorable tax treatment.

For the sample period, March 1, 1977 to December 31, 2000, we rule out both tax effects and tick-size effects on ex-dividend day behavior. In other words, we cannot find any support for tax-induced pricing and therefore consequently dividend clienteles or for the Bali-Hite (1998) pricing model but we find limited support for the short-term trading effects.

DATA AND DESCRIPTIVE STATISTICS

Our sample includes all common stock listed on the Toronto Stock Exchange during the period March 1, 1977 to December 31, 2000. We obtain price, dividend distribution and trading data from the CFMRC database. All ordinary taxable cash dividends are included in our sample. Because activity in the U.S. market may dominate activity in the Canadian market for firms that are listed in both countries and because significant events occurred in the U.S. market during our sample period, interlisted stocks are excluded from our sample to avoid confounding effects. For example, the U.S. tax system changed in 1986 to equalize taxes on dividends for ordinary investors. At that time, Canadian investors faced a tax-based preference for capital gains. Similarly, decimalization of the Toronto Stock Exchange in April 1996 was followed in June 1997 by a reduction of the minimum tick size from 1/8 to 1/16 on the New York Stock Exchange

Also removed are firms that have two or more distributions within four days or less of each other. Multiple cash distributions on the same day are grouped together and treated as a single distribution. We also eliminate observations with missing ex-day returns within a five-day window about the ex-dividend day. To further minimize noise and outlier influences, we restrict our sample to stocks that have a cum-day price of $3 or more and cash dividends of $1 or less. Returns and the price drop-off ratio are measured from the closing price on the day prior to the ex-dividend day to the opening price on the ex-dividend day, adjusted for movement in the level of the Toronto 300 stock index.

The ex-dividend price ratio and ex-dividend return are calculated using the approach suggested by Koski (1996).

$$\text{Price Ratio} = \frac{1}{N}\sum_{i=1}^{N} \frac{P_{cum,i} - \left[P_{ex,i} \left(\frac{TSE_{300_{cum,i}}}{TSE_{300_{ex,i}}} \right) \right]_i}{D_i}$$

$$\text{Ex-dividend return} = \frac{1}{N}\sum_{i=1}^{N} \frac{\left[P_{ex,i} \left(\frac{TSE_{300_{cum,i}}}{TSE_{300_{ex,i}}} \right) \right] - P_{cum,i} + D_i}{P_{cum,i}}$$

Where N = number of ex-dates; D_i = dividend with ex-date *i, i*=1, N;
$P_{cum,\,i}$ = cum-dividend price for ex-date *i, i*=1, N;
$P_{ex,\,i}$ = ex-dividend price for ex-date *i, i*=1, N;
TSE_{300} is the Toronto 300 stock index level.

The price drop-off ratio is notorious for its extreme values so it is trimmed by excluding its 5% highest and lowest values leaving a final sample of 9,091 observations.

In table 1, we report the summary statistics for the price drop to dividend ratio on ex-dividend days. The results indicate that the price drop for the full sample is only 41.5¢ for a dollar of dividend. The drop-off ratio is somewhat higher for stocks included on Toronto 35 index, which are the most liquid stocks.

Table 1

Descriptive Statistics for Stocks on the Toronto Stock Exchange

The dividend yield is calculated as $D / P_{cum.}$ The price ratio and ex-dividend day return are mean market adjusted statistics following Koski (1996).

Panel A: Full Sample (N=9091)

	Mean	Median	Std. Deviation	Minimum	Maximum
Dividend Amount	0.184	0.150	0.140	0.002	1.000
Cum-Price	20.373	17.250	13.970	3.000	268.000
Dividend Yield	0.010	0.009	0.008	0.000	0.206
Price Ratio	0.415	0.374	1.500	-8.208	8.118
Ex-Dividend Day Return	0.006	0.005	0.013	-0.069	0.221
Panel B: Toronto 35 Stocks (N=616)					
Dividend Amount	0.211	0.200	0.118	0.034	0.590
Cum-Price	25.214	20.438	16.788	7.25	129.125
Dividend Yield	0.009	0.009	0.004	0.001	0.022
Price Ratio	0.486	0.548	1.174	-6.117	5.945
Ex-Dividend Day Return	0.004	0.004	0.008	-0.015	0.068

RESULTS

First we look at the role of taxes in ex-day pricing, then at short-term trading effects, and finally at tick size impacts.

Tax Effects

Under the Canadian tax system, dividends are increased by a required proportion (the gross-up rate) before being added into income, and a fraction of grossed-up dividends is available as a tax credit. Currently, $100 in dividends results in $125 being taxed as income and generates a tax credit of $16.66. A portion (the inclusion rate) of capital gains is included in income. The tax regimes faced by the highest marginal rate investors are presented in Appendix B.

