Cross-Country Evidence on the Relation between Capital Gains Taxes, Risk, and Expected Returns*

Luzi Hail
The Wharton School, University of Pennsylvania

Stephanie Sikes
The Wharton School, University of Pennsylvania

Clare Wang
Kellogg School of Management, Northwestern University

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Abstract

This study empirically examines the prediction in Sikes and Verrecchia (2012) that the relation between capital gains tax rates and expected rates of return varies in the cross-section and over time with firm risk and market risk. Specifically, we test whether the general positive relation between expected returns and the capital gains tax rate becomes weaker or even reverses when (i) a firm's systematic risk is high, (ii) the market risk premium is high, or (iii) the risk-free rate is low. Using an international panel from 27 countries over the period 1990 to 2004, we find evidence supporting these predictions. The results are particularly pronounced in countries with substantive changes in tax rates, more trust in government institutions, less integrated and less liquid capital markets, and lower institutional ownership as well as around substantive increases and decreases in the three risk proxies. We corroborate our findings in a single country setting, using the 1978, 1997, and 2003 changes to the capital gains tax rate in the United States as events. Our results underscore the importance of macroeconomic and firm-specific factors in determining the effect of capital gains taxes on expected returns and suggest that tax rate changes can sometimes have opposite valuation implications than what policymakers have in mind.

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1. Introduction

Does firm risk and macroeconomic risk affect the general relation between capital gains tax rates and asset prices and hence, expected pretax rates of return? Prior studies document a positive relation between investor-level capital gains tax rates and expected pretax rates of return (e.g., Guenther and Willenborg 1999; Lang and Shackelford 2000; Dhaliwal, Krull, and Li 2007). The logic behind a positive relation is as follows: an increase in the capital gains tax rate reduces investors' expected after-tax cash flows, and thus lowers the price that they are willing to pay for firms' shares. In turn, the reduction in price increases firms' expected pretax rates of return (hereinafter referred to simply as expected returns or cost of capital).

However, the relation is likely more nuanced and does not necessarily have to be positive. Sikes and Verrecchia (2012) analytically show that in a diversified market with many firms whose cash flows co-vary and in which some risks are non-diversifiable, the relation between capital gains tax rates and expected returns varies both in the cross-section and over time based on firm-level and economy-wide risk attributes. Specifically, they outline three scenarios in which the relation between capital gains tax rates and expected returns will be less positive or even negative: (i) when a firm's systematic risk is high, (ii) when the market risk premium is high, or (iii) when the risk-free rate in the economy is low.

In this paper, we empirically test these predictions using a large international panel of capital gains tax rates and cost of capital. In addition and to increase the confidence in our results, we examine institutional settings where the mitigating forces of firm-level and aggregate risk are most likely to occur. Understanding the exact nature of the relation between capital gains taxes and expected returns is important for policymakers, firms, and investors because the general belief is that reducing capital gains tax rates stimulates growth and investment among firms relying on external equity financing. Yet, as our analysis shows, the macroeconomic conditions surrounding the implementation of a tax rate change might weaken or even induce opposite cost of capital and valuation effects and hence can hamper the intended economic stimulus.[1]

The predictions in Sikes and Verrecchia (2012) are based on the following trade-off. In a diversified market, an *increase* in the capital gains tax rate has two opposing effects. First, it reduces investors' expected after-tax cash flows leading to the aforementioned positive relation. Second, it also reduces investor-level risk because taxing capital gains and losses induces the tax authority to absorb some of the risk associated with firms' residual cash flows.[2] *Ceteris paribus*, when risk declines, investors are willing to pay a higher price for firms' shares, thereby lowering firms' expected returns. In scenarios when a firm's systematic risk or the market risk premium is high, investors put more weight on the risk reduction component of capital gains taxation. As a result, the effect of risk reduction attenuates and possibly even dominates the impact of lower expected after-tax cash flows. The general positive relation between capital gains taxes and expected returns becomes less positive or negative.

A third scenario arises when the risk-free rate of return is low. In asset pricing models such as the Capital Asset Pricing Model (CAPM), a risk-free asset (e.g., sovereign bonds) serves as the alternative to investments in risky firm shares. Higher capital gains tax rates increase the relative

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1 For example, the motivation behind the Jobs and Growth Tax Relief Reconciliation Act of 2003 in the U.S., which cut both the maximum statutory individual dividend and capital gains tax rates, was to reduce cost of capital and thus stimulate economic growth (108th Congress report, 2003). The Secretary of the Treasury at the time, John Snow, argued that "Because the President's proposal lowers the cost of capital […], it encourages investment and a higher long-term growth rate. Lower capital taxes mean more capital, which means higher productivity, which means faster growth and higher wages for everyone'' (Snow, 2003).

2 The tax authority absorbs risk by allowing investors to offset their taxable gains with taxable losses and thus shares in investors' gains as well as their losses. For example, in the U.S., individual investors can offset gains with losses and can deduct up to US$ 3,000 of net capital losses against ordinary income per year, and carry-forward any remainder indefinitely. Sikes and Verrecchia (2012) assume (and provide empirical support in their Appendix A) that the US$ 3,000 capital loss limitation is non-binding. Other countries have similar provisions that allow taxpayers to offset gains with losses and to carry forward unused losses indefinitely (e.g., Canada and Australia) or over a limited number of years (e.g., three years in Japan).

attractiveness of the risk-free investment, thereby reducing the demand for and the price of the risky asset. However, when the risk-free rate is close to zero, the after-tax return on the risk-free asset is small. Thus, in those situations, an increase in the capital gains tax rate does little to shift demand away from the risky asset and thereby decrease its price because investors can still earn more from the risky asset than from the risk-free asset. At the same time, the risk reduction effect of capital gains taxation is present.

We empirically test the above predictions using panel data of tax rates (see Appendix 1) and expected returns from 27 countries with capital gains taxation over the period 1990 to 2004. We conduct the analysis in a cross-country setting because it provides us with both substantial cross-sectional and inter-temporal variation in tax rates, market risk premiums, and risk-free rates. It also lets us isolate institutional settings in which the mitigating factors of tax capitalization are most likely to occur. Following prior literature, we use two conceptually different proxies of expected returns: realized buy-and-hold returns (*RET*) and implied costs of capital (*COC*) (e.g., Hail and Leuz 2006, 2009; Dhaliwal, Li, and Trezevant 2003; Dhaliwal, Krull, Li, and Moser 2005; Dhaliwal, Krull, and Li 2007).[3] We measure both proxies in a way that they capture investors' expected returns at the time of observation. To separate between the different scenarios, we employ three conditioning variables. We calculate a firm's systematic risk using a two-factor market model in which we regress a firm's excess return on the excess returns of the local market index and the world market index (e.g., Hou, Karolyi, and Kho 2011). Our proxy for systematic risk is the coefficient on the local market index. We estimate the yearly market risk premiums following Erb, Harvey, and Viskanta (1996a). That is, we take the fitted values from a model

[3] We conduct the *COC* analyses with the average of four commonly used measures of implied cost of capital (i.e., those suggested in Claus and Thomas 2001; Gebhardt, Lee, and Swaminathan 2001; Ohlson and Juettner-Nauroth 2005, as implemented in Gode and Mohanram 2003; and Easton 2004).

regressing local stock index returns on *Institutional Investor*'s country credit ratings and then subtract the risk-free rate of return. Local nominal interest rates on short-term treasury bills proxy for the returns on the risk-free asset.[4]

We start our analyses by confirming prior literature's findings of an on average positive relation between capital gains tax rates and expected returns (e.g., Guenther and Willenborg 1999; Lang and Shackelford 2000; Dhaliwal et al. 2007), however not before we eliminate Japan, a country with persistently low risk-free rates, from the realized returns tests. We then test each of the three predictions in Sikes and Verrecchia (2012) in a cross-sectional time-series regression. Consistent with theory, we find that the positive relation between capital gains taxes and expected returns is attenuated and sometimes even negative when a firm's systematic risk is high, when the market risk premium is high, and/or when the risk-free rate is low. In terms of economic magnitude, the effects are substantial, but not too big to be implausible. The results are robust to various alternative model and sample specifications, including estimation with firm fixed effects, controlling for economic growth or lock-in behavior by investors (e.g., Feldstein, Slemrod, and Yitzhaki 1980; Landsman and Shackelford 1995; Klein 2001; Ivkovich, Poterba, and Weisbenner 2005), and alternative tax rates (Becker, Jacob, and Jacob 2013).

To strengthen our identification, we next focus on settings where *a priori* we expect the mitigating forces of firm-level risk and market risk to be more pronounced. Consistently, we find stronger results in countries with substantive changes in capital gains tax rates over the sample period, in countries with higher investor trust in government institutions and actions, and with less integrated and less liquid capital markets. We also observe stronger negative relations in countries

[4] We rerun the analyses with alternative proxies for the market risk premium (i.e., return variability, market premiums based on aggregate yearly implied cost of capital, and country-year median firm beta) and real instead of nominal risk-free rates, and find very similar results (see Appendix 2).

with a lower proportion of institutional ownership. These findings ease concerns about the proportion of investors in a country who are actually subject to the local capital gains tax rate and the value they place on the risk-sharing component of capital gains taxation. We then conduct a pre-post comparison around substantive changes in systematic risk, market risk premiums, and risk-free rates. Our results continue to hold, notably for substantive increases *and* decreases in the risk proxies and, in the analyses of changes in firms' systematic risk, after including separate fixed effects for each country-year combination. The latter specification effectively controls for contemporaneous shocks and trends in the data. To further gauge the economic importance of our results, we separately estimate the relation between capital gains tax rates and expected returns for portfolios formed by ranking the sample observations according to firms' systematic risk. Not only do we find that the relation almost monotonically declines from low to high risk portfolios, but also that it is negative for a large portion of the overall sample.

In our last set of tests we corroborate the cross-country results in a single-country setting, which eliminates many of the potentially confounding factors of the international panel but comes at the cost of only very limited variation in tax rates and risk parameters. Specifically, we examine three regulatory changes to the capital gains tax rate in the United States: the Revenue Reconciliation Act of 1978 (RA78), the Taxpayer Relief Act of 1997 (TRA97), and the Jobs and Growth Tax Relief and Reconciliation Act of 2003 (JGTRRA03). Because the market risk premium and the risk-free rate varied substantially across the three events, this setting allows us to isolate the mitigating forces of these two risk variables on the general relation between capital gains tax rates and expected returns.[5] We find the relation to be negative and significant when the

[5] Based on several proxies, we find that the market risk premium is *high* surrounding the enactment of RA78, the risk-free rate is *low* around JGTRRA03, and the macroeconomic conditions are of moderate levels around the enactment of TRA97. These distinct characteristics allow for a comparison across events.

market risk premium is high (around RA78) or the risk-free rate is low (around JGTRRA03). In the intermediate case (around TRA97), the relation is positive, albeit insignificant, and significantly different than around the other two events. The pattern is consistent with time-series variation in the valuation effects of capital gains taxation and points to the macroeconomic conditions as moderating factors, as predicted by theory.

In summary, our study empirically shows that the extent to which capital gains taxes are impounded into price and thus affect expected returns varies significantly in the cross-section and over time with firm and market risk. A better understanding of the factors that mitigate tax capitalization is critical for policy makers who are considering capital gains tax rate changes as well as firms and investors interested in the valuation and real investment effects of such changes. Prior literature's findings that increasing (decreasing) the capital gains tax rate leads to higher (lower) expected returns are average results. We show that for firms with high systematic risk and in economies where the market risk premium is high or the risk-free rate low, changing capital gains tax rates can have no or the opposite effect. This finding is important as it goes against the conventional wisdom of tax capitalization. Our study also contributes to the evidence on how tax rate changes are incorporated into international asset prices (e.g., Dhaliwal, Krull, and Li 2011; Becker, Jacob, and Jacob 2013) in that we show that the degree of market integration, liquidity of capital markets, ownership structure, and investor trust in government institutions are important factors for capital gains taxes to have an effect.

