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SECTION 3. General issues in management

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An analysis of factors affecting ex-dividend day stock prices in global capital markets

Abstract

We investigate stock price changes on the ex-dividend day in 37 countries. We hypothesize that, in addition to taxes, other market frictions should also affect ex-dividend day stock prices in world markets. Empirical results show that mean price drop ratios deviate significantly from their predicted values based on differential tax rates between dividends and capital gains, and that proxies for agency conflicts and information asymmetry also help explain these cross-country deviations. After controlling for these factors, the weighted average of investors' tax rates are reflected in ex-dividend day stock price changes. The results are consistent with the idea that in addition to differential taxation of dividends and capital gains, agency conflicts and information asymmetry are also important factors affecting ex-dividend day stock prices in world markets.

Keywords: ex-dividend day, taxes, agency conflicts, information asymmetry.

JEL Classification: G15; G35.

Introduction

Academic research widely supports the view that risk-adjusted abnormal returns on the ex-dividend day are positive and related to a stock's dividend yield, although the identity of the marginal ex-day trader and the factors causing ex-day returns to be positive continues to be investigated in the literature. The original interpretation of the finding of positive ex-day returns, attributed to Elton and Gruber (1970), is that ex-day stock prices are set so that long-term investors will be indifferent between buying and selling shares before or after the ex-day. The ex-day price premium therefore reflects the different tax rates on dividends and capital gains paid by these investors. Kalay (1982) argues that risk-neutral short-term traders who are not subject to differential taxation of dividends and capital gains will capture dividends and largely eliminate excess returns on the ex-dividend day, with any remaining ex-day returns reflecting short-term traders' transaction costs. In the absence of transaction costs, ex-day prices would fall by the exact amount of the dividend, and returns would be arbitrated to zero. Dubofsky (1992), Bali and Hite (1998) and Frank and Jagannathan (1998) instead assert that the ex-day premium is mainly determined by market microstructure effects such as price discreteness, tick size and the bid-ask bounce. These authors show that microstructure factors can affect ex-day prices in the same way as differential taxation, and that ex-

day returns will be positive even if investors pay the same tax rate on dividends and capital gains. Heath and Jarrow (1998) relax Kalay's (1982) risk neutrality assumption and conclude that ex-day share prices are unlikely to be set by a single type of investor. Their findings suggest that share price behavior on the ex-day is probably influenced by a variety of factors, including differential taxation of dividends and capital gains, risk, transaction costs, and market microstructure effects.

Employing a broad international perspective, we further investigate the extent to which differential taxation is a primary determinant of stock price changes on the ex-dividend day, and explore the effect of additional factors that are also likely to influence ex-day stock prices. To date, most investigations into the issue of ex-day stock price changes focus on U.S. markets, even though most countries' tax codes do not treat dividend and capital gain distributions equally. International markets represent a natural arena for extending our knowledge regarding ex-dividend day price changes, as the influence of additional factors also likely to affect investors' preference for dividends, such as information asymmetry and agency conflicts, should be more pronounced internationally than in the U.S.

Recent studies confirm that financial markets in emerging countries exhibit significant differences compared with those in the U.S. For example, Claessens, Djankov and Lang (2000) and La Porta, Lopez-de-Silanes and Shleifer (1999, hereafter LLS) show that stock ownership structures in global financial markets exhibit considerable variation. Ali and Hwang (2000), Bushman, Piotroski and Smith (2004), and Hung (2001) conclude that corporate transparency and the extent of earnings management

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also vary substantially across economies, as do legal environments (LLS, 2006). Moreover, LLS (2006) show that as the level of home country agency conflicts between shareholders and managers rises, investors will have an increasing preference for dividends.

We specifically hypothesize that, in addition to differential taxation, other market frictions such as information asymmetry and agency conflicts will affect investors' preference for dividends vs. capital gains, and thus stock price movements on the ex-dividend day. Using data from 37 different countries, we employ a multivariate framework to investigate cross-country differences in ex-dividend day stock price changes. Our results indicate that factors such as stock ownership concentration, judiciary quality, and the pervasiveness of earnings management exert a significant influence on ex-dividend day stock prices. Even after controlling for these factors, however, we find that ex-day stock price changes still reflect the weighted average of investors' relative tax rates. Our results strongly suggest that agency conflicts, information asymmetry, and differential taxation of dividends and capital gains are all important factors affecting ex-dividend day stock prices in world markets.

The remainder of the paper is organized as follows. The following section presents a literature review of research on ex-dividend day price behavior in both the U.S. and international markets. Sections developing our hypotheses, describing our data and methodology, and presenting our empirical results and conclusions subsequently follow.

1. Review of the literature

In a Miller and Modigliani (1961) framework where no trader has a significant influence on prices, everyone has equal and costless access to relevant information and there are no transactions costs or taxes, rational investors will be indifferent between dividends and capital gains, and stock prices on the ex-dividend day should fall by the exact amount of the dividend payment. In a world of market frictions, however, ex-day stock prices drop by less than the amount of the dividend (Campbell and Beranek, 1955). Elton and Gruber (1970) argue that this occurs because dividends are taxed at a higher rate than capital gains, which results in rational investors selling shares at a price that equates the value of one dollar of dividends to one dollar of capital gains. This idea is usually expressed more formally as:

$$\frac{P_{cum} - P_{ex}}{D} = \frac{1 - t_o}{1 - t_c}, \quad (1)$$

where P_{cum} is the stock price on the day before the stock goes ex-dividend, P_{ex} is the price of the stock on the ex-dividend day, D is the amount of the dividend,

t_o is the tax rate on ordinary income, and t_c is the capital gains tax rate. The ratio is referred to in the literature as the price drop ratio (PDR). Many studies conclude that PDRs on the ex-day are less than one, as stock prices fall by less than the amount of the dividend. This finding can also be interpreted as the tax disadvantage of dividends resulting in positive stock returns on the ex-dividend day. Many studies conclude that differential taxation affects ex-day stock prices, including Litzenberger and Ramaswamy (1979, 1982), Poterba and Summers (1984), Barclay (1987), Elton, Gruber and Blake (2005), and Graham, Michaely and Roberts (2003).

Differential taxation may not be the only explanation of ex-dividend day stock price behavior, however. Eades, Hess and Kim (1984) observe positive returns around nontaxable distributions that are inconsistent with the tax explanation. The average price-drop ratios for stocks in the highest yield decile in Elton and Gruber's (1970) sample is significantly greater than one, which is also inconsistent with the tax argument. Kalay (1982) reports similar findings – the average price-drop ratio in the highest-yield sample is greater than one (1.29), even though the overall average price-drop ratio is less than one (0.88). These results suggest that tax-neutral short-term traders also play a significant role on the ex-dividend day, an idea that is supported by considerable evidence. For example, Lakonishok and Vermaelen (1986) report increased trading volume around the ex-dividend day. Boyd and Jagannathan (1994) find that institutional and corporate traders significantly affect ex-dividend day stock prices. Karpoff and Walkling (1988) document an inverse relation between transaction costs and excess returns on ex-dividend days, which also supports the view that ex-day stock prices are affected by short-term trading.