A tax paying investor at the highest marginal rate will prefer a dollar in dividends to a dollar in capital gains when

$$t < \frac{(1+g)c}{(1+g-i)}$$

where t is the person's marginal tax rate, g is the dividend gross-up rate, c is the grossed-up dividend tax credit and i the capital gains inclusion rate. An after-tax dollar of dividend is worth $1 + (1+ g)(c - t)$ and the same for a dollar of capital gains is $(1 - it)$. Using the data in Appendix B yields the results displayed in Table 2.

Table 2

Canadian Tax Regimes for an Ordinary Investor, 1977-2000

Period	Break-Even Tax Rate (%)[a]	Top Tax Bracket (%)	Maximum Tax Rate (%)	Taxed-Based Preference
1977	30.0	43	43.0	capital gains
1978-81	37.5	43	43.0	capital gains
1982-84	34.0	34	34.0	indifferent
1985	34.0	34	35.7	capital gains
1986/1 – 1986/6	22.7/34.0[b]	34	40.6	capital gains
1986/7 – 1986/12	22.7/34.0[b]	34	35.0	capital gains
1987	16.7/34.0	34	35.0	capital gains
1988	13.3/28.6[b]	29	29.9	capital gains
1989	13.3/28.6[b]	29	30.6	capital gains
1990	33.3	29	30.5	dividends
1991	33.3	29	31.9	dividends
1992	33.3	29	31.8	dividends
1993-98	33.3	29	31.3	dividends
1999	33.3	29	30.9	dividends
2000/1 – 2000/2	33.3	29	30.5	dividends
2000/2 – 2000/10	28.6	29	30.5	capital gains
2000/10 – 2000/12	22.2	29	30.5	capital gains

[a]Dividends are preferred when the break-even rate is more than the maximum rate.

[b]Lifetime capital gains exemption exhausted.

In the period 1990- February 2000, dividends were taxed preferentially. On the other hand, there was a capital gain preference for the initial period of our sample, 1977-1989 with investors being indifferent during the period 1982-1984. In addition, the Canadian government introduced an exemption on capital gains rising from $20,000 in 1985 to $500,000 by 1987. In 1989, the lifetime exemption on capital gains was limited to $100,000. Hence during the period 1986 to 1989, there was a stronger preference for capital gains. If a tax effect is present, we should see ex-dividend prices falling by more than the dividend in the nineties and paralleling the U.S. results in the eighties.

In table 3, we report the ex-dividend day price ratios by year and for four regimes by investor preference based on the marginal tax rates. If a tax effect is present, we should see a drop-off ratio greater than 1 when dividends were preferred. We find that this ratio is 0.415 for the overall sample, 0.438 for the years when dividends were preferred and 0.393 when capital gains carried a lighter tax burden. While the relationship between drop-off ratios in periods of different tax preferences is generally as expected, changing differential taxation has had minimal impact on ex-day price drop-off as price is still falling by less than half the amount of the dividend. In addition, during the lifetime capital gains exemption period, when capital gains preference should have been higher, the price ratio is 0.418, higher than the ratio for the overall capital gains preference period.

Table 3

Ex-dividend Day Price Ratios for Stocks on the Toronto Stock Exchange

The price ratio is a mean market adjusted statistic following Koski (1996). The *Dividend Preference, Capital Gains Preference, Indifferent,* and *Lifetime Exemption* regimes are as defined in table 2.

Period	N	Mean Dividend	Mean Price Ratio	t-Statistic (Ratio = 1)	Median Dividend	Median Price Ratio	Wilcoxon Sign Rank Statistic (Ratio = 1)
1977	263	0.222	0.354	-13.053	0.200	0.314	-10.436
1978	350	0.233	0.382	-11.953	0.210	0.450	-10.188
1979	414	0.244	0.482	-11.199	0.203	0.469	-9.910
1980	404	0.265	0.226	-12.492	0.250	0.205	-11.016
1981	330	0.245	0.360	-9.474	0.240	0.321	-8.951
1982	201	0.275	0.371	-6.921	0.250	0.415	-6.627
1983	289	0.211	0.505	-5.291	0.150	0.461	-5.347
1984	293	0.200	0.396	-8.519	0.150	0.430	-7.971
1985	396	0.184	0.384	-11.559	0.150	0.327	-10.301
1986	458	0.161	0.371	-10.162	0.130	0.143	-9.546
1987	541	0.148	0.417	-7.811	0.120	0.425	-7.581
1988	456	0.161	0.335	-12.529	0.125	0.300	-11.268
1989	483	0.176	0.543	-10.262	0.150	0.420	-9.625
1990	351	0.187	0.443	-11.241	0.150	0.379	-10.055
1991	325	0.182	0.348	-10.924	0.150	0.400	-9.987
1992	288	0.173	0.324	-9.268	0.125	0.344	-8.872
1993	389	0.167	0.482	-8.261	0.126	0.395	-8.308
1994	378	0.162	0.526	-6.433	0.125	0.497	-6.862
1995	409	0.163	0.422	-8.239	0.125	0.360	-8.360
1996	421	0.157	0.411	-10.698	0.120	0.381	-10.295
1997	443	0.155	0.380	-7.737	0.125	0.297	-8.785
1998	397	0.150	0.478	-4.811	0.115	0.453	-4.978
1999	403	0.146	0.523	-3.879	0.113	0.426	-4.830
2000	409	0.151	0.431	-3.870	0.100	0.254	-4.606
Dividend Preference	3857	0.163	0.438	-21.787	0.125	0.390	-24.805
Capital Gains Preference	4451	0.195	0.393	-28.397	0.150	0.340	-30.451
Indifferent	783	0.223	0.430	-11.546	0.180	0.449	-11.367
Lifetime Exemption	1938	0.161	0.418	-19.090	0.125	0.355	-18.673
Full Sample	9091	0.184	0.415	-37.180	0.150	0.374	-40.768