In Section 2, we discuss prior literature and the conceptual underpinnings of our empirical predictions. Section 3 presents the results of the cross-country analyses, first using the entire panel dataset, then for specific subsets of countries and around substantive changes in the three conditioning variables. In Section 4, we report the results of the single-country tests that center around changes to the capital gains tax rate in the U.S. Section 5 concludes.

2. Conceptual Underpinnings and Prior Literature

According to Miller and Scholes (1978, 1982), shareholder taxes are irrelevant in the determination of asset prices because taxable investors are infra-marginal. In contrast, in the after-tax CAPM developed by Brennan (1970) and Gordon and Bradford (1980), it is the weighted average tax rate of all investors in the economy that is relevant in determining the extent to which shareholder taxes are capitalized, not the tax rate of a hypothetical marginal investor. It follows that share prices can indeed reflect investor-level taxes. The general line of argument is that higher capital gains and/or dividend tax rates reduce expected after-tax cash flows, thereby decreasing the price that investors are willing to pay for a firm's shares. The resulting positive association between shareholder-level taxes and expected returns has been widely acknowledged.[6]

Against this backdrop, prior literature provides evidence of capital gains tax capitalization (for overviews see, e.g., Shackelford and Shevlin 2001; Hanlon and Heitzman 2010). For instance, several studies examine the reduction in the maximum statutory capital gains tax rate for individuals from 28 to 20 percent in the U.S. in May 1997 (TRA97). TRA97 is an ideal setting to test for the effects of tax capitalization because the tax rate cut was unexpected and the act made few unrelated changes. Studying returns in the week of the announcement but prior to the effective date of the tax cut, Lang and Shackelford (2000) and Dai, Maydew, Shackelford, and Zhang (2008) find that announcement week returns are higher than average weekly returns and that non-dividend-paying firms, a proxy for firms whose shareholders have accrued the largest capital gains,

[6] For instance, Scholes et al. (2009) write in their textbook that "[Lowering] the tax on dividends for a firm paying out 100% of its earnings reduces the firm's cost of capital. Lowering the capital gains tax rate for a non-dividend paying firm also lowers its cost of capital" (p. 108).

outperform dividend-paying firms.[7] Blouin, Hail, and Yetman (2009) show that American depositary receipts of low-dividend-yield firms outperform those of high-dividend-yield firms and that this price reaction translates to international markets when the barriers to arbitrage are low.[8] Using a 1993 change in U.S. tax laws that provided a 50 percent capital gains tax exclusion for share offerings, Guenther and Willenborg (1999) find a significant increase in prices of qualified initial public offerings. Another set of studies focuses on JGTRRA03, which changed both the dividend tax rate (from 38.1 to 15 percent) and the capital gains tax rate (from 20 to 15 percent), and therefore presents less clean of an event. Dhaliwal, Krull, and Li (2007) document a decrease in measures of implied cost of capital following JGTRRA03.[9] All the above studies have in common that they find evidence of a positive relation between capital gains tax rates and expected returns. However, they primarily focus on (short-term) average effects, and ignore macroeconomic factors or the conditioning role of firms' systematic risk. They also do not consider time-series variation in the documented relation.

Our paper explicitly allows for cross-sectional and time-series variation in tax capitalization. Doing so, we build on prior work on the risk-sharing properties of capital gains taxes. Domar and Musgrave (1944) were the first to propose that a proportional tax with a full

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7 Dai et al. (2008) also find evidence of the lock-in effect around TRA97. The lock-in effect reflects the shock to the supply side from a change in the capital gains tax rate. That is, lower tax rates should lead to a sudden surge in the supply of stocks, causing downward pressure on price. Because the resulting negative (short-term) relation between capital gains tax rates and expected returns might act as a confounding factor in our analysis, we explicitly control for this possibility in the tests (see Appendix 2).

8 Also consistent with tax capitalization, Ayers, Li, and Robinson (2008) find that around TRA97 the buy-sell order imbalance increases more for small trades (their proxy for individual trades) than for large trades (their proxy for institutional trades).

9 They further find that the decrease in expected returns is more pronounced for non-dividend-paying firms than for dividend-paying firms. Dai, Shackelford, Zhang, and Chen (2013) suggest that this result is due to non-dividend paying firms being more financially constrained. Auerbach and Hassett (2007) find that non-dividend-paying firms experienced significantly larger price increases surrounding key dates related to JGTRRA03. They conclude that non-dividend-paying firms benefit disproportionately from a dividend tax rate cut that is expected to last a sufficient amount of time because the present value of future taxable dividends is greater for these firms. We also examine TRA97 and JGTRRA03 and present results in Section 4.

loss offset provision results in the government being a partner in a taxpayer's investment and that such a tax system results in increased risk-taking by taxpayers. Tobin (1958) and Atkinson and Stiglitz (1980, Lecture 4) reach similar conclusions. All of these studies have in common that they focus on risk-sharing in a single-person decision problem rather than a financial market in which investors hold diversified portfolios. Guenther and Sansing (2010) extend this view and suggest that via capital gains taxes, the tax authority absorbs some of the risk associated with firms' residual cash flows. Yet, in their model they cannot assess the mitigating role of a firm's systematic risk and/or the market risk premium because the cash flows of the two firms comprising the economy are independent. Consistent with the notion of partial risk absorption by the government, Dai, Shackelford, and Zhang (2013) find that stock return volatility increased following the cuts to the U.S. capital gains tax rate in 1978 and 1997.

Building on this literature, Sikes and Verrecchia (2012) set up their model as an economy with many firms whose cash flows covary and in which some risks are non-diversifiable. These features allow them to outline three scenarios in which the general positive relation between capital gains tax rates and expected returns will be less positive or even negative: (i) when a firm's systematic risk is high, (ii) when the market risk premium is high, or (iii) when the risk-free rate is low.[10] The predictions related to systematic risk and the market risk premium stem from a trade-off between two opposing forces. The first force is the traditional notion that increasing the capital gains tax rate reduces expected after-tax cash flows, thus decreasing share prices and increasing expected returns. The second force is the notion that an increase in the capital gains tax rate increases the amount of the risk associated with firms' residual cash flows that the tax authority

[10] See Appendix 3 for a more formal summary of the key features of the Sikes and Verrecchia (2012) model. In this appendix, we also graphically illustrate that the values of systematic risk, the market risk premium, and the risk-free rate do not have to be extreme to produce a negative relation between capital gains taxes and expected returns.

absorbs. As a result, individual investors bear less risk, leading to higher share prices and lower expected returns. While the net effect of these opposing forces on expected returns is ambiguous and ultimately an empirical question, Sikes and Verrecchia (2012) offer clear predictions when they are most likely to occur. For a firm with relatively low systematic risk or in an economy with a relatively low market risk premium, the traditional tax capitalization effect dominates the risk absorption effect, thus leading to a *positive* relation between capital gains taxes and expected returns. However, for a firm with high systematic risk or in an economy with a high market risk premium, the risk absorption effect following a capital gains tax rate increase has a relatively larger impact on expected returns and could outweigh the effect of lower expected after-tax cash flows. In other words, the relation becomes *less positive* or even *negative*.

A third scenario arises when the risk-free rate of return is low. In asset pricing models such as the CAPM, a risk-free asset serves as an alternative to risky investments in firm shares. The risk-free asset becomes more attractive the higher the capital gains tax rate. However, in times of very low risk-free rates, the after-tax return on the alternate investment is small, and thus an increase in the capital gains tax rate does little to drive down prices because investors have no incentive to shift from the risky asset to the risk-free asset. In other words, investors still reap higher returns from investing in firms' shares as opposed to the negligible yield on the risk-free asset. At the same time, the risk absorption effect is still at play. As a result, the relation between capital gains tax rates and expected returns again becomes less positive or negative. In the next two sections, we empirically test the predictions related to these three scenarios.

3. Cross-Country Evidence: Analysis of International Tax Rate Panel

3.1. Sample Description and Research Design

For our analyses we rely on four primary data sources. We use Datastream to retrieve stock price and returns information, Worldscope for accounting data, I/B/E/S for analyst earnings forecasts used in the computation of the implied cost of capital measures, and a hand-collected panel of tax rates. The data requirements of the variables used in the regression analyses lead to an initial sample of 188,179 firm-year observations from 44 countries over the years 1990 to 2004. We end our sample in 2004 to avoid the potentially confounding effects of the adoption of International Financial Reporting Standards (IFRS) in many countries around the globe on *COC* and some of the control variables. Our main focus is the effect of a country's capital gains tax rate on expected returns. We collect the maximum statutory capital gains tax rates (*CGRATE*) and dividend tax rates (*DIVRATE*) from the OECD tax database and various publications of the Big Four audit firms (see Appendix 1 for details). As Table A1 in the appendix shows, individual-level taxation of capital gains is not ubiquitous, leaving us with a sample of 151,918 firm-years from 27 countries with non-zero *CGRATE* in the main analysis.[11] Table 1 provides a breakdown of the sample observations by country.

Aside from tax rates, we need proxies for expected returns and for the mitigating risk parameters. Following prior literature, we use two conceptually different measures of firms' expected returns (e.g., Dhaliwal, Li, and Trezevant 2003; Dhaliwal, Krull, Li, and Moser 2005; Hail and Leuz 2006, 2009; Dhaliwal, Krull, and Li 2007). First, we calculate annual buy-and-hold returns (*RET*) beginning in month +10 after a firm's fiscal-year end. Thus, the timing is such that

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[11] The sample further excludes countries with less than 20 firms, country-years with inflation above 25 percent (e.g., Turkey), and firms with market values below US$ 10 million.

RET reflects (realized) expected pre-tax returns at the time of the measurement of *CGRATE*.[12] The advantage of realized returns is that they are widely available and directly map into the construct we have in mind. However, they might be affected by market segmentation (e.g., Harvey 1995) or shocks to firms' growth opportunities (e.g., Elton 1999; Stulz 1999), and hence require fairly long time-series to produce unbiased estimates of expected returns. To overcome these drawbacks, our second measure estimates an *ex ante* return required by investors using market prices and analyst forecasts. We measure *COC* as the average of four commonly used measures of implied cost of capital (i.e., Claus and Thomas 2001; Gebhardt, Lee, and Swaminathan 2001; Ohlson and Juettner-Nauroth 2005; and Easton 2004). The basic idea of all four models is to substitute price and analyst forecasts into a valuation equation and to back out the cost of capital as the internal rate of return that equates current stock price with the expected future sequence of residual incomes or abnormal earnings. The individual models differ with respect to the use of analyst forecast data, the assumptions regarding short-term and long-term growth, the explicit forecasting horizon, and whether and how inflation is incorporated into the steady-state terminal value. It has been shown that implied cost of capital measures adequately capture the time variation in expected stock returns (Pástor, Sinha, and Swaminathan 2008), but due to the data requirements are only available for a subset of firms. In line with *RET*, we measure *COC* as of month +10 after a firm's fiscal year end.

To test the predictions in Sikes and Verrecchia (2012), we need empirical proxies for a firm's systematic risk, the market risk premium, and the risk-free rate in an economy. Ideally, all three measures vary across firms or countries and over time. We measure a firm's systematic risk

[12] Because we do not know the exact enactment dates of the tax rate changes in our international panel, we assign the tax rates that correspond to the calendar year of month +10 after a firm's fiscal-year end to each observation. Our results remain largely unchanged when we drop the enactment year from the analysis.