Some researchers have proposed that ex-dividend day stock prices might be completely unrelated to differential taxation. For example, Dubofsky (1992) contends that market microstructure effects cause prices to fall by less than the amount of the dividend. Specifically, he argues that abnormal returns on ex-dividend days are a result of NYSE Rule 118 and AMEX Rule 132, which affect the prices of limit buy orders. Bali and Hite (1998) argue that price discreteness is the underlying reason prices drop by less than the amount of the dividend, and that expected price drops will always be less than dividends, even in the absence of differential taxation. Frank and Jagannathan (1998) report similar findings.

More recent research questions the price discreteness argument, however. Graham, Michaely and Roberts (2003) show that average price-drop ratios increase

following the refining of tick size in 2001, and Jakob and Ma (2004) find no change in average price-drop ratios after the reduction in tick size. Cloyd, Li and Weaver (2006) reconcile these arguments and provide empirical evidence that both taxes and price discreteness affect price movements on the ex-dividend day. Their conclusions are similar to Heath and Jarrow's (1998) finding that ex-day share prices are unlikely to be set by any single type of investor.

Booth and Johnston (1984) conduct one of the earliest international ex-dividend day studies, using data from the Canadian market from 1970-1980. Their findings are consistent with the tax explanation, but not the short-term trading hypothesis. In contrast, Lakonishok and Vermaelen (1983) examine price movements on ex-dividend days immediately after tax reform in Canada and find evidence inconsistent with the tax hypothesis. Porterba and Summers (1984) report weak evidence in support of short-term trading on the ex-dividend day in the U.K. market. Kaplanis (1986) studies option prices in the U.K. and finds that the expected ex-day price drop implied in option prices is also significantly less than the amount of the dividend. Lasfer (1995) examines ex-day stock prices before and after the 1988 Income and Corporate Taxes Act in the U.K. and concludes ex-day stock price changes are consistent with the tax explanation.

Several studies focus on smaller European markets. Michaely and Murgia (1995) investigate ex-day stock price behavior in the Italian stock market, which has two classes of stocks that tax dividends differently. Their findings suggest that differential taxation and short-term trading are both important determinants of ex-dividend day stock prices. Liljeblom, Löflund and Hedwall (2001) examine stock price movements on ex-dividend days on the Helsinki Stock Exchange. Although their results suggest that the differential tax treatment of domestic and foreign investors influences ex-day prices, they also find that price drop ratios deviate significantly from those predicted by a pure tax explanation. Hietala (1990) analyzes price movements on ex-dividend days using data from the Finnish stock market and reports that prices fall according to the tax differential between capital gains and dividends, and that relatively high transaction costs suppress short-term trading around ex-dividend days in Finland. Espitia and Ruiz (1997) investigate ex-dividend price movements of stocks listed on the Madrid Stock Exchange. Their results are consistent with the tax explanation. They find that stock prices fall by less than the amount of the dividend, but there is a substantial variation among the price drop ratios, suggesting that differential taxation may not be driving the results for all the stocks in their sample.

Kato and Lowenstein (1995) examine price movements around ex-dividend days in Japan from 1981-1991. They find that dividend-related tax effects are secondary and that price movements on ex-dividend days in Japan appear to be motivated by corporate shareholders engaging in transactions for tax and other benefits, most likely driven by the unique ownership structure in Japan (Prowse, 1992). Their findings are also consistent with the notion that Japanese firms take advantage of their unique ownership structure to reduce overall taxation for corporate groups (Gramlich, Limpaphayom and Rhee, 2004).

Frank and Jagannathan (1998) examine the behavior of stock prices on ex-dividend days in Hong Kong from 1980-1993. Although neither dividends nor capital gains are taxed in Hong Kong, they find that the average price drop ratio for Hong Kong firms is significantly less than one (0.43). They posit that this is a result of market microstructure effects, although Kadapakkam (2000) argues that the Hong Kong findings result from physical settlement procedures. Kadapakkam (2000) examines stock price movements on the ex-dividend days after the introduction of the electronic settlement system in Hong Kong in 1992-1993, and finds that ex-dividend day abnormal returns decrease to an insignificant 0.17 percent, but average price-drop ratios are still less than one (0.90).

Milonas, Travlos, Xiao and Tan (2006) investigate stock price movements on ex-dividend days in the Chinese stock market from 1996-1998. Although they find that prices fall, on average, by an amount that is not statistically different from dividends, their results are not completely consistent with the tax explanation. For example, the average of observed market-adjusted price drop ratios for non-taxable stocks is 1.58, vs. a theoretical predicted ratio of 1.0. For the taxable sample, the average of the market-adjusted price drop ratios is 1.035, vs. a predicted value of 0.879.

Sarig and Tolkowsky (1997) examine price movements on ex-dividend days for stocks listed on the Tel Aviv Stock Exchange and find that prices fall by less than tax-adjusted dividend payments. Although these excess returns represents an arbitrage opportunity, they find no evidence of short-term trading volume around ex-dividend days. With no bid-ask spreads in the Israeli market – prices are quoted in hundredths of Israeli shekels – price discreteness cannot explain their finding of PDRs less than one. Their results suggest that factors other than taxation, short-term trading and market microstructure also influence ex-dividend day stock prices in the Israeli market.

In summary, while most international studies provide empirical support for the tax explanation of stock price movements on ex-dividend days, there are numerous findings that are not fully explained by

taxation. Moreover, the review of the literature presented above reveals that even when researchers' findings generally support the tax explanation, the evidence often suggests that other factors play an important role as well. In the following section we will explore additional factors likely to affect ex-dividend day stock price changes in international markets.

2. Research hypotheses

If Miller and Modigliani's (1961) assumption of perfect capital markets hold, investors will be indifferent between dividends and capital gains, and ex-day stock prices will fall by the exact amount of the dividend. The literature review in the previous section demonstrates that market frictions such as taxes, transaction costs and market microstructure effects matter on the ex-dividend day, however, with all of these factors contributing to the finding that ex-day price drop ratios in both the U.S. and other countries are less than one. We propose that, internationally, there are additional factors that will also affect stock price changes on the ex-dividend day. Foremost among these are information asymmetry and agency conflicts between shareholders and managers.

It is well-established in the literature that dividend payments mitigate agency problems (Easterbrook, 1984; Jensen, 1986; Fluck, 1998 and 1999; Hart and Moore, 1974; Myers, 1998; Gomes, 2000; Zwiebel, 1996; and Borokhovich, Brunarski, Harman and Kehr, 2005), and shareholders perceive that taking returns in the form of capital gains (vs. dividends) is riskier when they are uncertain managers will act primarily on their behalf (Jensen and Meckling, 1976). Specifically, as managers transfer a greater fraction of the firm's profits into retained earnings, the probability that managers will utilize the firm's assets to benefit themselves at the expense of shareholders increases (Jensen, 1986). LLSV (2000) conclude that investors in international markets prefer dividends to capital gains when the potential for agency conflicts are high: "... poorly protected shareholders seem to take whatever dividends they can get" (p. 27). LLS (2006) find that securities laws around the world help regulate agency conflicts between controlling shareholders and outside investors.