We find that this result is not specific to the highest marginal tax rate because over the sample period the nature of the dividend gross-up and tax credit means that as marginal rates decline the after-tax benefit of dividends increases relative to capital gains. As a consequence, during the 1990s tax-paying investors below the highest marginal rate had a stronger preference for dividends and during the 1980s a weaker preference for capital gains than exhibited in Table 2.

Without taxes setting ex-day prices, there is no longer a foundation for the dividend clientele effect. Nonetheless, the change in tax structure allows us to test whether clientele influences are more likely than short-term trading or tick size effects. All three hypothesis explain why ex-price drop-off should increase with yield but when dividends are more lightly taxed than capital gains, the clientele effect reverses and drop-off should be negatively correlated with yield. We partition our data into quintiles. If dividend clienteles dominate, drop-off should increase with yield in the capital gains preference regime and move inversely with yield in the dividend preference regime. On the other hand, the positive relationship between yield and ex-day price fall should be observed throughout the sample period if either the short-term trading or tick size effects are dominant. Yield is measured by dividend over cum price. The results are presented in table 4.

Table 4

Test for Tax Effects I: Ex-dividend Day Price Ratios by Dividend Yield for Stocks Listed on the Toronto Stock Exchange

Dividend Yield Quintile	Mean Dividend Yield	Mean Price Ratio (Full Sample)	Mean Price Ratio (Dividend Preference)	Mean Price Ratio (Capital Gains Preference)	t-Statistic (Equality of Ratios)
1	0.003	0.390	0.420	0.330	0.771
2	0.006	0.348	0.411	0.311	1.276
3	0.009	0.403	0.398	0.408	-0.170
4	0.012	0.468	0.511	0.437	1.418
5	0.020	0.468	0.494	0.440	1.258

The drop-off behavior does not clearly support any of the hypotheses. With the exception of the lowest quintile, price drop-off monotonically increases with yield for the capital gains preference period, but it does not decline with yield in the dividend-preferred regime. For the entire sample period, a curvilinear relationship between price drop and dividend yield appears to exist if we ignore the highest quintile. Hence there seems to be some support for the short-term trading hypothesis as predicted by Boyd and Jagannathan (1994).

Another way to analyze yield relationships is the regression specification of Lasfer (1995). He argues that under the tax hypothesis, ex-day return is positively related to yield through the equation

$$R = \left(\frac{t_d - t_g}{1 - t_g} \right) \frac{d}{P_{cum}}$$

where the ex-day return, R, is given by

$$R = \frac{P_{ex-open} - P_{cum-close} + D}{P_{cum-close}}$$

When t_d declines relative to t_g and ex-day pricing is tax-based, a regression of return on yield should show a reduced coefficient. Specifying the regression in the form

$$R_i = \alpha_0 + \alpha_1 Yield_i + \alpha_2 Dummy + \alpha_3 Dummy * Yield_i$$

where Dummy is equal to 1 for the dividend preferred regime and zero otherwise, will capture the impact, if any, of the change in tax regimes. In our sample, not only should α_3 be negative, it ought to be larger in absolute value than α_1 because of $t_g > t_d$.

Table 5

Test for Tax Effects II: OLS Regression Results of Ex-dividend Day Return on Dividend Yield

Standard errors (in parentheses) have been adjusted for heteroskedasticity using White's (1980) heteroskedastic-consistent covariance matrix and are reported in parentheses. *Dividend Preference* is a (0,1) dummy that is equal to 1 for the dividend-preferred regime and zero otherwise.