(*BETA*) using the local market beta from a two-factor model in which we regress a firm's monthly excess returns on the excess returns of the local market index and the world market index. We estimate this model over the 60 months prior to month +10 after a firm's fiscal year-end and require at least 24 months of data. The two-factor model flexibly accounts for differing degrees of market integration across firms and over time (e.g., Hou, Karolyi, and Kho 2011). The second conditioning variable is the market risk premium, defined as the expected return for the overall market portfolio in excess of the return on a risk-free investment. There is widespread disagreement on how to empirically measure the market risk premium and in particular on how long a measurement period one has to consider (e.g., Siegel and Thaler 1997; Welch 2000; Dimson, Marsh, and Staunton 2003; Damodaran 2012; Holthausen and Zmijewski 2014). Some also conclude that the historical average of excess returns overstates the market risk premium (e.g., Mayfield 2004). Because we need inter-temporal as well as cross-sectional variation in the market risk premium to test our predictions, we cannot use the long-run average of aggregate stock returns minus risk-free rates. Rather, we proxy for the market risk premium by deriving an equity risk premium based on country credit ratings (Erb et al. 1996a). *Institutional Investor* provides country credit ratings semi-annually. The country credit ratings are based on a survey of bankers from leading international banks and reflect fundamental country risk. Erb, Harvey, and Viskanta (1996b) show that the country credit ratings are correlated with future equity returns. We regress annual country index returns on the natural logarithm of a country's average credit rating in the previous year. A country's annual fitted value from this regression serves as a proxy for the country's expected market return for the year.[13] To estimate the market risk premium (*MRP*) for

[13] Hail and Leuz (2006) find that countries' annual fitted values from this regression are significantly correlated with country-level implied cost of capital estimates.

a given country and year, we subtract a country's risk-free rate for the year from its expected market return.

Our third conditioning variable is the risk-free rate of return (*RFR*). We set *RFR* equal to the nominal yields of local short-term treasury bills or, if unavailable, central bank papers and interbank loans. Similar to the tax rates, we use *MRP* and *RFR* from the calendar year of month +10 after a firm's fiscal-year end. Table 1 reports mean values of the expected return variables and the risk parameters by country. *MRP* ranges from 29.6% in Venezuela to 2.4% in the United Kingdom; *RFR* from a low of 1.9% in Japan to a high of 24.0% in Brazil. The table also indicates the country-level institutional features that we use (and discuss) in the cross-sectional tests in Section 3.3.

The main goal of the study is to uncover systematic heterogeneity in the general positive relation between expected returns and capital gains tax rates. Thus, our benchmark case is an unconditional model of the following form:

$$RET\ or\ COC = \beta_0 + \beta_1\ CGRATE + \beta_2\ DIVPEN + \sum \beta_j\ Controls_j + \sum \beta_i\ Fixed\ Effects_i + \varepsilon. \quad (1)$$

The dependent variables are *RET* and *COC*, our proxies for expected returns. *CGRATE* is the capital gains tax rate, our main variable of interest. Consistent with tax capitalization, we expect a positive coefficient on *CGRATE* when estimated unconditionally. Yet, this relation is expected to vary conditional on the three risk parameters. *DIVPEN*, which equals (*DIVRATE* – *CGRATE*)/(1 – *CGRATE*), stands for the dividend tax penalty and controls for the trade-off between capital gains and dividend taxation (Dhaliwal, Li, and Trezevant 2003; Dhaliwal, Krull, Li, and Moser 2005; Dhaliwal et al. 2007).[14] In the spirit of the Fama and French (1992, 1993)

[14] We do not interact *DIVPEN* with dividend yield because market values of equity should capitalize all expected dividend taxes, even those for firms that do not currently pay a dividend (e.g., Auerbach 1979; Bradford 1981). Our results are robust to replacing *DIVPEN* with *DIVRATE*.

three factor model, we include systematic risk (*BETA*), market value (*SIZE*), and the book-to-market ratio (*BMR*) as firm-level control variables. Riskier firms (i.e., higher *BETA* and *BMR*, smaller *SIZE*) should exhibit higher returns. *BMR* also captures differences in growth opportunities (La Porta et al. 2002) and accounting rules (Joos and Lang 1994). In the *COC* model, we further control for earnings variability (*EARNVAR*) and analyst forecast bias (*BIAS*) (Hail and Leuz 2006). *EARNVAR* controls for cross-country differences in macroeconomic risk and we expect a positive sign. We include *BIAS* because if analyst forecasts are overly optimistic and market participants understand this bias and adjust prices accordingly, estimates from implied cost of capital models will be upwardly biased (Botosan and Plumlee 2005). Finally, we include country, industry, and year fixed effects to account for unobserved (constant) heterogeneity along those three dimensions. We estimate the model in Eq. (1) using Ordinary Least Squares (OLS) regression and cluster the standard errors by firm.

In Table 2, we present descriptive statistics for the variables used in the regression analyses and, in the notes, provide further details on data sources and variable measurement. Notably, the three risk parameters exhibit ample variation, which we exploit next when testing the Sikes and Verrecchia (2012) predictions.

3.2. Relation between Capital Gains Taxes and Expected Returns

We start our empirical analyses with estimating Eq. (1), that is, the unconditional relation between expected returns and capital gains tax rates. The first two columns of Table 3 contain the results of this analysis, first with *RET* as the dependent variable (Panel A), then for *COC* (Panel B). Using all available data, the realized returns regression in column (1) produces negative coefficients on *CGRATE* (and *DIVPEN*). This finding is inconsistent with a general positive relation between capital gains taxes and expected returns, but might be due to the risk absorption effect, on average, outweighing the effects on after tax cash flows for our global sample. Closer inspection reveals that Japan, a country with consistently low risk-free rates over the sample period, is the primary driver of this relation. Dropping the Japanese observations in column (2) yields positive and significant coefficients on both *CGRATE* and *DIVPEN*.[15] The firm-level control variables behave largely as expected. *BETA* and *BMR* are positively related to expected returns. *SIZE* is insignificant. When using *COC* as the dependent variable, in Panel B, the coefficients on *CGRATE* and *DIVPEN* are positive and significant regardless of whether or not Japan is included. All the firm-level controls have the predicted signs and are highly significant. Overall, the results suggest that on average and without considering the mitigating forces of firm and country level risk, capital gains tax rates are *positively* related to expected returns, consistent with prior literature and the traditional notion of tax capitalization.

We next turn to testing the three Sikes and Verrecchia (2012) predictions. Doing so, we expand our base model by introducing a binary variable that allows the coefficient on *CGRATE* to vary across groups of firms along the three risk dimensions:

$$RET \text{ or } COC = \beta_0 + \beta_1\, CGRATE + \beta_2\, CGRATE*RISK + \beta_3\, RISK + \beta_4\, DIVPEN + \sum \beta_j\, Controls_j + \sum \beta_i\, Fixed\ Effects_i + \varepsilon. \quad (2)$$

The variable *RISK* stands for a binary indicator variable that we code such that the interaction term *CGRATE*RISK* captures the incremental capital gains tax effect of firms with high systematic risk, in countries with high market risk premiums and low risk-free rates relative to the base group (captured by the coefficient β_1). Thus, we predict that β_2 is negative. Because β_1 should assume a positive sign, the total effect (i.e., the sum of $\beta_1 + \beta_2$) can either take on positive

15 We re-estimate Eq. (1) dropping one country at a time, and only after Japan is excluded, *CGRATE* becomes significantly positive. Note that in all the analyses that follow, we include Japan. However, we assess the impact of the large sample countries (i.e., Japan and U.S.) in the sensitivity analyses (see Appendix 2).

or negative values. This sum of coefficients indicates whether the overall relation between expected returns and capital gains taxes is still positive or becomes negative for high systematic risk firms and in markets with high market risk premiums or low risk-free rates. For completeness, we also include the main effect of *RISK*. All the other variables in Eq. (2) are as defined before.[16]

Specifically, we define three *RISK* partitions. We set $BETA_{HIGH}$ to one for firms whose systematic risk (*BETA*) is above the sample median in a given year, and zero otherwise. This coding of $BETA_{HIGH}$ allows a firm's classification to vary in the cross-section and over time. Next, we define MRP_{HIGH} equal to one if a country's annual *MRP* is above the sample median. Because MRP_{HIGH} takes on the same value for all firms in a country and year, it only varies along those two dimensions. We expect the main effect on both $BETA_{HIGH}$ and MRP_{HIGH} to be positive in Eq. (2) because investors demand higher expected returns from firms with higher systematic risk and when the market risk premium is higher. Finally, we set RFR_{LOW} equal to one if a country's annual *RFR* falls below the 30th percentile of the sample distribution. We choose the 30th percentile as the cutoff to ensure a more even sample distribution across the two partitions.[17] We expect the main effect of RFR_{LOW} to be negative, consistent with reduced expected returns when risk-free rates are low.

Columns (3) to (6) in Table 3 present the results of the (conditional) estimation of Eq. (2). We first separately introduce each of the three risk parameters one at a time. In the realized returns regressions (Panel A), the main effect on *CGRATE* remains negative and significant in columns (3) and (5) but is positive and significant in column (4). At the same time, the interaction term

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[16] To aid in the interpretation of the coefficients, we demean the continuous *CGRATE* variable (using the sample mean) when computing the interaction term in Eq. (2).

[17] Notably, the two largest sample countries (U.S. and Japan) have yearly risk-free rates below the sample median so that a cutoff at the median would only leave us with 28,217 firm-years in the above-median group. Choosing the cutoff at the 25th or 35th percentile does not substantially alter our results.

between *CGRATE* and each of the three risk variables (i.e., $BETA_{HIGH}$, MRP_{HIGH}, and RFR_{LOW}) is always negative and significant, indicating that the relation between capital gains taxes and expected returns is even more negative for firms with high systematic risk or in countries with low risk-free rates and becomes significantly negative for firms in countries with a high market risk premium. When we include all three conditioning variables in a single model in column (6), the main effect (representing firms with low systematic risk in low market risk premium countries and periods with relatively high risk-free rates) is significantly positive. The first two interaction terms are still negative and significant, but the interaction of RFR_{LOW} with *CGRATE* is positive and significant. However, in Table 4, we show that this interaction is negative and significant, as expected, when we focus on sub-samples where we expect the mitigating forces of risk to be strongest. The main effects of the risk variables exhibit the predicted sign (positive for $BETA_{HIGH}$ and MRP_{HIGH}, negative for RFR_{LOW}). The *COC* regressions in Panel B reveal a very similar picture with two exceptions. First, the main effect of *CGRATE* (and *DIVPEN*) is always significantly positive, consistent with a general positive impact of tax capitalization. Second, both of the interaction terms with MRP_{HIGH} and RFR_{LOW} are negative and significant, while the interaction with $BETA_{HIGH}$ is not significant. In most cases, the sum of the effects is indistinguishable from zero or still positive.

Overall, the results in Table 3 support the predictions in Sikes and Verrecchia (2012). In terms of economic magnitude, the coefficients on *CGRATE* suggest that a one percentage point increase in the capital gains tax rate leads to a 0.13 (0.06) percentage point *increase* in *RET* (*COC*) for the benchmark firms (based on column 6). For firms with high systematic risk, a one percentage point increase in the capital gains tax rate results in a 0.01 (0.06) percentage point increase in *RET* (*COC*). The same change in countries with a high market risk premium results in a 0.87 (0.01) percentage point *decrease* in *RET* (*COC*). For firms in countries with low risk-free rates the resulting changes are a 0.22 (0.03) percentage point increase in *RET* (*COC*). These numbers are clearly economically meaningful, particularly in light of the average change of capital gains tax rates of 9.3 percentage points in our sample. At the same time, the valuation effects are never too large to be implausible.

In the next three subsections we assess the sensitivity of the above results. Specifically, we focus on subsets of countries and events for which the mitigating forces of the three risk variables should be more pronounced. In Appendix 2, Table A2, we provide additional sensitivity analyses regarding (i) the set of control variables, (ii) the definitions of market risk premium, risk-free interest rates, and tax rates, (iii) the clustering of standard errors and the fixed effects structure, and (iv) the composition of the sample and the potentially confounding effects of lock-in. These analyses show that our findings and estimated magnitudes are robust to alternative design choices.