We also propose that, in addition to the potential for agency conflicts, information asymmetry between managers and shareholders will also affect investors' preference for dividends. Generally speaking, managers are thought to have more information than outside investors (Myers and Majluf, 1984), and incentives to conceal the true performance of the firm in order to preserve their private benefits (Leuz, Nanda and Wysocki, 2003). In environments where firms are required to disclose less information, investors' preference for dividends will be higher, as

cash payouts reduce managers' ability to divert firm resources for private benefits. LLSV (1997) and (1998) conclude that the severity of agency problems to which minority shareholders are exposed differs greatly across countries, mainly because the legal protection of these shareholders varies. LLS (2006) specifically assert that one of the reasons securities laws matter is the law can mandate the disclosure of certain information.

Previous research indicates that the level of information asymmetry and agency conflicts is higher in non-U.S. countries (Denis and McConnell, 2003; Shleifer and Vishny, 1997). This occurs because the ownership structures of global companies are substantially different than those of U.S. firms (Claessens, Djankov and Lang, 2000; LLS, 1999). Previous research has shown that ownership structure has a significant impact on the extent of agency conflicts and firm valuation in both U.S. and world markets (Lins, 2003; Morck, Shleifer and Vishny, 1988; McConnell and Servaes, 1990; Prowse, 1992). It is also well-documented that the levels of information asymmetry vary significantly across international markets (Bushman, Piotroski and Smith, 2004; Leuz, Nanda and Wysocki, 2003).

We hypothesize that the increased likelihood for agency conflicts and information asymmetry between managers and shareholders in international markets will affect investors' preference for dividends, and thus price drop ratios on the ex-dividend day. Our main hypothesis is that in countries where the potential for agency conflicts and information asymmetry is higher, ex-day price drop ratios will also be higher, as investors' marginal rate of substitution for dividends vs. capital gains increases, despite the tax disadvantage of dividends. Controlling for agency and information effects allows us to further investigate LLSV's (2000) finding of "... no conclusive evidence on the effect of taxes on dividend policies" (p. 27) in world markets. In the following section we define the variables we use as proxies for agency conflicts and information asymmetry in different countries, and describe our methodology for testing whether the differential taxation of dividends and capital gains still affects ex-day prices in world markets after these factors have been taken into account.

3. Data and methodology

Table 1 reports data from 47 countries around the world, including the after-tax value of dividends and capital gains and the predicted price drop ratios (PDR*) for each country. The data shown in the table are from calendar year 2000, and are drawn from a variety of sources: the OECD Tax Database, Doing Business and Investment Series, and International Tax Summaries.

Table 1. Tax advantage of dividends and predicted price-drop ratios

	(A)	(B)	(C)	(D)	(E)	(G)	(H)	(I)
	Corporate tax rate		Personal tax rate			(1-B+E)×(1-D)	(1-A)×(1-C/4)	(G / H)
Country	Undistributed profits	Distributed profits	Capital gains	Dividends	Imputation rate	Value of \$1 in dividends	Value of \$1 in capital gains	Predicted price-drop ratio
Argentina	0.35	0.35	0.00	0.00	0.00	0.65	0.65	1.00
Australia	0.34	0.34	0.47	0.49	0.34	0.52	0.58	0.88
Austria	0.34	0.34	0.00	0.25	0.00	0.50	0.66	0.75
Belgium	0.40	0.40	0.00	0.15	0.00	0.51	0.60	0.85
Brazil	0.33	0.33	0.28	0.00	0.00	0.67	0.62	1.07
Canada	0.45	0.45	0.32	0.48	0.22	0.40	0.51	0.79
Chile	0.15	0.35	0.45	0.45	0.00	0.36	0.75	0.47
Colombia	0.35	0.35	0.35	0.35	0.00	0.42	0.59	0.71
Denmark	0.32	0.32	0.40	0.40	0.00	0.41	0.61	0.67
Ecuador	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00
Egypt	0.42	0.42	0.00	0.00	0.00	0.58	0.58	1.00
Finland	0.29	0.29	0.28	0.29	0.29	0.71	0.66	1.08
France	0.38	0.38	0.26	0.61	0.33	0.38	0.58	0.65
Germany	0.62	0.43	0.00	0.51	0.30	0.42	0.39	1.10
Greece	0.35	0.35	0.00	0.00	0.00	0.65	0.65	1.00
Hong Kong	0.16	0.16	0.00	0.00	0.00	0.84	0.84	1.00
India	0.35	0.45	0.20	0.00	0.00	0.55	0.62	0.89
Indonesia	0.30	0.30	0.00	0.15	0.00	0.60	0.70	0.85
Ireland	0.24	0.24	0.20	0.44	0.00	0.43	0.72	0.59
Israel	0.36	0.36	0.00	0.25	0.00	0.48	0.64	0.75
Italy	0.37	0.37	0.13	0.46	0.37	0.54	0.61	0.89
Japan	0.41	0.41	0.26	0.50	0.00	0.30	0.55	0.53
Kenya	0.33	0.33	0.00	0.05	0.00	0.64	0.68	0.95
Malaysia	0.28	0.28	0.00	0.30	0.28	0.70	0.72	0.97
Mexico	0.35	0.35	0.00	0.35	0.35	0.65	0.65	1.00
Netherlands	0.35	0.35	0.00	0.60	0.00	0.26	0.65	0.40
New Zealand	0.33	0.33	0.33	0.39	0.33	0.61	0.61	0.99
Nigeria	0.30	0.30	0.25	0.10	0.00	0.63	0.66	0.96
Norway	0.28	0.28	0.28	0.28	0.28	0.72	0.67	1.08
Peru	0.30	0.30	0.00	0.00	0.00	0.70	0.70	1.00
Philippines	0.32	0.32	0.01	0.10	0.00	0.61	0.68	0.90
Portugal	0.35	0.35	0.00	0.25	0.00	0.49	0.65	0.75
Singapore	0.26	0.26	0.00	0.28	0.28	0.73	0.74	0.99
South Africa	0.30	0.39	0.00	0.00	0.00	0.61	0.70	0.88
South Korea	0.31	0.31	0.00	0.22	0.00	0.54	0.69	0.78
Spain	0.35	0.35	0.20	0.48	0.29	0.49	0.62	0.79
Sri Lanka	0.35	0.45	0.00	0.35	0.27	0.53	0.65	0.82
Sweden	0.28	0.28	0.30	0.30	0.00	0.50	0.67	0.76
Switzerland	0.25	0.25	0.00	0.42	0.00	0.43	0.75	0.58
Taiwan	0.25	0.25	0.00	0.40	0.25	0.60	0.75	0.80
Thailand	0.30	0.30	0.00	0.10	0.00	0.63	0.70	0.90
Turkey	0.33	0.33	0.00	0.50	0.00	0.34	0.67	0.51
UK	0.30	0.30	0.40	0.33	0.10	0.54	0.63	0.86
United States	0.39	0.39	0.20	0.32	0.00	0.41	0.58	0.71
Uruguay	0.30	0.30	0.00	0.00	0.00	0.70	0.70	1.00

Table 1 (cont.). Tax advantage of dividends and predicted price-drop ratios

	(A)	(B)	(C)	(D)	(E)	(G)	(H)	(I)
	Corporate tax rate	Personal tax rate		$(1-B+E) \times (1-D)$	$(1-A) \times (1-C/4)$	(G/H)		
Country	Undistributed profits	Distributed profits	Capital gains	Dividends	Imputation rate	Value of \$1 in dividends	Value of \$1 in capital gains	Predicted price-drop ratio
Venezuela	0.34	0.34	0.34	0.00	0.00	0.66	0.60	1.09
Zimbabwe	0.35	0.35	0.20	0.20	0.00	0.52	0.62	0.84

Notes: Table 1 presents the tax data used to calculate the predicted Price-Drop Ratio (PDR*) for each country in the sample. Tax data for the year 2000 are collected from (i) OECD Tax Database (<http://www.oecd.org>); (ii) *Doing Business and Investment Series*, 2000. United States: PricewaterhouseCoopers; (iii) *1997 International Tax Summaries, 1997*. ed: George J. Yost III, New York: John Wiley and Sons; and (iv) *Worldwide Tax Guide*, 2004. United Kingdom: PKF International.