	Full Sample	Lowest Dividend Yield Quintile	Highest Dividend Yield Quintile
Intercept (α_0)	-0.0008 (0.0007)	0.0005 (0.0008)	-0.0046** (0.0018)
Dividend Yield (α_1)	0.6538*** (0.0683)	0.5022* (0.2572)	0.7824*** (0.0920)
Dividend Preference (α_2)	0.0007 (0.0008)	0.0001 (0.0010)	-0.0012 (0.0031)
Dividend Preference * Dividend Yield (α_3)	-0.0950 (0.0835)	-0.1466 (0.3269)	0.0342 (0.1628)
	0.1491	0.0021	0.2283

* = p < .05. ** = p < .01. *** = p < 0.001.

Consistent with our earlier results, Table 5 shows that while α_3 is negative, it is not significant and is far away from its tax hypothesis value. Nor are the findings sensitive to the level of yield. For example, repeating the regressions for the highest and lowest dividend yield quintiles yields the same conclusion. In contrast to Lasfer's results for the U.K. markets, the results do not indicate that tax changes have any significant impact on the ex-day effect.

On the other hand, according to Boyd and Jagannathan (1994) a straight line approximation to a curvilinear relationship could produce a negative intercept, which is what we find for the full sample as well as the high dividend yield quintile. As before, there seems to be some support for the short-term trading hypothesis.

Short-term trading effects

According to this hypothesis, high dividend yield and liquid stocks are likely to attract the most arbitrageurs. Hence, these stocks should have smaller ex-day returns and higher abnormal volume around the ex-day.

In table 6, we report abnormal returns for a eleven-day window around the ex-day. Abnormal returns are higher for high-yield stocks relative to low-yield stocks on the ex-day and on both of the two prior days, contradicting the short-term trading effect hypothesis (panel A). However, post-decimalization ex-day abnormal returns are lower relative to pre-decimalization, consistent with a reduction in transaction costs (panel B). Mackinnon and Nemiroff (1999) document a reduction in bid-ask spread following the switch to decimal trading. We assume that bid-ask spread is a measure of transaction costs. According to Boyd and Jagannathan (1994), the reduction in transaction costs is likely to affect the arbitragers the most and lead to lower ex-day returns subsequent to decimalization as well as an increase in trading volume before and after the ex-day.

Table 6

Test for Short-term trading I: Abnormal Returns around Ex-dividend Day for Stocks Listed on the Toronto Stock Exchange

The pre-decimal period is March 1, 1977 to March 31, 1996. The post-decimal period is May 1, 1996 to December 31, 2000. April 1996 has been excluded to draw a sharper distinction between the two sample periods.

Panel A: Comparison of High and Low Dividend Yield Stocks

Day	Mean Abnormal Return (Full Sample)	t-Statistic (Abnormal Return = 0)	Mean Abnormal Return (Low Dividend Yield Quintile)	t-Statistic (Abnormal Return = 0)	Mean Abnormal Return (High Dividend Yield Quintile)	t-Statistic (Abnormal Return = 0)	t-Statistic (Low Yield = High Yield)
-5	-0.008	-0.400	-0.110	-1.635	-0.009	-0.212	1.281
-4	0.029	1.825	-0.014	-0.445	0.017	0.441	0.625
-3	0.011	0.596	-0.049	-1.540	0.047	0.804	1.459
-2	0.019	1.249	-0.001	-0.025	0.096	2.713**	2.019*
-1	0.028	1.931	-0.058	-1.814	0.048	1.326	2.199*
0	0.569	41.844***	0.194	11.125***	1.098	24.693***	19.125***
1	-0.041	-2.819**	-0.095	-2.987**	-0.066	-2.003*	0.635
2	-0.010	-0.713	-0.042	-1.419	0.054	1.561	2.113*
3	-0.022	-1.495	-0.051	-1.498	0.013	0.403	1.368
4	-0.039	-2.578**	-0.080	-2.259*	0.007	0.203	1.78
5	-0.022	-0.594	0.124	0.802	-0.051	-1.223	-1.079

Panel B: Comparison of Pre- and Post-Decimalization periods

Day	Mean Abnormal Return (Pre Decimal)	t-Statistic (Abnormal Return = 0)	Mean Abnormal Return (Post Decimal)	t-Statistic (Abnormal Return = 0)	t-Statistic (Pre Decimal = Post Decimal)
-5	0.021	1.145	-0.113	-1.616	2.628**
-4	0.033	1.871	0.016	0.462	0.442
-3	0.013	0.702	0.001	0.021	0.282
-2	0.022	1.349	0.008	0.220	0.398
-1	0.031	1.976*	0.017	0.467	0.395
0	0.615	40.296***	0.404	13.651***	6.456***
1	-0.013	-0.855	-0.139	-3.905***	3.590***
2	0.006	0.375	-0.072	-2.111*	2.280*
3	-0.002	-0.111	-0.097	-2.621**	2.655**
4	-0.032	-1.880	-0.063	-1.949	0.866
5	-0.064	-3.177**	0.127	0.823	-2.112*

* = $p < .05$. ** = $p < .01$. *** = $p < 0.001$.