3.3. Analyses for Subsets of Sample Countries

In this section, we report results of estimating Eq. (2) for subsets of countries where we expect the mitigating forces of the risk parameters to be stronger. We create five binary indicator variables to partition the full sample into two groups (see also Table 1 for variable definitions and descriptive information). First, we focus on countries with large increases or decreases (exceeding five percentage points) in their capital gains tax rates over the sample period (*ΔCGRATE*=1). Such changes in tax rates are the primary source of variation that we exploit for identification purposes in our cross-sectional time-series regressions. We identify 17 countries with substantive tax rate changes. Second, to identify settings in which investors place a greater value on the risk-sharing component of capital gains taxation, we use the median of the corruption index from La Porta et al. (1998) to split the sample countries into two groups. Consistent with investors placing more trust in the government, we expect the results to be stronger for the subset of countries with less corruption (*CORRUPT*=1). Third, we identify countries with below median total foreign direct investment flows, as measured by the World Bank (*FDI*=1). We expect the results to be stronger for these countries because they are less integrated in the global economy. Fourth, in an attempt to identify the ultimate owner of firms' shares, we classify countries into those with below average ownership by (potentially tax-exempt) domestic and foreign institutional investors (*INSTOWN*= 1).[18] Fifth, we identify countries with below median aggregate market turnover (*TURNOVER*=1). We expect that in less liquid markets, investors have fewer opportunities to trade and diversify their risks and thus value the risk-sharing component of capital gains taxation more.

Table 4 reports the results of the above five partitions. We only tabulate the results for the subsets of countries with a partitioning variable of '1' (i.e., where we expect stronger mitigating effects of the risk parameters), but indicate with *p*-values from *F*-tests of how these coefficient estimates compare to the countries with a partitioning variable of '0'. In Panel A, we present the results using *RET* as the dependent variable. The main effect of *CGRATE* is positive in four out of five cases, suggesting that for the base group the general notion of tax capitalization holds (i.e., for firms with low systematic risk in countries with low market risk premiums and moderate to high risk-free rates). The interaction terms of *CGRATE* with the three conditioning variables $BETA_{HIGH}$, MRP_{HIGH}, and RFR_{LOW} are negative and with one exception significant throughout the panel. This finding suggests that whenever the mitigating forces of the three risk variables are at work, the relation between expected returns and capital gains tax rates becomes less positive and even negative in some cases. More to the point, the magnitudes of the interaction terms are almost

[18] For instance, Blouin, Bushee, and Sikes (2013) show that only a minority of institutional investors in the U.S. are sensitive to individual-level capital gains taxes. Alternatively, institutional investors could be more risk tolerant than individuals, and hence rely less on the tax absorption function of the tax authorities.

all larger than in the estimations using the full sample in Table 3 and are statistically larger than in the countries with a partitioning variable of '0' in almost all of the cases. Thus, the mitigating forces of systematic risk, the market risk premium, and the risk-free rate are stronger in countries with substantive changes in capital gains tax rates, low corruption, fewer foreign direct investments and hence less integrated markets, a lower proportion of institutional ownership, and in countries whose financial markets have lower aggregate turnover.

In Panel B we present the *COC* results. The tenor of the findings is fairly similar to the realized returns tests, albeit slightly weaker. The main effect of *CGRATE* is always positive and significant. The interaction terms with MRP_{HIGH} and RFR_{LOW} are always negative and except for one case significant. The total effects (i.e., $\beta_1 + \beta_2$) are negative in a third of the cases, suggesting that the relation between expected returns and capital gains taxes for firms in high market risk premium countries or in periods with low risk-free rates is generally positive but to a lesser degree than for the benchmark firms. Moreover, the interaction terms are statistically larger than in the countries with a partitioning variable of '0' in only half of the cases. Consistent with the last column in Table 3, the interaction term of *CGRATE* with $BETA_{HIGH}$ is never significant in the predicted direction.

We conduct four additional cross-sectional tests (not tabulated). First, following Djankov et al. (2010) we use the tax evasion scores from World Economic Forum (2001) to identify countries with above median levels of tax morale. In these countries, compliance with tax laws is relatively higher and tax evasion should be less of an issue. Consistent with our expectation, we find that the results are stronger in countries with less tax evasion. Second, we expect for risk-sharing to be more valuable in countries where capital markets comprise a smaller proportion of the total economy. In such countries, capital gains taxation allows the tax authority to pool risks that investors would otherwise be unable to reduce via diversification. Consistent with this idea, we find that the results are stronger in countries with a below average aggregate market capitalization of publicly traded firms as a percent of GDP. The third and fourth tests are meant to capture the likelihood that investors are local investors subject to the country's capital gains tax rate. In the third test, we repeat the analyses of foreign direct investments, but only use total inflows to partition the sample. In the fourth test, we identify countries with below median foreign institutional ownership. In most cases, foreign investors are subject to taxation in their home country, if at all, and not in the country where their investments are domiciled. In general, the results are stronger in countries with fewer foreign direct investment inflows and with lower foreign institutional ownership, as expected. Taken together, the fact that we find stronger results for the mitigating forces of a firm's systematic risk, the market risk premium, and the risk-free rate in settings where *ex ante* we expect this to be the case increases our confidence in the overall findings.

3.4. Analyses Around Substantive Changes in the Risk Variables

An alternative way to improve the identification of the stipulated effects is to focus on substantive changes in the three risk variables. Such a specification around changes allows for a pre-post comparison of time periods when the influence of the mitigating factors was presumably high (e.g., high systematic risk and market risk premium, low risk-free rate) with time periods when the influence of the mitigating factors was low (e.g., low systematic risk and market risk premium, high risk-free rate). Doing so, we center our analysis around substantive changes in either a firm's systematic risk, a country's market risk premium, or a country's risk-free rate and only include the firm-years leading up to and following the change. That is, we include years t–4 to t+3 when the change-year is t=0, but cut short the event window if another change occurs.

Specifically, we re-estimate the model in Eq. (2) but replace the conditioning variable with a binary indicator that takes on the value of one in the period with a higher (lower) level of systematic risk or market risk premium (the risk-free rate). Because we conduct the analysis separately for increases and decreases, the indicator variable is either set to one in the pre-period (decreases) or the post-period (increases) for systematic risk and market risk premium, or vice versa for the risk-free rate. We use the following criteria to identify substantive changes. For firms' systematic risk, a change is defined as a switch from below to above (above to below) the annual sample median in *BETA* from one year to another. Based on this definition, using the *RET* sample, we identify 9,206 increases and 8,660 decreases over the sample period. For the market risk premium and the risk-free rate we compute all year-to-year changes in *MRP* and *RFR,* and define substantive changes as those above (below) the 85^{th} (15^{th}) percentile of the sample distribution. This definition leads to 47 increases and 47 decreases in *MRP* of on average 64 percent, and to the same number of increases and decreases in *RFR* of on average 34 percent.

We present the results for substantive changes in *BETA* in Panel A of Table 5. Note that for this specification, we have within-country variation of whether a firm is assigned to the high or low group of systematic risk in a given year. That is, for some firms a particular year falls into the pre-period while for other firms the same year might fall into the post-period around an increase or decrease in *BETA*. Thus, we can further tighten our identification by replacing the country and year fixed effects with a specific fixed effect for every country-year combination. This specification effectively controls for contemporaneous shocks and trends in the data.[19] For both dependent variables, *RET* and *COC*, the main effect of *CGRATE* is positive and significant, suggesting that when systematic risk is relatively low, the relation between expected returns and

[19] The fact that *CGRATE* and not just $CGRATE*BETA_{High}$ is specified in the model is due to how we assign the tax rates to the individual firm-years (see also Footnote 12).

capital gains taxes is positive. The interaction term $CGRATE*BETA_{High}$ is negative and significant in three out of four cases. Thus, following a substantive increase or preceding a substantive decrease in systematic risk, the effect of tax capitalization is weaker. This finding is probably the closest we can get in terms of a causal interpretation of the documented relations.

Panels B and C present the results for increases and decreases in the market risk premium and the risk-free rate, respectively. The main effects on *CGRATE* are mostly positive but not always significant. More importantly, the interaction terms with either MRP_{High} or RFR_{Low} are negative (except for the implied cost of capital model surrounding decreases in *MRP* and the realized returns model surrounding increases in *RFR*) and significant in six out of eight cases. Taken together, the pre-post comparison shows that, consistent with expectations, the mitigating forces of systematic risk, the market risk premium, and the risk-free rate of return are more pronounced around a substantive change in these parameters. That the results hold both ways, for increases and decreases, is particularly notable.

3.5. Analysis of Firms Ranked Along the Risk Variables

In our final analysis in this section, we want to get a better feel for the prevalence of either a positive or negative relation between expected returns and capital gains tax rates along the three risk dimensions. In their Proposition 3, Sikes and Verrecchia (2012) only refer to a firm's systematic risk or the market risk premium being sufficiently large, and the risk-free rate being very small to give rise to a negative relation. However, as we illustrate in Figure A1 in Appendix 3, assuming reasonable values for the model parameters, a large area is visible where the relation between expected returns and capital gains taxes becomes negative. Similarly, when estimating the realized returns regression in the full sample, the main effect of *CGRATE* is negative, suggesting that the mitigating effect of risk absorption by tax authorities is not as uncommon as one would think.

We assess this issue by re-estimating the model in Eq. (1) for separate portfolios of firms formed by sorting all firm-year observations into equally-sized deciles based on yearly rankings of *BETA*. Due to the large number of observations, we only conduct this analysis for *RET* as the dependent variable. Table 6 contains the coefficient estimates from the ten separate regressions. *CGRATE* is always significant and, with the exception of decile 10, monotonically decreases moving from the low to the high *BETA* portfolios. The coefficient is positive for the first two deciles and negative for the remaining deciles. The mean *BETA* for the firms in decile 3 is 0.290, which is not necessarily high. We note, however, that each decile includes observations from multiple countries and years and thus represents a mixture of the other two conditioning variables. Thus, we also present the mean values of *MRP* and *RFR* for each of the deciles. The mean *MRP* increases over the first four deciles, then remains fairly steady until declining over the last three deciles. The mean *RFR* is fairly steady across the first six deciles and then declines over the last four deciles. One possible explanation for the increase in the coefficient on *CGRATE* from the ninth to tenth decile is the decline in the mean *MRP* and the increase in the mean *RFR* over these two deciles.[20]

[20] We are unable to create balanced portfolios when we rank firm-year observations by *MRP* or *RFR* because the larger countries have relatively low *MRP* and *RFR*. The quintiles are very uneven (i.e., 38% (5%) of the observations are in quintile 1(5) for *MRP*, and 43% (3%) are in quintile 1 (5) for *RFR*). However, the patterns are generally consistent with our expectation. For *MRP*, the coefficient on *CGRATE* is positive for quintiles 1-2 and negative for quintiles 3-5. For *RFR*, the coefficient on *CGRATE* is negative for quintile 1, positive for quintiles 2-4, and negative for quintile 5. The negative coefficient in quintile 5 is attributable to observations from 1990 and Brazil.