The information used – corporate and personal tax rates for dividends and capital gains as well as the imputed tax rates – come from a variety of sources. The first is the OECD Tax Database for 2000. Twenty-three countries in the list of 30 OECD member nations match the countries in the sample: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the U.K., and the U.S. The required tax rates are included in the OECD Tax Database. For the remaining countries that are not in the OECD Tax Database, other references are used to find the required rates, with sources examined in descending order by publication date. Where possible, the listed rates are compared among sources for confirmation; differences are resolved based on the most complete reference closest to year 2000. The OECD Tax Database shows the effective statutory tax rates for individual investors receiving income from a domestic source. The effects of other taxes and credits are also included in the rates shown in the OECD Tax Database. Rates obtained from other sources are also “all-in” rates, to the extent that information was available.

Columns A and B in Table 1 display the corporate tax rates on profits. Most countries have the same corporate tax rate whether the profits are retained in the company (Column A, undistributed profits) or paid to shareholders (Column B, distributed profits). Four countries tax distributed profits higher than undistributed profits (Chile, India, South Africa, and Sri Lanka), and one taxes undistributed profits higher than distributed profits (Germany).

Columns C and D show the individual tax rates for both capital gains and dividends. Out of 47 countries, five nations tax capital gains more highly than dividends, 28 countries impose a higher tax on dividends, and 14 have the same nominal rate for both. Fifteen countries also have an imputed tax rate,

which is used to fully or partially offset the effects of taxes paid at the corporate level before profits are distributed to shareholders as dividends. Using the tax rates in Columns A – E, the after-tax value to shareholders of \$1 in dividends and \$1 in capital gains can be calculated. The value of \$1 received as dividends is equal to:

$$(1 - \text{corp. tax rate on distributed profits} + \text{imputation rate}) \times (1 - \text{personal tax rate on dividends}).$$

Similarly, the value of \$1 received as capital gains is equal to:

$$(1 - \text{corp. tax rate on undistributed profits}) \times (1 - [1/4] \times \text{personal tax rate on cap gains})^1.$$

The ratio of these two metrics (value of dividends/value of capital gains) yields the predicted price drop ratio (PDR*) from Elton and Gruber (1970), shown in Column I of Table 1.

Panel A of Table 2 shows the method used to construct the sample. Datastream is our main source of data. To be included in the sample, we require publicly-traded companies to have a sufficient amount of information available in Datastream. We benchmark our sampling technique to LLSV (1997), who included 49 countries in their sample. Using these nations as the starting point, three countries (Jordan, Nigeria, and Uruguay) are removed because there was no company or market information available on Datastream. Nine other countries (Colombia, Ecuador, Egypt, Greece, Kenya, Pakistan, Sri Lanka, Venezuela, and Zimbabwe) are eliminated because insufficient firm-specific information was available. This left 37 countries in the sample.

This table shows the procedure used to construct the sample for this study.

¹ Poterba (1987) finds that the effective tax rate on capital gains is lower than the nominal rate. La Porta, Lopez-de-Silanes, Shleifer, and Vishny (2000) estimate that the effective tax rate on capital gains equals 25% of the personal rate.

Table 2. Construction of the sample

Panel A: Countries in the sample	
49	Countries originally in La Porta, Lopez-de-Silanes, Shleifer, and Vishny, (1997), <i>Legal determinants of external finance</i>
-3	Countries where company information not available in Data-stream (Jordan, Nigeria, Uruguay)
-9	Countries that do not meet data requirements (Colombia, Ecuador, Egypt, Greece, Kenya, Pakistan, Sri Lanka, Venezuela, Zimbabwe)
37	Countries in the sample
Panel B: Firms in the sample	
33,262	Number of firms in the sample based on countries in the sample (Panel A)
26,929	Dividend payment events in 2000
-2,604	Missing industry code or other company information
-1,635	Insufficient data for beta estimation
-5,842	Missing return data in (t = -1 to t = +1) dividend event window
-11,961	Dividend yield below cut-off value
-475	Dividend yield above cut-off value
4,412	Final sample

Among the 37 countries, 33,262 publicly-traded firms form the basis for the sample used in this study. These firms have 26,929 dividend-paying events in the year 2000, as shown in Panel B of Table 2. Missing company information or industry classification codes eliminated 2,604 firms. Our analysis requires that we estimate each stock's beta vs. its home country market index over the 78-day window before and after the ex-day. There are a number of companies with insufficient data available for beta calculations, resulting in 1,635 observations being removed. Another 5,842 observations are eliminated because of missing stock return data during the dividend event window (days t-1 through t+1). Finally, the cut-off values for the dividend yield are set. If the dividend yield on the dividend record date falls below 2 percent or above 12 percent, the observation is eliminated. The lower cut-off value is set to filter out price drops that would be overwhelmed by transaction costs. We eliminate 11,961 observations where the dividend yield on the date of record is below 2 percent. The upper cut-off value eliminates 475 observations, leaving a total sample size of 4,412, as shown in Panel B of Table 2.

We calculate the observed conditional price drop ratio (PDR) for each event *i* using a market model expected return to discount the ex-day price:¹

$$PDR_i = \frac{P_{i,cum} - \frac{P_{i,ex}}{1 + E[r_{i,ex}]}}{D_i}, \quad (2)$$

where the ex-dividend day closing price $P_{i,ex}$ is discounted back one day using each stock's daily expected return, $E[r_{i,ex}]$. $P_{i,cum}$ is the closing price on the cum-dividend day, and D_i is the amount of the dividend paid out for event *i*. We estimate the market model parameters using a 78-day window $t = [-40 \text{ to } -2]$ and $[+2 \text{ to } +40]$ relative to the ex-day of $t = 0$:

$$r_i = \alpha_i + \beta_i(r_m) + \varepsilon_i, \quad (3)$$

and construct the expected return for each stock *i* on the ex-day:

$$E[r_{i,e,x}] = \hat{\alpha} + \hat{\beta}(r_{m,ex}), \quad (4)$$

which is then used to condition the price drop ratio in Equation (2).