In table 7, we examine trading activity during the eleven-day window around the ex-day. The abnormal volume is the ratio of the trading volume on the ex-day to the normal turnover minus one. Normal trading volume is average trading volume during the period -64 to -25 days prior to the ex-dividend day as in Frank and Jagannathan (1998). Consistent with the results of Graham et al. (2003), volume is greater on the ex-day than on non-event days for the full sample and for the high dividend yield quintile, although abnormal volume is not statistically significant for the low yield quintile (panel A). Abnormal volume shows a significant increase in the post-decimalization period relative to pre-decimalization for the ex-day, which is again consistent with a reduction in transaction costs (panel B).

Table 7

Test for Short-term trading II: Abnormal volume around ex-dividend day for stocks listed on the Toronto Stock Exchange

Panel A: Comparison of High and Low Dividend Yield Stocks

Day	Abnormal Volume (Full Sample)	t-Statistic (Abnormal Volume = 0)	Abnormal Volume (Low Dividend Yield Quintile)	t-Statistic (Abnormal Volume = 0)	Abnormal Volume (High Dividend Yield Quintile)	t-Statistic (Abnormal Volume = 0)	t-Statistic (Low Yield = High Yield)
-5	0.086	3.587	0.140	2.821	0.008	0.136	-1.740
-4	0.095	4.544	0.107	2.230	0.061	1.436	-0.725
-3	0.135	6.124	0.155	3.112	0.146	3.073	-0.132
-2	0.168	7.313	0.123	2.318	0.228	4.119	1.379
-1	0.198	8.260	0.126	2.582	0.454	6.517	3.852***
0	0.075	3.540	0.082	1.655	0.162	3.081	1.100
1	0.156	5.219	0.182	2.260	0.157	2.705	-0.257
2	0.150	4.805	0.117	1.928	0.194	2.337	0.753
3	0.311	4.764	0.278	3.250	0.432	2.651	0.834
4	0.251	5.496	0.318	2.243	0.180	3.271	-0.902
5	0.202	1.093	0.217	2.756	-0.206	-0.597	-1.197

Panel B: Comparison of Pre- and Post-Decimalization periods

Day	Abnormal Volume (Pre Decimal)	t-Statistic (Abnormal Volume = 0)	Abnormal Volume (Post Decimal)	t-Statistic (Abnormal Volume = 0)	t-Statistic (Pre Decimal = Post Decimal)
-5	0.069	2.444	0.150	3.417	-1.392
-4	0.094	3.925	0.098	2.330	-0.070
-3	0.150	5.755	0.084	2.099	1.228
-2	0.187	7.024	0.104	2.307	1.476
-1	0.191	7.014	0.227	4.454	-0.622
0	0.046	1.967	0.182	3.669	-2.653**
1	0.133	3.876	0.231	3.830	-1.356
2	0.159	4.230	0.118	2.483	0.531
3	0.362	4.413	0.130	2.439	1.460
4	0.271	4.774	0.186	3.652	0.762
5	0.232	0.986	0.092	2.177	0.310

* = $p < .05$. ** = $p < .01$. *** = $p < 0.001$.

Table 8 shows the relationship between pre- and post-decimalization abnormal volume for the largest and smallest quintiles. There is no significant difference for the largest quintile. The smallest quintile, however, shows a significant increase in abnormal volume for both the ex- and immediately prior days. The reduction in transaction costs associated with the reduction in tick size may provide additional arbitrage opportunities and increased arbitrage related trading in stocks with lower dividend yield i.e., those stocks that would likely have been less attractive to arbitrageurs in the pre-decimalization period.

Table 8

Test for Short-term trading III: Abnormal volume around ex-dividend day – Dividend Yields and Decimalization

Panel A: Comparison of Pre- and Post-Decimalization periods, High Yield Stocks

Day	Mean Abnormal Volume (Pre-Decimal, High Yield)	t-Statistic (Abnormal Volume = 0)	Mean Abnormal Volume (Post-Decimal, High Yield)	t-Statistic (Abnormal Volume = 0)	t-Statistic (Pre Decimal = Post Decimal)
-5	-0.035	-0.514	0.057	0.699	-0.675
-4	0.059	1.258	0.236	1.934	-1.605
-3	0.139	2.760	0.216	1.740	-0.660
-2	0.223	3.551	0.073	0.928	1.190
-1	0.497	6.147	0.328	2.244	0.985
0	0.138	2.487	0.149	1.282	-0.095
1	0.192	2.714	0.089	0.991	0.722
2	0.215	2.144	0.176	1.386	0.192
3	0.541	2.622	0.109	1.049	1.087
4	0.192	3.115	0.199	1.703	-0.055
5	-0.273	-0.622	-0.053	-0.736	-0.262