4. Single-Country Evidence: Changes in Capital Gains Tax Rates in the United States

4.1. Sample Description and Research Design

In this section, we test the mitigating forces of the market risk premium and the risk-free rate on the relation between expected returns and capital gains tax rates in a single country setting, namely around three regulatory changes of the capital gains tax rate in the U.S. The advantage of this setting is that we can hold the institutional environment constant thereby precluding many of the potentially confounding factors in an international context from interfering with the results (e.g., differences in tax rules and tax systems, differences in tax evasion and corruption and thus the value investors might place on risk-sharing with the government, differences in market liquidity and efficiency, etc.). However, this comes at the cost that we only observe a very limited amount of variation in the tax rate. Specifically, the Revenue Reconciliation Act of 1978 (RA78) reduced the maximum statutory tax rate on capital gains from 35 to 28 percent; the Taxpayer Relief Act of 1997 (TRA97) further reduced it to 20 percent; and the Jobs and Growth Tax Relief and Reconciliation Act of 2003 (JGTRRA03) lowered it even further to 15 percent. As a consequence of this limited variation, we can only estimate a single slope coefficient around each regulatory event (i.e., the *CGRATE* variable is identified solely by a high-rate period before the change and a low-rate period after the change) and then make comparisons across events. This leads to the following simplified version of the base model in Eq. (1):

$$RET = \beta_0 + \beta_1\ CGRATE + \sum \beta_j\ Controls_j + \sum \beta_i\ Industry\ Fixed\ Effects_i + \varepsilon. \qquad (3)$$

We estimate the model using OLS regression analysis and monthly observations in the 48 months surrounding each event (excluding the event month t=0).[21] To control for time-series and

[21] For RA78 and JGTRRA03, we center the analysis around each act’s enactment month (November 1978 and May 2003). For TRA97, consistent with prior studies (Lang and Shackelford 2000; Ayers et al. 2008; Dai et al. 2008;

cross-sectional correlation in the residuals, we cluster the standard errors by firm and year. Due to data restrictions, we only estimate the model with *RET* as the dependent variable, equal to the monthly buy-and-hold returns. *CGRATE* captures the capital gains tax effect. We cannot estimate *DIVPEN* in Eq. (3) because of lack of variation (and only include it when estimating the model over the entire U.S. sample period). The firm-specific control variables comprise systematic risk (*BETA*) measured by regressing a firm's monthly excess returns on the excess returns of the value-weighted market index over the prior 60 months, the log transformed market value of equity (*SIZE*), and the ratio of accounting book value to market value of equity (*BMR*). We further include monthly inflation rates to control for time-varying macroeconomic trends. The model contains industry fixed effects, but no time period effects.

Note that the model in Eq. (3) does not include the conditioning variables. The interaction term between the conditioning variables and *CGRATE* is not defined because of perfect collinearity. Thus, we draw inferences about the mitigating effects of the market risk premium and the risk-free rate of return from comparisons of the three events. As Panel A of Table 7 illustrates, the three events have unique market risk premium and risk-free rate characteristics. We measure the market risk premium with three proxies: first, as the standard deviation of monthly index returns over the event period (*RETVAR*); second, as the implied equity risk premium as measured by Damodaran (2012) (*MKTCOC*); and third, as the mean *MEDBETA* over the event period, which equals the monthly median of firms' systematic risk (*BETA*).[22] The risk-free rate of return is captured by the mean 1-month nominal Treasury bill rate (*RFR*) over the event period.

Blouin et al. 2009), we use the announcement month (May 1997) instead of the enactment month (August 1997). In sensitivity analyses (not tabulated) we make sure that our results are not affected by this choice.

[22] We note that the value-weighted average of firms' individual betas equals one. However, it is possible that periods in which the median firm has a higher beta are perceived as riskier and that investors demand a higher risk premium in these periods. We cannot use the risk premium derived from country credit ratings in these tests because *Institutional Investor* only began providing this data in September 1979.

The first event, RA78, is characterized by a high market risk premium and high risk-free rate. On the other end of the spectrum, the third event, JGTRRA03, exhibits a medium market risk premium, but very low risk-free rate. The second event, TRA97, lies somewhere in the middle, both in terms of the market risk premium and risk-free rate.

Based on these characteristics of the conditioning variables, we expect the β_1 coefficient in Eq. (3) to be significantly less positive around both RA78 (event #1) and JGTRRA03 (event #3) than around TRA97 (event #2), because these are periods of a high market risk premium and low risk-free rate, respectively. Both factors, according to Sikes and Verrecchia (2012), should lead investors to put more weight on the risk absorption function by the tax authorities. In terms of relative magnitude of events #1 and #3, we cannot form a prediction.[23] In Panel B of Table 7, we present descriptive statistics for the variables used in the regression analyses and, in the notes, provide further details on data sources and variable measurement. We tabulate values for the entire U.S. sample period covering all three events (i.e., from November 1976 to May 2005).

4.2. *Relation between Capital Gains Taxes and Expected Returns Across Three Events*

Table 8 presents the results from estimating Eq. (3) for the full sample and separately for the three events. In column (1), we include all monthly return observations over the entire 1976 to 2005 period. This long time series also allows us to control for the dividend tax penalty (*DIVPEN*). Both tax variables, *CGRATE* and *DIVPEN*, have a positive sign, consistent with capital gains and dividend tax capitalization. However, using standard errors clustered by firm and year, the two coefficients are not significant. Among other things, this result could be due to

[23] Arguably, the choice of conditioning variables is somewhat arbitrary. For instance, using real risk-free rates, the relative ranking changes. TRA97 exhibits the highest real risk-free rate and RA78 the lowest. On the other hand, if we were to use the Altman's *z*-score or the standard deviation of earnings as proxies for market risk, JGTRRA03 ranks highest, and the other two events are very similar. However, none of these alternative proxies changes the relative predictions, as TRA97 should continue to exhibit the most positive β_1 coefficient among the three events.

the mitigating forces of factors like market risk or risk-free rates over the long sample window. The coefficient on *BMR* is positive and significant, as one would expect. *SIZE* is also positively related to expected returns in the full sample, contrary to our prediction. *BETA* is insignificant. The coefficient on *INFL* exhibits a significantly negative sign, yet this variable likely also captures time-varying macroeconomic factors other than just inflation.

Considering the three events, which are depicted in columns (2) to (4), the *CGRATE* coefficient is negative and significant around event #1 and #3, and positive but insignificant around event #2. In relative terms, both events #1 and #3 exhibit a statistically different, more negative, relation between expected returns and capital gains tax rates than event #2, but are not distinguishable from each other. This pattern is consistent with our expectations and with a high market risk premium around RA78 and a low risk-free rate around JGTRRA03 having a mitigating effect on the relation between expected returns and capital gains taxes.[24] The results also corroborate our earlier findings in the international panel. In terms of economic magnitude, a one percentage point decrease in *CGRATE* in the period surrounding the two events with significant relations resulted in monthly *RET* increases of 0.51 (RA78) and 0.40 (JGTRRA03) percentage points, which represent a 24 percent and 37 percent change for the average firm, respectively.[25] These effects are substantive, but not too big to be implausible.

In sensitivity tests (not tabulated) we find that the results are robust to (i) controlling for yearly growth in GDP, or (ii) dropping the time-series control (*INFL*). In an attempt to address

[24] The results for JGTRRA03 are of special interest as, e.g., Dhaliwal et al. (2007) and Auerbach and Hassett (2007) suggest a positive relation between the capital gains tax rate and expected returns around this event. Our research design differs in several ways from their approach. Auerbach and Hassett (2007) conduct a short-window event study around key dates related to the legislation. Dhaliwal et al. (2007) compare quarterly implied cost of capital pre and post the introduction of JGTRRA03 using a binary regime dummy. Moreover, we are less interested in the absolute level of the *CGRATE* coefficient than in its relative ranking across events.

[25] To calculate the percentage change for the average firm, we use the mean *RET* for each period (2.13% for RA78 and 1.09% for JGTRRA03).

investors' lock-in behavior, we re-estimate the regressions after eliminating the three months immediately following the enactment month *t*=0 for each of the three events. This is the period most likely to suffer from a supply-side shock following the reduction in tax rates due to investors "unlocking" their capital gains (see also our discussion of the lock-in effect in Appendix 2). The results hold after this sample adjustment.

Finally, we consider two additional capital gains tax rate changes, namely the Economic Recovery Tax Act of 1981 (ERTA81), which reduced the capital gains tax rate from 28 to 20 percent, and the Tax Reform Act of 1986 (TRA86), which increased the rate from 20 to 28 percent. Both acts were massive overhauls of the tax code, containing many potentially confounding factors. In terms of the conditioning variables, ERTA81 exhibits a high market risk premium (*RETVAR* of 0.049, *MKTCOC* of 5.4%, and *MEDBETA* of 1.17) and risk-free rate (*RFR* of 11.2%), and TRA86 is somewhere in the middle (*RETVAR* of 0.054, *MKTCOC* of 4.03%, *MEDBETA* of 1.03, and *RFR* of 6.6%). We find that *CGRATE* is more negative around our event #1 (RA78) than around ERTA81 (which has a *lower* market risk premium by two of the three measures and a *higher* risk-free rate) and TRA86 (which has a *lower* market risk by two of the three measures and an intermediate risk-free rate). We also find a more negative relation around our event #3 (JGTRRA03), which has a substantially lower risk-free rate than both ERTA81 and TRA86. Overall, the patterns we find from comparing the relations between expected returns and capital gains tax rates surrounding regulatory changes in a single country provide further support for the predictions in Sikes and Verrecchia (2012).

5. Conclusion

In this study, we examine how firm and market risk affects the relation between investor-level capital gains tax rates and asset prices using panel data from 27 countries over the 1990 to

2004 period. Specifically, we test and find evidence supportive of the predictions in Sikes and Verrecchia (2012) that the general positive relation between capital gains tax rates and expected returns is attenuated when (i) a firm's systematic risk is high, (ii) the market risk premium is high, or (iii) the risk-free interest rate is low. These effects are particularly pronounced in countries with substantive changes to their capital gains tax rate, with low corruption, with greater ownership by local investors who are subject to local capital gains tax rates, in less integrated and less liquid capital markets, and surrounding increases and decreases in the three risk parameters. Finally, we corroborate the results from the cross-country analyses in a single country setting, namely around three regulatory changes to the capital gains tax rate in the United States. We find that when the market risk premium is high (RA78) or when the risk-free rate is low (JGTRRA03), the relation between the capital gains tax rate and expected returns is negative while it is positive (but insignificant) in times with an intermediate market risk premium and risk-free rate (TRA97).

Overall, these results confirm that the relation between capital gains tax rates and expected returns is more nuanced than generally thought, and that the risk characteristics of the firm and/or the economy should be considered when evaluating the anticipated effects of tax rate changes. Moreover, a standard criticism of raising the capital gains tax rate is that doing so will increase firms' cost of capital and as a result, discourage investment and thus economic growth. Our results suggest that, at a minimum, this anticipated effect will be weaker when a firm's systematic risk is high, the market risk premium is high, or the risk-free rate is low, and could even be in the opposite direction.

The attenuating force of the risk variables on the general positive relation between capital gains taxes and expected returns should be stronger the more symmetric the tax treatment of capital gains and losses and the greater the value that taxpayers place on sharing risk with the government.

We expect that in countries with high corruption, taxpayers place less trust in the government and thus less value on having the tax authority as a partner in their investments. Consistent with this idea, the results are stronger for countries with less corruption. Taxpayers might also place less value on the risk-sharing component of capital gains taxation in countries where they have other means of reducing their exposure to firms' systematic risk (e.g., via hedges). As we show, the predicted relation is weaker in countries with greater aggregate institutional investor ownership, which we expect is correlated with the sophistication of a country's financial market, as well as in countries with more liquid capital markets, where we expect there to be more opportunities to trade and diversify risks. In addition, we expect for the risk-sharing component of capital gains taxation to be valued more in countries where the financial market comprises a smaller percentage of the total economy. In such countries, capital gains taxation allows the tax authority to pool risks that independent entrepreneurs would otherwise not be able to reduce via diversification. Consistent with this idea, we find that our results are stronger in countries with lower aggregate market capitalization of publicly traded firms as a proportion of GDP.

Finally, it is possible that the tax authority redistributes the risk that it absorbs via a capital gains tax back into the economy. For example, when times are good, governments may not need as much revenue and as a result reduce capital gains tax rates. And when times are bad, governments might increase capital gains tax rates as a means to raise revenue. Even if this is the case, investors who participate in financial markets and receive less than their proportionate share of the redistributed risks place a value on the risk-sharing component of capital gains taxation. However, there are also net losers. Individuals to whom the amount of redistributed risk exceeds the benefits they derive (if any) from the risk reduction offered by capital gains taxation or from possible economic growth that results from firms having lower cost of capital likely are among the net losers. Thus, to the extent that a government redistributes the risks that it absorbs across taxpayers, the risk-sharing component of capital gains taxation has welfare implications. These distributional implications are beyond the scope of the current paper but offer an interesting avenue for future research.