The first hypothesis to be tested is whether each country's mean price drop ratio reflects the differences between dividend and capital gains tax rates in that country. According to Elton and Gruber (1970), in equilibrium, the price drop ratio should be equal to the ratio of tax rates on capital gains and ordinary income. We test the null hypothesis:

$$H_0 : \overline{PDR} = PDR^*$$

against the alternative hypothesis:

$$H_a : \overline{PDR} \neq PDR^*$$

using *t*-statistics for the mean PDRs in each country:

$$t = \frac{\overline{PDR} - PDR^*}{\sigma_{\overline{PDR}}}, \quad (5)$$

We further test whether differential taxation and other factors effect ex-day stock price changes by regressing the mean price drop ratios on the predicted price drop ratios and a set of variables proxying for agency and information asymmetry effects in each country:

$$\frac{P_{i,cum} - \frac{P_{i,ex}}{(1 + E[r_{i,ex}])}}{D_i} = \beta_0 + \beta_1 PDR^* + \sum_{j=1}^J \gamma_j \text{proxy variable}_j + \varepsilon \quad (6)$$

According to the tax explanation (Elton and Gruber, 1970), the slope coefficient should equal one ($\beta_1=1$), indicating that the average price drop ratios (PDR) are equal to the predicted PDR*s based on tax differentials in various countries. Variables proxying for agency conflicts and information asymmetry are also included in the regression model. The variables are the same ones used in LLSV (1998) and LLS (2006). These authors find that the factors discussed below significantly affect investors' preference for receiving dividends. The

¹ Lasfer (1995) shows that discounting the ex-day price back to the cum-day significantly affects measurement of the price drop ratio, and that failure to discount $P_{i,ex}$ can result in biased measurements of the PDR.

exact construction of each variable is described in detail in Appendix A¹.

The first variable is ownership concentration, calculated as the average percentage of common shares owned by the top three shareholders in the ten largest non-financial, privately-owned domestic firms in a given country. This variable is used as a proxy for the extent of agency conflicts. If agency conflicts are not important, there should be no relation between the average ownership concentration and the average price drop ratios (PDR). If agency conflicts play a role on ex-dividend days, there are two competing hypotheses.

According to the alignment-of-interest hypothesis, higher ownership concentration should lead to a greater preference for capital gains, as the agency cost of equity declines with rising management ownership (Jensen and Meckling, 1976). The reason is that large shareholders can mitigate managerial expropriation as they have more control over managerial decisions (Demsetz and Lehn, 1985). Large shareholders also have longer investment horizons, which can alleviate problems related to poor investment decisions by managers (Stein, 1989). Previous studies have documented a positive relation between ownership structure and market valuation (McConnell and Servaes, 1990; Morck, Shleifer and Vishny, 1988). Morck, Shleifer and Vishny (1988) find evidence in support of the alignment-of-interest hypothesis when management shareholdings are in the 0-5 percent range and the beyond 25 percent range. They contend that the initial range reflects managers' greater incentives to maximize firm value, while the very high ownership levels might reflect a pure convergence of interests. Anderson and Reeb (2003) find that S&P 500 firms with concentrated ownership by families tend to perform better than widely-held S&P 500 firms.

The competing hypothesis is the entrenchment hypothesis (McConnell and Servaes, 1990; Morck, Shleifer and Vishny, 1988), which predicts that ownership concentration makes investors prefer dividends over capital gains because a concentrated ownership structure can exacerbate agency conflicts between controlling shareholders and outside investors (Jensen and Meckling, 1976). LLS (1999) and Claessen, Djankov and Lang (2000) show that firms in many economies have concentrated ownership structures, dominated by families or states. Researchers have also shown that corporate ownership is more concentrated in countries with inferior legal protection (LLSV, 1998). With a highly-

concentrated ownership structure, controlling shareholders have substantial power over outside investors (Denis and McConnell, 2003; LLSV, 1998). For example, controlling shareholders can increase the consumption of perquisites which, in turn, leads to a lower market value of the firm. Under these circumstances, shareholders will prefer that the firm disgorges a significant amount of its free cash flow in the form of dividends (Jensen, 1986). DeAngelo H. and DeAngelo L. (2000) argue that concentrated ownership by families can negatively affect corporate payout decisions which leads to poor performance. Consequently, higher ownership concentration should lead to an increased preference for dividends, resulting in higher price drop ratios.

In summary, finding a significant (positive or negative) relation between ownership concentration and the ex-day price drop ratio supports the idea that the potential for greater agency conflicts influences stock price behavior on ex-dividend days. A positive relation between ownership concentration and the ex-day price drop ratio implies that higher ownership concentration will result in investors' having a higher preference for dividends, despite their tax disadvantage. On the other hand, a negative relation between ownership concentration and the ex-day price drop ratio indicates that investors have a preference for capital gains beyond the predictions of the tax hypothesis.

The second variable is the disclosure index, which measures the level of information disclosure with respect to prospectuses, director compensation, ownership structure, and connected transactions by corporations in each country. Corporate transparency, defined as the availability of firm-specific information to outsiders (Bushman, Piotroski and Smith, 2004), depends on the level of information disclosure by firms. Greater disclosure increases corporate transparency and reduces information asymmetry between managers and outside investors. Companies have incentives to disclose information because it can significantly influence investors' decisions (Grossman, 1981; Grossman and Hart, 1980). On the other hand, managers have incentives to conceal their private benefits from investors because they fear disciplinary actions (Shleifer and Vishny, 1997). LLS (2006) conclude that mandated levels of disclosure benefit stock markets worldwide because increased transparency hampers managers' ability to expropriate wealth from shareholders. We propose that investors in countries with lower levels of disclosure (high information asymmetry) will have a higher preference for dividends vs. capital gains. The empirical prediction is that disclosure levels will be negatively related to ex-day price drop ratios.

¹ The authors wish to thank Andre Shleifer for providing us with the data and Rafael LaPorta for explanations on the data collection.

The third variable is a proxy for the pervasiveness of earnings management across countries between 1990 and 1999. Earnings management is another factor that can affect investors' preference for dividends. The accounting literature usually employs discretionary accruals as a proxy for the levels of earnings management. The problem is that accrual accounting also provides managers with opportunities to manipulate earnings for their personal gain (Healy, 1985; DeAngelo, 1988). For example, managers can manipulate earnings to conceal unfavorable information or control private benefits (Leuz, Nanda and Wysocki, 2003). Hung (2001) finds that the use of accrual accounting negatively affects the quality of earnings in different markets. In a study of 977 companies in seven Asian markets, Fan and Wong (2002) find that high agency conflicts lead to low earnings informativeness. Consequently, increased earnings management activities should increase investors' preference for dividend payments, which are also thought to convey information. We predict a positive relation between the pervasiveness of earnings management and the ex-day price drop ratio.

The efficiency and the effectiveness of the judiciary system influences the level of agency conflicts by increasing outside investors' ability to discipline managers (LLS, 1999). An effective judicial system also enhances outsiders' ability to enforce contracts designed to limit insiders' private benefits (LLSV, 1998). Researchers have found a positive relation between the quality of legal systems and the protection afforded to outside investors, which makes it more difficult for managers and large-block shareholders to expropriate shareholder wealth (LLSV, 1997 and 1998). LLS (2006) also propose that well-defined securities laws help keep stock promoters and corporate issuers from cheating investors. Examining 1,433 firms in 18 emerging markets, Lins (2003) finds that shareholder protection mechanisms

alleviate agency costs. The variable "Judiciary quality" is an assessment of the "efficiency and integrity of the legal environment as it affects business, particularly foreign firms," noted in the International Country Risk Guide produced by the country risk rating agency Political Risk Services (1996). This variable is scaled from 0 to 10, with lower scores representing lower efficiency levels. We predict a negative relation between the price drop ratio and this variable, as lower levels of judiciary quality increase investors' preference for dividends.