Panel B: Comparison of Pre- and Post-Decimalization periods, Low Yield Stocks

Day	Mean Abnormal Volume (Pre-Decimal, High Yield)	t-Statistic (Abnormal Volume = 0)	Mean Abnormal Volume (Post-Decimal, High Yield)	t-Statistic (Abnormal Volume = 0)	t-Statistic (Pre Decimal = Post Decimal)
-5	0.120	1.700	0.275	2.055	-1.017
-4	0.087	1.668	0.067	0.770	0.176
-3	0.163	2.611	0.087	1.113	0.602
-2	0.134	2.371	0.020	0.248	0.989
-1	0.070	1.506	0.371	2.548	-2.585**
0	0.007	0.134	0.267	1.881	-2.144*
1	0.082	0.918	0.346	1.897	-1.342
2	0.088	1.215	-0.028	-0.295	0.788
3	0.371	3.171	0.321	1.995	0.210
4	0.303	1.716	0.212	2.040	0.267
5	0.167	1.783	0.154	1.409	0.067
4	0.143	4.750	0.194	4.049	-0.820
5	0.145	4.846	0.190	4.066	-0.732

* = $p < .05$. ** = $p < .01$. *** = $p < 0.001$

A further short-term trading argument in Frank and Jagannathan (1998) suggests that if tick-size issues affect trading, volume should drop off more when the stock is trading newly ex-dividend relative to the immediately cum-dividend period. Overall, the trading volume exhibits this behavior with a gradual increase in abnormal volume leading up to the ex-day, followed by a drop in abnormal volume on the ex-day and gradual increase in abnormal volume in the immediately ex-dividend period (table 8, panel A). This pattern appears in both the pre- and post-decimalization periods (table 8, panel B), although the effect is more dramatic in the pre-decimalization period when the tick-size is larger.

Tick Size Effects

Recent changes in Canadian financial markets permit a clinical study of the importance of tick-size. On April 15, 1996, stock markets decimalized and at the same time reduced the minimum tick size for most stocks. For stocks trading at $3 to under $5, minimum price change fell from 5¢ to 1¢ and for stocks at $5 and above the reduction was from 12.5¢ (1/8th) to 5¢. If tick size is important, it should show up in our sample since we are analyzing stocks priced at $3 or more. Panel A of table 9 displays some summary results involving tick size. April 1996 has been excluded to draw a sharper distinction between the two periods.

Table 9

Test for Tick Size Effects : Ex-dividend Day Price Ratios for stocks listed on the Toronto Stock Exchange

The *Hypothetical Price Ratio* is the price drop ratio that obtains under the Bali and Hite (1998) pricing model as outlined in Appendix A.

Panel A: Summary Statistics.

	N	Median Dividend	Mean Price Ratio	t-Statistic (Ratio = 1)	Median Dividend	Median Price Ratio	Wilcoxon Sign Rank Statistic (Ratio = 1)
Pre Decimal	7119	0.193	0.406	-40.522***	0.150	0.379	-39.284***
Post Decimal	1955	0.152	0.449	-11.040***	0.120	0.352	-13.573***
Full Sample	9091	0.184	0.415	-37.180***	0.150	0.374	-40.768***

Panel B: Price Ratios by Dividend Yield

Dividend Yield Quintile	Mean Dividend Yield	Mean Price Ratio (Full Sample)	Mean Price Ratio (Pre Decimal)	Mean Price Ratio (Post Decimal)	t-Statistic (Equality of Ratios)
1	0.003	0.390	0.301	0.506	-1.859
2	0.006	0.348	0.317	0.441	-1.413
3	0.009	0.403	0.419	0.341	1.082
4	0.012	0.468	0.466	0.480	-0.192
5	0.020	0.468	0.475	0.382	1.333

Panel C: Price Ratios by Dividend Size

Dividend Size Quintile	Mean Dividend	Mean Price Ratio (Full Sample)	Mean Price Ratio (Pre Decimal)	Mean Price Ratio (Post Decimal)	t-Statistic (Equality of Ratios)
1	0.048	0.330	0.296	0.395	-0.918
2	0.092	0.322	0.280	0.478	-2.147*
3	0.146	0.425	0.393	0.549	-1.950
4	0.226	0.501	0.521	0.420	1.577
5	0.406	0.498	0.511	0.409	1.569