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Appendix 1: Panel of International Capital Gains and Dividend Tax Rates

Table A1 presents a panel of the maximum statutory capital gains tax rates (Panel A) and dividend tax rates (Panel B) in 44 countries with data available to estimate our main regressions over the 1990 to 2004 period. The tax rates are effective rates incurred by individual investors with non-substantial stockholdings that qualify for long-term capital gains tax treatment. We start the collection of the tax rate data with the OECD tax database (http://www.oecd.org/tax/tax-policy/tax-database.htm), and complete and cross-check the panel with various annual publications from the Big Four accounting firms. Specifically, we use the Worldwide Tax Summaries published by PricewaterhouseCoopers (previously Coopers & Lybrand), the EY Worldwide Personal Tax Guides, and KPMG's Individual Tax Rate Surveys. We also compare our data to the rates in Becker, Jacob, and Jacob (2013) and make adjustments when appropriate. In case of inconsistencies among the different sources or when data are missing, we rely on the sources with the most detail and, if necessary, try to resolve the issues by contacting tax experts in the local offices of the accounting firms.

Appendix 2: Additional Sensitivity Analyses

In this appendix, we provide additional sensitivity analyses of our main specification (i.e., models 3 to 5 in Table 3) regarding (i) the set of control variables, (ii) the definition of the market risk premium and risk-free interest rate, (iii) the clustering of standard errors and the fixed effects structure, (iv) the composition of the sample and the potentially confounding effects of lock-in, and (v) alternate dividend and capital gains tax rates. We present the corresponding coefficient estimates of the interaction terms of *CGRATE* with the three conditioning variables in Table A2.

First, we include additional control variables in our model. To account for the fact that an investor's willingness to substitute between risky and risk-free assets depends on the returns level of both asset types, we include the continuous *MRP* and *RFR* variables as controls. We do this using the nominal risk-free rates but also after transforming the nominal interest rates into real interest rates (and consequently redefining the RFR_{Low} indicator to be based on real rates). Next, we control for macroeconomic shocks and trends that could affect a government's tax policy and/or expected returns by including average annual growth in GDP (the results are similar if we control for the level instead of changes in GDP). As an alternative to cutting the capital gains tax rate, governments can allow taxpayers to index their capital gains. We account for this alternate tax policy tool by including yearly inflation in the model.[26] Finally, we re-estimate our models after replacing the relative *DIVPEN* with the absolute *DIVRATE*. As the results under the first heading in Table A2 show, our model is robust to the inclusion of additional control variables and none of the inferences change.[27]

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[26] Indexation of capital gains is uncommon (Edwards 2012). A current example is Israel. Earlier examples include Ireland (for assets purchased prior to 2004), Australia (from 1985 to 1999), and the U.K. (prior to April 5, 2008).

[27] The results also hold when we control for the size and liquidity of local capital markets by including either the aggregate market capitalization of public firms scaled by GDP or aggregate market turnover (i.e., volume divided by market capitalization) in the model (not tabulated).

Second, we assess the sensitivity to our choice of the market risk premium proxy and the risk-free rate. We redefine the binary MRP_{High} indicator based on (i) annual return variability (equal to the standard deviation of daily returns on the local market index) in line with Mayfield (2004), (ii) an implied risk premium (equal to the value-weighted average *COC* in a country and year where we require at least 20 firms minus the risk-free rate) in line with Damodaran (2012), or (iii) the median *BETA* in a given country-year. In all three cases, the results are very similar to those reported in the text, except for the insignificant interaction term in the *RETVAR* specification when using *COC* as the dependent variable. We also compute RFR_{LOW} based on the real risk-free rate (RFR_{REAL}) as opposed to the nominal risk-free rate.[28] This change leaves the results largely unaffected.

Third, we consider alternative ways to cluster the standard errors. In our main model, we cluster by firm. This clustering structure potentially neglects the time dimension. Thus, we repeat our analyses with two-way clustering by firm and year. To address potential cross-correlation in the residuals across countries and industries, we also repeat the analyses with clusters for every country-industry combination, which arguably is more conservative than firm clustering. Finally, we replace the country and industry fixed effects with firm fixed effects thereby controlling for any unobserved (constant) within-firm heterogeneity. As the third heading in Table A2 shows, the results are largely unaffected by these choices except for the $CGRATE*RFR_{Low}$ interaction in the *RET* regressions, which becomes insignificant when we cluster by firm and year and when we cluster by country-industry.

Fourth, we expand our sample by including all observations for which we have data (i.e., 44 countries with and without capital gains tax rates). The idea is to also use firms from countries

[28] The only difference between this test and the one discussed above is that here we do not include the continuous variables *MRP* and RFR_{REAL} as additional controls.

that are unaffected by capital gains taxation when estimating the coefficients on the control variables. The results are robust to this larger sample. Next, we limit the influence of the two largest sample countries by only including randomly selected 14,000 (5,000) firm-years from the U.S. and Japan in the *RET* (*COC*) analyses. That way, their weight is about the same as the third largest sample country (U.K.). While the *COC* results are largely the same, the interaction $CGRATE*RFR_{Low}$ becomes insignificant when *RET* is the dependent variable. Next, we exclude the years of substantive tax rate changes from the sample. The purpose of this adjustment is twofold. On the one hand, we do not know the exact enactment dates of the tax rate changes in our international panel. By dropping the change-years we avoid misclassifications. On the other hand, this adjustment helps us address concerns about short-term supply effects driven by lock-in behavior. The lock-in effect stipulates that taxable investors incorporate the tax that will be due upon disposing their shares into their reservation price. Thus, a reduction in the capital gains tax rate can result in temporary downward pressure on price when a group of taxable investors suddenly reach their reservation price and the supply of a stock temporarily exceeds its demand (e.g., Dai et al. 2008). This effect can create a short-term negative correlation between expected returns and capital gains tax rates similar to the one stipulated by our predictions. As the fourth heading in Table A2 shows, dropping the change-years and hence the period of potential short-term supply effects does not affect our results.

Fifth, we assess the effect of alternative tax rate data. Jacob and Jacob (2013) and Becker, Jacob, and Jacob (2013) also construct a dataset of dividend and capital gains tax rates for a global sample over the period 1990-2008. Because they focus on the capital gains tax rate that is applicable to share repurchases, our rates sometimes differ from theirs. Thus, we repeat our analyses with their rates, if available. The results are robust to this alternate set of tax rates.

Appendix 3: Sikes and Verrecchia (2012) Theoretical Model

In this appendix, we briefly summarize key features of the model in Sikes and Verrecchia (2012) and show that the values for our three risk variables (firm systematic risk, market risk premium and risk-free rate) do not need to be extreme in order for them to reverse the general positive relation between expected returns and the capital gains tax rate.[1]

1. Underlying Assumptions

There are J firms in the economy indexed as $j = 1, 2, ..., J$. A risk-free bond yields a (pre-tax) return of $\$1 + R_f$, where $R_f \geq 0$ is the (pre-tax) risk-free rate. Sikes and Verrecchia (2012) model a one-period economy in which prices are set for firms' shares at the beginning of the period based on an uncertain cash flow at the end of the period. The price of shares in firm j at the beginning of the period is represented by P_j, and the uncertain cash flow of firm j at the end of the period is represented by $\tilde{V}_j$. The expression $\tilde{V}_M = \sum_{j=1}^{J} \tilde{V}_j$ represents the market cash flow. Firms' end-of-period cash flows have a multivariate normal distribution, and are correlated.

N investors populate the economy indexed as $i = 1, 2, ..., N$. $U(c)$ represents investor i's utility preference for residual cash proceeds of c. Each investor has an exponential utility function defined by $U(c)$, where

$$U(c) = \frac{1}{\rho}\left(1 - \exp\left[-\rho \cdot c\right]\right),$$

and $\rho > 0$ represents each investor's constant, absolute risk aversion. As risk aversion goes to 0, $U(c)$ converges asymptotically to risk neutrality: $\lim_{\rho \to 0} U(c) = \lim_{\rho \to 0} \frac{1}{\rho}(1 - \exp\left[-\rho \cdot c\right]) \to c$. In addition, $U(\cdot)$ is standardized such that $U(0) = 0$.

A percentage α of the N investors in the economy is subject to both a tax rate of t on the capital gains portion of the cash proceeds from their investment in firms' shares, and a tax rate τ on the cash proceeds from their investment in the risk-free bond (interest income),

[1] Large portions of what follows are taken directly from Sikes and Verrecchia (2012).

where $0 \leq t, \tau < 1$. The remaining $1-\alpha$ percentage of investors is not subject to either tax. Finally, the market for firms' shares is perfectly competitive.

2. Setting of Price

Sikes and Verrecchia (2012) first determine the market price for firm j that prevails in a perfectly competitive market in which N investors compete to hold shares in each firm as well as a risk-free bond. They derive the demand for firms' shares by those investors who are subject to tax and by those investors who are not subject to tax. They then determine the market price for firm j by equating the demand for firm j's shares by both types of investors to the supply of firm j's shares. This leads to Proposition 1, which is as follows:

Proposition 1. *In a diversified market setting where a proportion α of the economy is subject to tax and a proportion $1-\alpha$ is not subject to tax, the price of firm j's shares is*

$$P_j = \frac{(1-(1-\alpha)\,t)\,E\left[\tilde{V}_j\right] - (1-t)\,\frac{\rho}{N} Cov\left[\tilde{V}_j \cdot \tilde{V}_M\right]}{\alpha\left(1+\frac{1-\tau}{1-t}R_f\right) + (1-\alpha)(1-t)(1+R_f)}. \tag{1}$$

where $E\left[\tilde{V}_j\right]$ is firm j's expected pretax cash flow and $Cov\left[\tilde{V}_j \cdot \tilde{V}_M\right]$ is the covariance of firm j's cash flow with the market cash flow.

3. Derivation of Expected Returns

Sikes and Verrecchia (2012) next determine an expression for firm j's expected pre-tax return:

$$E\left[\tilde{r}_j\right] = \frac{E\left[\tilde{V}_j\right] - P_j}{P_j}. \tag{2}$$

They then compute the expected pre-tax rate of return by substituting P_j from (1) into (2), which leads to their Proposition 2.