Following LLSV (2006), we also include trading activity and the logarithm of per capita GDP in the regression model as control variables. Trading activity is the ratio of share value traded to GDP, and $\ln(\text{GDP})$ is the natural logarithm of per capita Gross Domestic Product in 2000. These variables control for the depth of securities markets and the size of the home country economy.

4. Empirical results

Table 3 shows the average price drop ratios by country for year 2000. The far right-hand column contains the predicted price drop ratios (PDR*), calculated as shown in Equation (2) and presented in Table 2. Table 3 is sorted according to values of PDR* from lowest (0.40, Netherlands) to highest (1.10, Germany). After this initial sort, the countries in the sample are classified into one of three categories according to tax treatment. If capital gains receive preferential tax treatment, PDR* is less than one. If dividends receive preferential treatment, PDR* is greater than 1.0. If both receive equal treatment, PDR* is equal to one. Most countries award preferential tax treatment to capital gains. Only four countries give preferential tax treatment to dividends (Brazil, Norway, Finland, and Germany), while four countries tax capital gains and dividends equally (Argentina, Hong Kong, Mexico, and Peru).

Table 3. Mean price drop ratio adjusted for expected return on the ex-dividend day by country

Country	Mean	Median	Maximum	Minimum	SD	t-stat	N	PDR*
Netherlands	0.447	0.457	2.221	-1.197	0.732	0.635	99	0.40
Chile	0.757 **	0.827	1.327	-0.052	0.453	2.255	13	0.47
Turkey	1.293	0.910	14.464	-2.340	2.743	1.599	31	0.51
Japan	1.143 ***	1.023	15.981	-7.703	1.827	6.131	339	0.53
Switzerland	0.542	0.337	15.154	-3.301	1.960	-0.158	69	0.58
Ireland	-0.045	-0.305	2.768	-1.341	1.336	-1.257	7	0.59
France	0.706	0.674	3.729	-2.049	0.863	0.965	209	0.65
Denmark	0.444 **	0.410	1.788	-2.098	0.687	-2.611	65	0.67
US	0.888 ***	0.858	11.345	-1.938	1.106	3.028	368	0.71
Austria	0.103 ***	0.018	1.052	-0.551	0.544	-4.119	12	0.75
Israel	0.624	0.763	2.451	-2.630	0.750	-1.271	57	0.75
Portugal	0.261	0.519	1.002	-0.826	0.754	-1.716	7	0.75

Table 3 (cont.). Mean price drop ratio adjusted for expected return on the ex-dividend day by country

Country	Mean	Median	Maximum	Minimum	SD	t-stat	N	PDR*
Sweden	0.909	0.822	9.026	-2.342	1.308	1.322	129	0.76
South Korea	0.675	0.731	10.628	-6.730	2.144	-0.863	311	0.78
Spain	0.416 *	0.244	1.816	-0.698	0.695	-1.856	12	0.79
Canada	0.243 ***	0.293	5.888	-5.220	1.164	-7.303	241	0.79
Taiwan	2.058 ***	1.306	13.330	-0.992	2.311	6.111	126	0.80
Belgium	0.226 ***	0.325	2.408	-1.689	0.908	-3.829	31	0.85
Indonesia	0.473	0.250	6.346	-1.685	1.485	-1.501	35	0.85
UK	0.428 ***	0.575	2.204	-12.322	1.057	-8.448	433	0.86
South Africa	0.618 ***	0.553	3.801	-1.710	0.827	-3.276	111	0.88
Australia	0.787 **	0.833	5.969	-4.403	0.861	-2.164	369	0.88
Italy	0.384 ***	0.460	1.678	-1.206	0.766	-2.860	19	0.89
India	-0.368 ***	-0.392	16.804	-5.919	1.796	-10.696	233	0.89
Thailand	1.013	0.983	4.298	-0.558	0.742	1.291	72	0.90
Philippines	0.082	0.055	1.438	-1.139	0.962	-1.904	5	0.90
Malaysia	0.832 *	0.817	8.664	-3.020	1.062	-1.688	164	0.97
New Zealand	0.862	0.675	10.964	-3.468	1.398	-0.889	91	0.99
Singapore	1.120	0.979	19.024	-0.941	2.093	0.576	89	0.99
Argentina	0.791	0.740	1.446	0.201	0.456	-1.451	10	1.00
Hong Kong	0.996	0.888	11.745	-4.892	1.637	-0.034	240	1.00
Mexico	0.481 ***	0.574	1.768	-0.642	0.568	-3.653	16	1.00
Peru	1.932	1.274	10.901	0.215	3.025	1.022	11	1.00
Brazil	0.743 ***	0.631	5.145	-1.494	1.139	-2.845	96	1.07
Norway	1.016	0.768	12.944	-1.722	2.085	-0.178	40	1.08
Finland	0.843	1.084	4.858	-4.375	1.587	-1.299	79	1.08
Germany	0.435 ***	0.435	3.498	-4.813	0.890	-9.851	172	1.10

Notes: This table presents summary statistics of Price Drop Ratios (PDR) by country. Price Drop Ratio (PDR) is defined as the difference between the cum-dividend day closing price and the ex-dividend day closing price (adjusted by expected daily returns based on the market model) divided by the dividend amount (shown as Equation 2). Market returns are calculated using stock indexes in each country. PDR* is the predicted price drop ratio based on 2000 tax information in the respective country. Statistical significance is denoted by ***, **, and * at the 1, 5, and 10 percent levels respectively.

Table 3 also provides descriptive statistics for the observed PDRs for each of the 37 countries in the sample. The mean, median, maximum, minimum, standard deviation and number of observations are shown. Mean and median PDRs are calculated for every ex-dividend day in the sample for each country during 2000. We also report *t*-statistics that test the difference between the predicted PDR* and observed mean PDR (Equation 5).

It is apparent that there is a wide range of PDR values within each country, as evidenced by the maximum and minimum values and standard deviations. The maximum PDR value across the entire sample is greater than 19 (Singapore), with a minimum value of -12.3 (U.K.). The mean PDR is positive for nearly every country except for Ireland (-0.045) and India (-0.368). Ireland's mean PDR is not significantly different from its predicted value of 0.59, a finding most likely due to the small number of observations. However, the average PDR for India is

significantly less than its predicted value of 0.89 at the one percent level.

The results show the mean price drop ratios for slightly more than half the countries in the sample (19) are not significantly different from their predicted price drop ratios. This preliminary finding strongly suggests that differential taxation is an important determinant of ex-dividend day stock price changes in global markets. For the remaining 18 countries in the sample, we find that the mean PDRs are statistically different from their predicted values, however, with 14 of these 18 countries having mean PDRs less than their predicted PDR* based solely on differential taxation. This finding suggests that additional factors, such as agency conflicts and information asymmetry, also affect ex-day stock prices internationally.