Panel D: Comparison of Hypothetical and Realized Price Ratios

Dividend Size Quintile	Hypothetical Price Ratio (Pre Decimal)	Hypothetical Price Ratio (Post Decimal)	Difference Between Hypothetical and Actual Price Ratios (Pre Decimal)	Difference Between Hypothetical and Actual Price Ratios (Post Decimal)	t-Statistic (Equality of Differences)
1	0.009	0.321	0.287	0.074	1.945
2	0.026	0.624	0.254	-0.146	4.307***
3	0.583	0.795	-0.190	-0.246	0.686
4	0.635	0.840	-0.113	-0.420	4.745***
5	0.826	0.906	-0.315	-0.497	2.800**

* = $p < .05$. ** = $p < .01$. *** = $p < 0.001$

According to the Bali and Hite (1998) argument, the drop-off ratio should increase after decimalization and it does increase from 0.406 to 0.449; however this difference is not significant (t=1.13) and the median price ratio decreases from 0.379 to 0.352. Graham et al. (2003) report similar findings for NYSE stocks, although the magnitude of the price drop ratio is higher in the U.S. This is confirmed by yield analysis (panel B). Drop-off should increase monotonically with yield and, of course, be higher in the post-decimalization period. The drop-off does increase with yield in the pre-decimalization period; however there is no relationship between yield and drop-off in the post-decimalization period and the drop-off is not uniformly greater post-decimalization.

Of course, the tick size hypothesis does not actually claim that the drop-off increases with yield, it says that drop-off increases with the magnitude of the dividend. If, for some reason, yield and dividend are not strongly correlated in Canada, the previous evaluation may be misleading. Panel C sorts the drop-off ratio by dividend size into quintiles. Under the tick size hypothesis, the ratio should monotonically increase with dividend and the ratio should be higher at every quintile after decimalization. Neither occurs.

Knowing the cum price, minimum tick size and dividend makes it possible to compute the ex-price predicted by a tick size controlled drop-off (assuming an investor preference for capital gains that is not taxed based). The hypothetical drop-off ratios are presented in panel D of table 9. The hypothetical price drop in the two lowest quintiles before decimalization flags a problem with the Bali-Hite (1998) model. As shown in Appendix B, the model has no prediction of ex-day pricing when the dividend is smaller than the tick size. In the spirit of their model, the predicted cum-ex price change was set to zero in those situations. Since prior to decimalization most dividends in these quintiles were smaller than the tick size, the hypothetical price drop is very small. Recall that the tick size is 1¢ for stocks trading between $3 and $5 and 5¢ for stocks trading at a price above $5.

Price drop-off is considerably less than the model's predictions and tick size reduction does not improve the situation. The latter assertion is tested by comparing the two sets of differences (essentially the model's forecast errors) to see if a smaller tick size has helped move the realized toward the hypothesized values. Setting aside the lowest quintiles for the reason given above, the differences are significantly apart only when the model fit has deteriorated post-decimalization (quintiles four and five). Again, the correspondence between the Bali-Hite (1998) model and actual outcomes is significantly wide apart.

CONCLUSION

We study ex-dividend day stock price behavior in Canada. During the period examined, tax laws changed from favoring capital gains to taxing dividends less. Moreover, markets switched to decimal trading and at the same time reduced the minimum required price change. Thus, if taxes, tick size and short-term trading affect ex-day pricing, it should show up in the analysis. We find no evidence that taxes or tick size are important in setting ex-day prices. However, we find some evidence that short-term trading affects ex-day behavior.

APPENDIX A

The Bali and Hite Model

Bali and Hite (1998) start with a tax induced preference for capital gains and propose that the equilibrium ex-day price rounds down such that $P_{ex} = P_{cum} - nD$ where

n = integer(D/s), s being the tick size, when the dividend is not an integer multiple of tick size and n = integer(D/s) – 1 when the dividend is evenly divided by tick size.

They assume that prices are set by taxes and that for the marginal (price setting) seller their tax on dividends is higher than the tax on capital gains, $t_d > t_g$. Consider two cases where the dividend is not an integer multiple of the tick size but larger than the tick size, for example, dividend $D = 26¢$ and tick size = $10¢$.

Case 1: Price rounds down to the tick below the dividend.

$$\underline{D} = 20¢ < D \text{ and } P_{ex} = P_{cum} - \underline{D}$$

The sellers will sell cum if

$$(1 - t_g)(P_{cum} - P_0) > (1 - t_g)(P_{cum} - \underline{D} - P_0) + (1 - t_d)D$$

or

$$\underline{D} > \frac{1 - t_d}{1 - t_g} D = \lambda D$$

i.e, $\lambda < 1$ and P_0 is the original purchase price. For some sellers the equation will hold and they will be willing to sell.
The buyers will buy cum if

$$(1 - t_g)(P_1 - P_{cum}) + (1 - t_d)D < (1 - t_g)(P_1 - (P_{cum} - \underline{D})$$

or

$$\underline{D} < \lambda D$$

which will hold for some buyers, as P_1 is the expected selling price.
The arbitragers (who are indifferent between dividends and capital gains) will buy cum and sell ex if

$$(1 - t)(P_{ex} - P_{cum}) + (1 - t)D > 0$$

and short sell cum when

$$(1 - t)(P_{ex} - P_{cum}) + (1 - t)D < 0$$

In this case $(1 - t)(-\underline{D}) + (1 - t)D > 0$ so the arbitrager will buy. Since there are both buyers and sellers in the market, there will be an equilibrium price.