Proposition 2. *In a diversified market setting where a proportion α of investors is subject to a capital gains tax rate of t on their investment in firm j and a tax rate of τ on their* *investment in the economy's risk-free asset while a proportion $1-\alpha$ is not subject to either tax, the expected pre-tax rate of return can be expressed as*

$$E\left[\tilde{r}_j\right]=\frac{\left(1-t+\alpha\frac{2t-\tau-t^2}{1-t}\right)R_f\cdot E\left[\tilde{V}_j\right]+\left(1-t\right)\frac{\rho}{N}Cov\left[\tilde{V}_j\cdot\tilde{V}_M\right]}{\left(1-\left(1-\alpha\right)t\right)E\left[\tilde{V}_j\right]-\frac{\rho}{N}\left(1-t\right)Cov\left[\tilde{V}_j\cdot\tilde{V}_M\right]}. \tag{3}$$

4. Effect of Change in Capital Gains Tax Rate on Expected Returns

Taking the derivative of $E\left[\tilde{r}_j\right]$ in (3) with respect to t yields

$$\frac{d}{dt}E\left[\tilde{r}_j\right]=\left(A-B\right)\frac{\alpha\cdot E\left[\tilde{V}_j\right]}{1-t}, \tag{4}$$

where

$$A=\frac{1+t-\tau\left(2-\alpha\right)+\alpha t\frac{t-\tau}{1-t}}{\left(\left(1-\left(1-\alpha\right)t\right)E\left[\tilde{V}_j\right]-\left(1-t\right)\frac{\rho}{N}Cov\left[\tilde{V}_j\cdot\tilde{V}_M\right]\right)^2}\cdot R_f\cdot E\left[\tilde{V}_j\right], \tag{5}$$

and

$$B=\frac{1+2\frac{1-\tau}{1-t}R_f}{\left(\left(1-\left(1-\alpha\right)t\right)E\left[\tilde{V}_j\right]-\left(1-t\right)\frac{\rho}{N}Cov\left[\tilde{V}_j\cdot\tilde{V}_M\right]\right)^2}\cdot\left(1-t\right)\frac{\rho}{N}Var\left[\tilde{V}_M\right]\cdot\beta_j. \tag{6}$$

The term β_j represents firm j's beta expressed in terms of firm j's cash flow and the market cash flow, and equals $Cov\left[\tilde{V}_j\cdot\tilde{V}_M\right]/Var\left[\tilde{V}_M\right]$, where $Var\left[\tilde{V}_M\right]$ is the variance of the market cash flow. The expression $\left(1-t\right)\frac{\rho}{N}Var\left[\tilde{V}_M\right]$ in (6) represents the market risk premium expressed in terms of cash flow and is positive. Letting $\Gamma_M=\left(1-t\right)\frac{\rho}{N}Var\left[\tilde{V}_M\right]$, Sikes and Verrecchia (2012) rewrite (5) and (6) as

$$A=\frac{1+t-\tau\left(2-\alpha\right)+\alpha t\frac{t-\tau}{1-t}}{\left(\left(1-\left(1-\alpha\right)t\right)E\left[\tilde{V}_j\right]-\Gamma_M\beta_j\right)^2}\cdot R_f\cdot E\left[\tilde{V}_j\right], \tag{7}$$

$$B=\frac{1+2\frac{1-\tau}{1-t}R_f}{\left(\left(1-\left(1-\alpha\right)t\right)E\left[\tilde{V}_j\right]-\Gamma_M\beta_j\right)^2}\cdot\Gamma_M\cdot\beta_j. \tag{8}$$

They then discuss under what circumstances the sign of the derivative in (4) is negative. They assume that $\alpha > 0$; otherwise, the derivative of $E\left[\tilde{r}_j\right]$ with respect to t is zero. Next, provided that $E\left[\tilde{V}_j\right]$ and $Cov\left[\tilde{V}_j \cdot \tilde{V}_M\right]$ are both positive, B will always be positive because t and τ are both strictly less than 1, and A will be positive for realistic assumptions about t and τ. For example, negative A requires risk-free investments to be subject to a very high tax rate, τ, while risky investments are subject to a very low capital gains tax rate, t. Thus, they presume that A will be positive.

Considering (4), there are at least three circumstances for which the sign of the derivative could be negative. In the first and second circumstances, if either firm j's (cash flow) beta, β_j, is positive and large, or the market risk premium, Γ_M, is large and firm j's beta is positive, then B as defined in (8) will dominate A regardless of the sign of A. This yields $\frac{d}{dt}E\left[\tilde{r}_j\right]$ as negative provided that firm j's expected cash flow is positive.

In the third circumstance, if R_f is approximately zero, then A as defined in (7) will also be close to zero. In turn, B will play the dominant role in determining the sign of (4). Therefore, if $\beta_j > 0$, then B as defined in (8) will be positive. This will result in the sign of $\frac{d}{dt}E\left[\tilde{r}_j\right]$ being negative provided that $E\left[\tilde{V}_j\right]$ is positive.

This leads to Proposition 3 in Sikes and Verrecchia (2012), which we empirically test.

Proposition 3. *In a diversified market setting where some investors are subject to tax, and firm j's expected cash flow and (cash flow) beta are both positive, the expected pre-tax rate of return of firm j can be associated negatively with a change in the capital gains tax rate when either: (1) firm j's beta, β_j, is sufficiently large; (2) the market risk premium, Γ_M, is sufficiently large; or (3) the (pre-tax) risk-free rate of return, R_f, is sufficiently small.*

5. Illustration

We will now assume reasonable values for the parameters and show that β_j, Γ_M, and R_f do not need to be extreme in order for the derivative in (4) to be negative. We illustrate the relation in Figure A1. In both panels, R_f is on the y-axis. In Panel A, β_j is on the x-axis and we hold Γ_M constant at 5%, and in Panel B, Γ_M is on the x-axis and we hold β_j constant at 0.74. In Panel A, we set the market risk premium equal to 5% because according to Dimson et al. (2003), Table 1, the geometric mean and arithmetic mean of the world equity risk premium relative to Treasury bills or the nearest equivalent short-term instrument over the period 1900-2002 equal 4.4% and 5.7%, respectively. We set $\beta_j = 0.74$ in Panel B because the mean *BETA* for our sample of 27 countries over the 1990-2004 sample period is 0.746.[2] In both panels, we let $E\left[\tilde{V}_j\right] = 1$, $\alpha = 50\%$, $t = 20\%$, and $\tau = 30\%$.

The shaded areas in Figure A1 show the values of R_f, β_j, and Γ_M for which the derivative in (4) is negative, conditional on the assumed values for the other parameters. Consistent with the first two predictions in Proposition 3 of Sikes and Verrecchia (2012), Panels A and B of Figure A1 show that as beta and the market risk premium increase, the shaded area becomes larger. Moreover, consistent with the third prediction, when beta or the market risk premium is low, the risk-free rate also has to be very low in order for the derivative in (4) to be negative. On the other hand, for typical values of beta or the market risk premium, the risk-free rate does not need to be that low to yield a negative derivative in (4).[3]

[2] We acknowledge that β_j in Sikes and Verrecchia (2012) is a cash-flow beta and thus not exactly equivalent to the beta from a CAPM model stated in terms of returns, which equals $= \frac{Cov[r_j \cdot r_M]}{Var[r_M]} = \frac{P_M}{P_j}\frac{Cov\left[\tilde{V}_j \cdot \tilde{V}_M\right]}{Var\left[\tilde{V}_M\right]}$, where r_j and r_M are the expected returns for firm j and for the market, respectively. In an untabulated robustness test, we confirm that our main results in Table 3 are robust to multiplying a firm's *BETA* by its stock price.

[3] If we instead set $t = \tau$, the line would remain upward-sloping but would be less steep. Moreover, if we set $t > \tau$, the line would still be upward-sloping but less steep than in the latter case.

Table 1: Sample Composition, Risk Variables, and Cross-Sectional Partitioning Variables by Country

	Sample Composition				*Risk Variables*		*Partitioning Variables*				
	(1) Realized Buy-and-hold Returns (RET)		*(2) Implied Cost of Capital (COC)*		*(3) Market Risk Premium*	*(4) Risk-Free Interest Rate*	*(5) Substantive Changes in Tax Rate*	*(6) Corruption Index*	*(7) Foreign Direct Investments*	*(8) Total Institutional Ownership*	*(9) Total Market Turnover*
Country	*N*	*Mean*	*N*	*Mean*	*MRP*	*RFR*	*ΔCGRATE*	*CORRUPT*	*FDI*	*INSTOWN*	*TURNOVER*
Australia	4,282	16.6%	1,839	10.8%	7.7%	6.6%	***1***	***8.5***	1.152	***1.3%***	4.828
Brazil	1,094	28.0%	177	16.3%	8.9%	24.0%	0	6.3	1.171	***1.4%***	***1.789***
Canada	6,304	16.6%	1,901	11.1%	5.2%	5.4%	***1***	***10.0***	1.409	13.4%	4.115
Chile	1,109	18.2%	120	13.0%	13.8%	5.4%	***1***	5.3	2.094	***1.0%***	***0.823***
China	3,296	3.6%	125	10.5%	18.1%	3.3%	0	–	1.406	***0.7%***	***3.219***
Colombia	103	52.7%	–	–	22.2%	9.5%	***1***	5.0	***0.955***	***0.1%***	***0.374***
Denmark	1,941	17.0%	638	11.5%	5.7%	5.8%	***1***	***10.0***	***-0.762***	7.2%	***3.732***
Finland	987	22.5%	455	13.1%	6.5%	6.0%	0	***10.0***	***-2.939***	10.1%	5.870
France	6,911	14.5%	2,506	11.0%	3.5%	5.3%	***1***	***9.1***	1.596	***4.7%***	6.388
Hungary	181	20.9%	60	15.6%	7.4%	13.5%	0	–	1.898	6.9%	8.454
India	2,516	25.2%	609	14.1%	20.4%	8.5%	***1***	4.6	***-0.366***	***3.6%***	***3.305***
Indonesia	1,260	9.4%	227	15.8%	19.5%	15.1%	0	2.2	***0.709***	***1.2%***	***2.535***
Ireland	641	18.6%	218	12.6%	7.2%	5.9%	***1***	***8.5***	1.926	12.4%	***2.705***
Israel	604	19.7%	50	10.4%	13.0%	10.6%	***1***	8.3	***1.123***	***1.2%***	7.364
Italy	2,740	12.0%	694	10.9%	5.7%	7.0%	***1***	6.1	***0.260***	***3.1%***	7.974
Japan	35,523	6.7%	4,292	8.4%	7.2%	1.9%	***1***	***8.5***	***-0.352***	***1.8%***	3.629
Norway	1,319	18.0%	418	13.1%	4.0%	6.5%	0	***10.0***	***-0.979***	10.3%	6.607
Philippines	919	5.4%	195	12.8%	22.7%	12.3%	0	2.9	***0.453***	***0.9%***	***1.438***
Poland	431	24.5%	106	12.6%	7.9%	14.9%	***1***	–	1.234	6.0%	***2.075***
Russian Federation	132	58.2%	–	–	24.7%	12.0%	0	–	***1.016***	***3.8%***	***1.003***
South Africa	2,354	23.7%	894	16.3%	16.0%	13.0%	***1***	***8.9***	***-1.961***	5.8%	***1.955***
Spain	1,672	20.2%	773	11.5%	5.5%	7.0%	***1***	7.4	1.583	5.3%	6.399
Sweden	2,191	19.2%	783	12.1%	5.7%	6.4%	***1***	***10.0***	1.908	12.7%	7.096
Taiwan	4,508	9.8%	567	11.8%	7.5%	5.9%	0	6.9	–	***0.6%***	10.533
United Kingdom	14,409	13.4%	5,267	11.3%	2.4%	6.7%	0	***9.1***	1.891	16.1%	7.441
United States	54,393	15.3%	26,568	10.6%	4.3%	4.1%	***1***	***8.6***	***0.859***	30.0%	9.604
Venezuela	98	44.2%	–	–	29.6%	8.0%	***1***	4.7	1.328	–	***2.126***
Total/Median	151,918	6.5%	49,482	10.3%	7.5%	6.5%	17	8.5	1.138	4.2%	3.732

(continued)

Table 1 (continued)