Table 4 presents descriptive statistics of the variables used in the regression analysis, and Table 5 reports the regression results. The first column in Table 5

reports results from a univariate regression with observed price drop ratios as the dependent variable and predicted price drop ratios as the independent variable. The slope coefficient equals 0.375. The value of the coefficient is not statistically significant at conventional levels ($H_0: \beta_1 = 0$). The adjusted R-squared is low (0.1 percent) and the associated F -statistic is insignificant. This initial finding is not supportive of the tax explanation in global markets.

Table 4. Descriptive statistics

Variables	Mean	SD	Median	N
Predicted price-drop ratio	0.823	0.182	0.85	37
Observed price-drop ratio	0.679	0.476	0.68	37
Trading activity	0.328	0.334	0.19	37
Ownership concentration	0.441	0.131	0.480	37
Earnings management	15.481	7.379	18.30	27
Disclosure	0.653	0.204	0.67	37
Judiciary quality	7.959	2.233	9.00	37
Ln(GDP)	9.265	1.187	9.84	37

Notes: This table present descriptive statistics of all variables used in the regression analyses. All data are for 2000. The predicted price drop ratio (PDR*) is calculated as the theoretical values of one dollar of dividends divided by one dollar of capital gains using 2000 tax information from each country. Price-Drop Ratio (PDR) is defined as the difference between the cum-dividend day closing price and the ex-dividend day closing price (adjusted by expected daily returns based on the market model) divided by the dividend amount. Expected returns are computed using the market model with the estimation period [-78 to +78]. Market returns are calculated using the major stock market index in each country. The remaining variables are provided by La Porta, Lopez-de-Silanes, and Shleifer (2006). Trading activity is the ratio of share value traded to GDP. Ownership concentration is the average percentage of common shares owned by the top three shareholders in the ten largest non-financial, privately-owned domestic firms in a given country. Earnings management is a proxy for the pervasiveness of earnings management across countries between 1990 and 1999. Disclosure is a country index assessing the level of information disclosure (with respect to prospectuses, director compensation, ownership structure, and connected transactions) by corporations in each country. Judiciary quality is an assessment of the "efficiency and integrity of the legal environment as it affects business, particularly foreign firms" produced by the country risk rating agency International Country Risk (ICR). This variable is scaled from 0 to 10, with lower scores representing lower efficiency levels. Ln(GDP) is the natural logarithm of per capita Gross Domestic Product in 2000.

The results from the multivariate regression are reported in the second column of Table 5. Once the proxy variables for agency conflicts and information asymmetry are included in the model, the slope coefficient for the predicted price drop ratio becomes statistically significant at the one percent level. The coefficient (1.058) is also not significantly different from one ($t = 0.368$), which strongly supports the idea that differential taxation influences stock price movements on ex-dividend days internationally, consistent with the Elton and Gruber (1970) framework.

Table 5. Regression results

Variables	Model 1	Model 2
Intercept	0.301 (0.459)	-1.195 (0.912)
Predicted price-drop ratio	0.375 (0.551)	1.058*** (0.396)
Ownership concentration		-1.783*** (0.688)
Disclosure		0.250 (0.415)
Judiciary quality		-0.111*** (0.044)
Earnings management		0.015* (0.011)
Trading activity		0.537** (0.184)
Ln(GDP)		0.210*** (0.083)
Adjusted R-squared	0.001	0.679
F-Statistic	0.464	5.757***
N	27	27

Notes: Table 5 shows OLS regression results for all countries in the sample. The dependent variable is the average price-drop ratio for each country. The predicted price-drop ratios are calculated based on the dividend and capital gains tax rates in the respective countries for 2000. Other independent variables are provided by La Porta, Lopez-de-Silanes, and Shleifer (2006). Trading activity is the ratio of share value traded to GDP. Ownership concentration is the average percentage of common shares owned by the top three shareholders in the ten largest non-financial, privately-owned domestic firms in a given country. Earnings management is a proxy for the pervasiveness of earnings management across countries between 1990 and 1999. Disclosure is a country index assessing the level of information disclosure by corporations in the respective country. Judiciary quality is an assessment of the "efficiency and integrity of the legal environment as it affects business, particularly foreign firms" produced by the country risk rating agency International Country Risk (ICR). Ln(GDP) is the natural logarithm of per capita Gross Domestic Product in 2000. Standard errors are reported in parentheses. *, **, and *** denote statistical significance (one-tailed) at 10, 5 and 1 percent levels respectively.

$$\frac{P_{i,cum} - \frac{P_{i,ex}}{(1 + E[r_{i,ex}])}}{D_i} = \beta_0 + \beta_1 PDR^* + \sum_{j=1}^J \gamma_j \text{proxy variable}_j + \varepsilon$$

We find support for the idea that the potential for agency conflicts affects stock price movements on ex-dividend days in world markets. The regression coefficient for ownership concentration is negative (-1.783) and statistically significant at the one percent level. According to the sign of the coefficient, ownership concentration increases investors' preference for capital gains and leads to lower price drop ratios than those predicted by the tax hypothesis alone. This finding provides support for the alignment-of-interest hypothesis, and is most likely a result of the highly-concentrated ownership structure (48 percent) of firms in our sample. The coefficient for judiciary quality is also negative and statistically significant at the one percent level,

however, consistent with the hypothesis that a low-quality judicial system leads to poor investor protection and increases the potential for agency conflicts between insiders and outside investors. Investors prefer the agency problem-mitigating aspect of dividends, which leads to higher price drop ratios.

The empirical evidence generally supports the idea that information asymmetry affects stock price movements on the ex-dividend day in global markets. The regression coefficient for the pervasiveness of earnings management is positive (0.015) and is statistically significant at the ten percent level. Finding that earnings management positively affects price-drop ratios suggests that investors' preference for dividends is higher in the presence of earnings management, and this preference is reflected in ex-day stock prices. The regression coefficient on the level of disclosure is not statistically significant, however. The possibility exists that the effect of corporate disclosure may have been captured by the other variables in the model.

The results for the two control variables show that trading activity and the size of the home country economy are positively related to price drop ratios. The adjusted R-squared of 67.9 percent and the *F*-statistic of 5.76 indicate the model explains a significant amount of the variation in price drop ratios across world markets. The empirical evidence strongly supports the idea that differential taxation affects ex-day stock prices internationally, and that agency conflicts and information asymmetry also play a role on the ex-day.

Conclusions

In their seminal paper, Miller and Modigliani (1961) contend that, under the assumption of perfect capital markets, investors will be indifferent between dividends and capital gains. This implies that stock prices should fall by the exact amount of the dividend payment on the ex-dividend day. Elton and Gruber (1970) relax the no taxation assumption to account for the well-known fact that prices drop by less than the amount of dividends. We hypothesize that, in addition to differential taxation, other factors also affect stock price movements on ex-dividend days. We propose that in countries with higher levels

of agency conflicts and information asymmetry, investors will have a greater preference for dividend payments, and this preference will be discernible in higher ex-dividend day price drop ratios (or, equivalently, lower ex-day returns). International markets provide a natural testing ground for these propositions due to the high variation in information asymmetry and agency conflicts across different countries and economies.