Case 2: Price rounds up to the price above the dividend.

$$\overline{D} = 30¢ > D \text{ and } P_{ex} = P_{cum} - \overline{D}$$

The sellers will sell cum when $\overline{D} > \lambda D$, which it is so they will sell. The buyers will buy cum when $\overline{D} < \lambda D$, which it isn't so they will wait for the ex-date. For the arbitragers, $(1 - t)(D - \overline{D}) < 0$ so they will sell short on the cum date. Therefore, there are sellers but no buyers and consequently no equilibrium.

An equilibrium price can be achieved only when price rounds down to the tick below the dividend.

The same type of analysis will show that even when a dividend is a tick multiple, for example 30¢ so that there can be complete adjustment, equilibrium is achieved only by price rounding down to the tick below the dividend.

Dividend smaller than tick size

Now suppose the dividend is less than one tick, for example $\underline{D}$ = 6¢ and tick size = 10¢. We have $\underline{D}$ = 0 and $\overline{D}$ = 10.

Case 1: $\underline{D}$ = 0, $P_A = P_B$ and therefore sellers will wait, buyers will buy and arbitragers will buy and consequently there is no equilibrium.

Case 2: Sellers will sell, buyers will wait and arbitragers will short sell; again there is no equilibrium.

By construction, the situation where the dividend is a multiple of the tick size is not feasible, so the Bali-Hite (1998) model has a basic flaw: no equilibrium pricing when the dividend is less than the tick size.

After-tax preference for dividends

Now, consider the situation where capital gains are taxed at a higher rate than dividends, that is $\lambda > 1$. In case 1, sellers will wait, buyers will buy and arbitragers will buy and therefore there can be no equilibrium. In case 2, sellers sell when $\overline{D} > \lambda D$, which will be true for some sellers; buyers buy when $\overline{D} < \lambda D$, which will be true for some buyers, and the arbitrager will short sell so there will be an equilibrium. In other words, price will have to drop by more than the amount of the dividend before there is equilibrium. This is also true for dividends that are even multiples of tick size.

APPENDIX B

Canadian Tax Regimes, 1982 – 2000

Period	Gross Up	Tax Credit	Inclusion Rate	Top Bracket	Surtax - % of Basic Federal Tax (BFT)	Maximum Tax Rate
1982-84	50	22 2/3	50	34	0	34
1985	50	22 2/3	50	34	2.5%(BFT – 6,000) + 2.5% (BFT – 15,000)	35.7
1986/1 – 1986/6	50	22 2/3	0/50[a]	34	1.5% first 6,000 + 6.5%(15,000 – 6000) + 11.5% (BFT – 15,000)	40.63
1986/7 – 1986/12	50	22 2/3	0/50[a]	34	3	35.02
1987	33 1/3	16 2/3	0/50[a]	34	3	35.02
1988	25	13 1/3	0/66.67[b]	29	3	29.87
1989	25	13 1/3	0/66.67[b]	29	4 + 1.5% (BFT – 15,000)	30.6
1990	25	13 1/3	75	29	5	30.45
1991	25	13 1/3	75	29	5 + 5% (BFT – 12,500)	31.9
1992	25	13 1/3	75	29	4.5 + 5% (BFT – 12,500)	31.76
1993-98	25	13 1/3	75	29	3 + 5% (BFT – 12,500)	31.32
1999	25	13 1/3	75	29	1.5 + 5% (BFT – 12,500)	30.89
2000/1 – 2000/2[c]	25	13 1/3	75	29	5% (BFT – 15,500)	30.45
2000/2[d] – 2000/10	25	13 1/3	66 2/3	29	5% (BFT – 15,500)	30.45
2000/10[e] – 2000/12	25	13 1/3	50	29	5% (BFT – 15,500)	30.45

[a]For 1986-87, investors had a $500,000 lifetime capital gains exemption. Net capital gains in excess of the limit have a 50% inclusion rate.
[b]For 1988-89, investors had a $100,000 lifetime capital gains exemption. Net capital gains in excess of the limit have a 66 2/3% inclusion rate.
[c]Until February 27, 2000.
[d]February 28 to October 16, 2000.
[e]October 17 to the end of December, 2000.

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