Using data from 37 countries, we employ a multivariate framework to investigate cross-country differences in ex-dividend day stock price changes. Our results indicate that factors such as stock ownership concentration, judiciary quality, and the pervasiveness of earnings management exert a significant influence on ex-dividend day stock prices. Even after controlling for these factors, however, we find that ex-day stock price changes reflect the weighted average of investors' relative tax rates. Our results indicate that differential taxation of dividends and capital gains is also a significant determinant of ex-dividend day stock price changes in global markets.

Our findings also suggest several directions for future research. Now that our study has identified differential taxation, agency conflicts and information asymmetry as factors affecting price movements on ex-dividend days, a natural extension of this work would be incorporating the effect of investor tax heterogeneity on ex-dividend day price movements, as this factor is also necessary to induce tax-based trading among investors (Dhaliwal and Li, 2006; Lakonishok and Vermaelen, 1986; Michaely and Murgia, 1995). Transaction costs are also not specifically addressed in this study, but controlled for with a more general trading activity variable. It would be interesting to examine the impact of specific microstructure factors on ex-dividend day stock prices across world markets. Finally, although our sample size does not allow for an examination of the dynamic interrelation among factors, the finance and accounting literature has documented complex interactions among legal systems and the level of protection afforded to investors, the extent of agency conflicts, and different levels of corporate disclosure across world markets.

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Appendix A. Proxy variables for agency conflicts and information asymmetry and other control variables

Ownership concentration: The average percentage of common shares owned by the top three shareholders in the 10 largest nonfinancial, privately-owned domestic firms in a given country. A firm is considered privately owned if the State is not a known shareholder in it.

The ownership concentration variable is first used in La Porta et al. (1998) and subsequently in La Porta et al. (2006). For the 1998 paper, the authors build a database of the 10 largest nonfinancial firms in 45 out of 49 countries in their sample. Firms are ranked based on market capitalization. La Porta et al. (1998) consider only domestic corporations that are entirely privately owned; multinationals and state-owned companies are excluded. For a handful of countries, ten firms could not be found that match their criteria, so the sample constituted at least five companies. Out of the nations with insufficient data, only two countries (India and Philippines) are included in our sample. La Porta et al. (1998) identify the three largest shareholders of each firm and compute the combined cash flow ownership stake of these shareholders. For each country, the holdings of the three largest shareholders of the 10 largest publicly traded companies are averaged to create a measure of ownership concentration. La Porta et al. (1998) acknowledge that their data are not adjusted for affiliations among the top three shareholders, shareholdings affiliated with management, or the presence of pyramidal ownership structures. La Porta et al. (1998) note that their measure of ownership is comparable to the ownership concentration measures for American companies used by Demsetz and Lehn (1985) and Morck et al. (1988). Values in Table 7 of La Porta et al. (1998) match the values in the dataset we employ.

Disclosure requirements index: The disclosure requirements index is constructed by La Porta et al. (2006). The index of disclosure equals the arithmetic mean of (1) prospectus; (2) compensation; (3) shareholders; (4) inside ownership; (5) irregular contracts; and (6) transactions, where the definitions for (1) – (6) are as follows:

(1) Prospectus: Equals one if the law prohibits selling securities that are going to be listed on the largest stock exchange of the country without delivering a prospectus to potential investors; equals zero otherwise.

(2) Compensation: An index of prospectus disclosure requirements regarding the compensation of the Issuer's directors and key officers. Equals one if the law or the listing rules require that the compensation of each director and key officer be reported in the prospectus of a newly-listed firm; equals one-half if only the aggregate compensation of directors and key officers must be reported in the prospectus of a newly-listed firm; and equals zero when there is no requirement to disclose the compensation of directors and key officers in the prospectus for a newly-listed firm.

(3) Shareholders: An index of disclosure requirements regarding the Issuer's equity ownership structure. Equals one if the law or the listing rules require disclosing the name and ownership stake of each shareholder who, directly or indirectly, controls 10% or more of the Issuer's voting securities; equals one-half if reporting requirements for the Issuer's 10% shareholders do not include indirect ownership, or if only their aggregate ownership needs to be disclosed; and equals zero when the law does not require disclosing the name and ownership stake of the Issuer's 10% shareholders. We combine large shareholder reporting requirements imposed on firms with those imposed on large shareholders themselves.

(4) Inside ownership: An index of prospectus disclosure requirements regarding the equity ownership of the Issuer's shares by its directors and key officers. Equals one if the law or the listing rules require that the ownership of the Issuer's shares by each of its director and key officers be disclosed in the prospectus; equals one-half if only the aggregate number of the Issuer's shares owned by its directors and key officers must be disclosed in the prospectus; and equals zero when the ownership of the Issuer's shares by its directors and key officers need not be disclosed in the prospectus.

(5) Irregular contracts: An index of prospectus disclosure requirements regarding the Issuer's contracts outside the ordinary course of business. Equals one if the law or the listing rules require that the terms of material contracts made by the Issuer outside the ordinary course of its business be disclosed in the prospectus; equals one-half if the terms of only some material contracts made outside the ordinary course of business must be disclosed; and equals zero otherwise.

(6) Transactions: An index of the prospectus disclosure requirements regarding transaction between the Issuer and its directors, officers, and/or large shareholders (i.e., "related parties"). Equals one if the law or the listing rules require that all transactions in which related parties have, or will have, an interest be disclosed in the prospectus; equals one-half if only some transactions between the Issuer and related parties must be disclosed in the prospectus; and equals zero if transactions between the Issuer and related parties need not be disclosed in the prospectus.

Earnings management: Leuz, Nanda, and Wysocki (2003) use financial accounting data from 1990 to 1999, spanning 31 countries and more than 8,000 firms, to find proxies that capture the extent to which company insiders manage

earnings. They show that in countries with weak investor protection, earnings manipulation is more extensive. The four proxies are: smoothing reported operating earnings using accruals; smoothing and the correlation between changes in accounting accruals and operating cash flows; discretion in reported earnings (magnitude of accruals); and discretion in reported earnings (small loss avoidance). The authors create four country-level measures aggregating all firms in each respective country. A country ranking gauging the pervasiveness of earnings management within a country is obtained by averaging the country rankings for the four individual earnings management measures. The values used by Leuz et al. (2003) were incorporated into the dataset prepared by La Porta et al. (2006), which is the same dataset we use.

Efficiency of the judiciary: An assessment of the “efficiency and integrity of the legal environment as it affects business, particularly foreign firms” in the International Country Risk Guide produced by the country risk rating agency Political Risk Services (1996). Each annual value assigned to a nation “may be taken to represent investors’ assessment of conditions in the country in question.” The efficiency rating is scaled from 0 to 10, with lower scores representing lower efficiency levels. Annual values for four years, 1980 through 1983, are averaged. Source: La Porta et al. (1998), definition in Table 1 and data values in Table 5.

Trading activity (liquidity): The average total value of stocks traded as a percentage of GDP for the period 1996 to 2000. Source: World Bank, Key Development Data and Statistics. Data are available free of charge for 2001-2006 (<http://tinyurl.com/anqax>); earlier data are available by subscription.

Log GDP per capita: Natural logarithm of per capita GDP (in U.S. dollars) in 2000.