The expected returns (cost of capital) sample comprises a maximum of 151,918 (49,482) firm-year observations from 27 countries with non-zero capital gains tax rates over the 1990 to 2004 period. The sample excludes countries with less than 20 individual firm observations, country-years with inflation rates above 25%, and firms with market value below US$ 10 million. In the first two columns, the table reports the number of firm-years and mean values by country for the two dependent variables used in the analyses. (1) We use realized buy-and-hold returns (*RET*) computed over one year and based on US$ price information adjusted for dividends and stock splits. (2) The implied cost of capital (*COC*) is the average cost of capital estimate implied by the mean analyst consensus forecasts and stock prices using the Claus and Thomas (2001) model, the Gebhardt, Lee, and Swaminathan (2001) model, the Ohlson and Juettner-Nauroth (2005) model, and the Easton (2004) model. See Hail and Leuz (2006) for details on the estimation procedure. We measure *RET* (*COC*) beginning in (as of) month +10 after the fiscal-year end, and truncate both variables at the 1^{st} and 99^{th} percentile. We collect the financial data from Worldscope, analyst forecast data from I/B/E/S, and stock price data from Datastream. In the next two columns, the table reports mean values for two variables used to distinguish between high and low market risk premium/risk-free investment return countries in the analyses. (3) The market risk premium (*MRP*) is equal to the expected market return minus the risk-free rate. Following Erb, Harvey, and Viskanta (1996a), we derive yearly country-level expected returns from *Institutional Investor*'s country credit ratings by regressing one-year ahead local market index returns (source: Datastream) on the natural logarithm of mean yearly country credit ratings. The fitted values from this regression then serve as a proxy for a country's future expected market return. (4) The risk-free interest rate (*RFR*) is the country-year median of monthly nominal short-term Treasury bill rates (or, if unavailable, yields on central bank papers and interbank loans) collected from Datastream and the World Bank. The risk-free rates correspond to the calendar year of month +10 after a firm's fiscal-year end. In the last five columns, the table reports country values for the partitioning variables used in the cross-sectional analyses. (5) We identify countries with year-to-year changes in capital gains tax rates exceeding 5 percentage points (Δ*CGRATE*=1). (6) We measure the level of investor trust in the country's institutions and government using the corruption index (source: La Porta et al. 2008). Higher scores indicate less corruption (*CORRUPT*=1). (7) We measure a country's openness and market integration as the total foreign direct investment flows in percent of GDP (source: World Bank). We take the natural logarithm of the yearly values and compute the time-series mean for each country. Lower values stand for less integrated markets (*FDI*=1). (8) Total institutional ownership is the country median firm-level ratio of the total number of shares held by institutional investors over market capitalization (source: Ferreira and Matos 2008). The data are only available for the years 2000 to 2004 of our sample period. Lower values indicate countries with fewer stock holdings by institutional investors (*INSTOWN*=1). (9) Total market turnover (*TURNOVER*) is the time-series mean of aggregate yearly trading volume (i.e., sum of daily trading volume of shares included in the local market index) scaled by end-of-year market capitalization. Lower values stand for less liquid markets (*TURNOVER*=1). For the cross-sectional analyses, we transform the continuous partitioning variables in columns (6) to (9) into binary indicators by splitting the sample by the median (as indicated in the last row of the table). Values in ***bold italics*** mark countries with a partitioning indicator value of '1'.

Table 2: Descriptive Statistics for Variables Used in the Regression Analyses

	N	*Mean*	*Std. Dev.*	*P1*	*P25*	*Median*	*P75*	*P99*
Dependent Variables:								
Buy-and-hold Returns (RET)	151,918	13.3%	49.5%	-74.3%	-16.9%	6.5%	33.8%	198.8%
Implied Cost of Capital (COC)	49,482	10.9%	3.5%	5.2%	8.5%	10.3%	12.5%	22.7%
Tax Variables:								
Capital Gains Tax Rate (CGRATE)	151,918	23.5%	10.1%	0.0%	20.0%	26.0%	28.0%	47.0%
Dividend Tax Rate (DIVRATE)	151,918	29.6%	13.0%	0.0%	20.0%	35.0%	39.6%	47.9%
Dividend Penalty (DIVPEN)	151,918	0.070	0.181	-0.512	0.000	0.122	0.238	0.373
Risk/Control Variables:								
Risk-Free Interest Rate (RFR)	151,918	4.0%	3.3%	0.1%	1.2%	3.9%	5.4%	16.1%
Market Risk Premium (MRP)	151,918	6.8%	4.6%	-0.2%	3.7%	6.1%	9.1%	22.1%
Systematic Risk (BETA)	151,918	0.746	0.910	-2.131	0.286	0.749	1.222	3.193
Log (Market Value) (SIZE)	151,918	12.265	1.780	9.315	10.905	12.085	13.406	16.969
Book-to-Market Ratio (BMR)	151,918	0.778	0.598	0.069	0.372	0.619	0.997	3.029
Earnings Variance (EARNVAR)	49,482	0.033	0.051	0.001	0.008	0.018	0.036	0.267
Forecast Bias (BIAS)	49,482	0.006	0.032	-0.043	-0.003	0.000	0.006	0.137

The sample comprises up to 151,918 firm-year observations from 27 countries between 1990 and 2004 with sufficient Worldscope financial data, I/B/E/S analyst forecast data, and Datastream stock price data (see Table 1). The table presents distributional statistics for the variables used in the regression analyses. The two dependent variables are: (1) realized buy-and-hold returns (*RET*) computed over one year and based on US$ price information adjusted for dividends and stock splits; and (2) the implied cost of capital (*COC*), which equals the average cost of capital estimate implied by the mean analyst consensus forecasts and stock prices using the Claus and Thomas (2001) model, the Gebhardt, Lee, and Swaminathan (2001) model, the Ohlson and Juettner-Nauroth (2005) model, and the Easton (2004) model. See Hail and Leuz (2006) for details on the *COC* estimation procedure. We measure *RET* (*COC*) beginning in (as of) month +10 after the fiscal year-end. The tax variables are the maximum statutory capital gains tax rates (*CGRATE*) and dividend tax rates (*DIVRATE*) for individuals, as indicated in the OECD tax database and various publications of the Big 4 accounting firms (see Appendix 1 for details). Instead of the dividend tax rate we include the dividend tax penalty in our models. We compute *DIVPEN* as (*DIVRATE* – *CGRATE*) / (1 – *CGRATE*). The tax rates correspond to the calendar year of month +10 after a firm's fiscal-year end. We use the following control variables: The risk-free interest rate (*RFR*) is the country-year median of monthly nominal short-term Treasury bill rates (or, if unavailable, yields on central bank papers and interbank loans) collected from Datastream and the World Bank. We measure *RFR* over the same interval as the tax rates. The market risk premium (*MRP*) is equal to the expected market return minus the risk-free rate. Following Erb, Harvey, and Viskanta (1996a), we derive yearly country-level expected returns from *Institutional Investor*'s country credit ratings by regressing one-year ahead local market index returns (source: Datastream) on the natural logarithm of mean yearly country credit ratings. The fitted values from this regression then serve as a proxy for a country's future expected market return. We measure a firm's systematic risk (*BETA*) as the coefficient on the local market index from a two-factor market model that regresses the firm's monthly excess returns on the excess returns of the local market index and a world market index over the 60 months leading up to month +10 after the firm's fiscal year-end. We require at least 24 months of data for the estimation of *BETA*. We measure *SIZE* as the natural logarithm of the market value of equity in US$ thousand (i.e., stock price times the number of shares outstanding). Book-to-market (*BMR*) is the ratio of the accounting book value to the market value of equity. We measure earnings variance (*EARNVAR*) as the firm's standard deviation of annual earnings per share over the last five years scaled by total assets per share. We require at least three yearly earnings-per-share observations to calculate *EARNVAR*. Forecast bias (*BIAS*) is the one-year-ahead analyst forecast error (mean earnings-per-share forecast minus actual) scaled by forecast-period stock price. We measure *SIZE*, *BMR*, and *EARNVAR* as of the fiscal year-end, and *BIAS* as of month +10 after the fiscal year-end. Except for the tax variables, *RFR*, and *MRP*, we truncate all variables at the 1st and 99th percentile.

Table 3: Relation between Capital Gains Tax Rates and Expected Returns Conditional on Firm Risk, Market Risk Premium, and Risk-Free Rate

Panel A: Buy-and-hold Returns as Dependent Variable

	Unconditional Estimation		*Estimation Conditional on Risk Variables*			
Base Sample (CGRATE>0 Countries)	*(1) All Countries*	*(2) All Countries Except Japan*	*(3) Systematic Risk (BETA)*	*(4) Market Risk Premium (MRP)*	*(5) Risk-Free Rate (RFR)*	*(6) All Three Combined*
Tax Variables:						
(1) CGRATE	-0.374***	0.268***	-0.245***	0.104***	-0.172***	0.131***
	(-12.19)	(7.70)	(-7.65)	(2.93)	(-4.66)	(3.17)
(2) CGRATE*$BETA_{High}$	–	–	-0.262***	–	–	-0.125***
			(-10.09)			(-4.82)
P-value: (1)+(2) = 0			[0.000]			[0.904]
(3) CGRATE*MRP_{High}	–	–	–	-1.040***	–	-0.999***
				(-25.12)		(-23.79)
P-value: (1)+(3) = 0				[0.000]		[0.000]
(4) CGRATE*RFR_{Low}	–	–	–	–	-0.292***	0.088**
					(-7.83)	(2.25)
P-value: (1)+(4) = 0					[0.000]	[0.000]
DIVPEN	-0.029**	0.057***	-0.025*	-0.053***	-0.012	-0.085***
	(-2.06)	(3.37)	(-1.75)	(-3.69)	(-0.74)	(-5.46)
Control Variables:						
$BETA_{High}$	–	–	0.014***	–	–	0.009**
			(3.87)			(2.44)
MRP_{High}	–	–	–	0.051**	–	0.061***
				(11.73)		(13.64)
RFR_{Low}	–	–	–	–	-0.038***	-0.048***
					(-9.37)	(-11.42)
BETA	0.012***	0.008***	0.006***	0.008***	0.013***	0.005*
	(7.01)	(4.11)	(2.59)	(4.46)	(7.17)	(1.88)
SIZE	-0.001	0.000	-0.001	0.000	-0.001	0.000
	(-0.94)	(0.29)	(-0.83)	(0.65)	(-0.72)	(0.60)
BMR	0.097***	0.089***	0.096***	0.087***	0.096***	0.087***
	(35.63)	(23.78)	(35.38)	(31.61)	(35.17)	(31.39)
Country, Industry, and Year Fixed Effects	Included	Included	Included	Included	Included	Included
N	151,918	116,395	151,918	151,918	151,918	151,918
R^2	0.078	0.056	0.079	0.084	0.079	0.085

(continued)

Table 3 (continued)

Panel B: Implied Cost of Capital as Dependent Variable

	Unconditional Estimation		*Estimation Conditional on Risk Variables*			
Base Sample (CGRATE>0 Countries)	*(1) All Countries*	*(2) All Countries Except Japan*	*(3) Systematic Risk (BETA)*	*(4) Market Risk Premium (MRP)*	*(5) Risk-Free Rate (RFR)*	*(6) All Three Combined*
Tax Variables:						
(1) CGRATE	0.015***	0.034***	0.016***	0.046***	0.041***	0.060***
	(3.75)	(7.76)	(3.61)	(10.47)	(8.50)	(11.27)
(2) CGRATE*$BETA_{High}$	–	–	-0.003	–	–	0.004
			(-0.77)			(1.03)
P-value: (1)+(2) = 0			[0.002]			[0.000]
(3) CGRATE*MRP_{High}	–	–	–	-0.073***	–	-0.067***
				(-15.32)		(-13.82)
P-value: (1)+(3) = 0				[0.000]		[0.257]
(4) CGRATE*RFR_{Low}	–	–	–	–	-0.041***	-0.029***
					(-8.54)	(-5.89)
P-value: (1)+(4) = 0					[0.964]	[0.000]
DIVPEN	0.008***	0.007***	0.008***	0.002	0.016***	0.008***
	(4.73)	(3.79)	(4.85)	(1.37)	(8.07)	(3.95)
Control Variables:						
$BETA_{High}$	–	–	0.004***	–	–	0.004***
			(9.20)			(8.50)
MRP_{High}	–	–	–	0.002***	–	0.002***
				(3.12)		(2.92)
RFR_{Low}	–	–	–	–	-0.000	-0.001
					(-0.47)	(-1.19)
BETA	0.002***	0.002***	0.000	0.002***	0.002***	0.000*
	(9.75)	(7.39)	(1.60)	(8.89)	(9.90)	(1.72)
SIZE	-0.005***	-0.004***	-0.005***	-0.005***	-0.005***	-0.005***
	(-31.80)	(-27.90)	(-32.42)	(-31.27)	(-31.75)	(-31.89)
BMR	0.019***	0.021***	0.019***	0.019***	0.019***	0.019***
	(29.17)	(28.76)	(28.96)	(29.21)	(29.14)	(28.95)
EARNVAR	0.038***	0.040***	0.037***	0.038***	0.037***	0.037***
	(9.52)	(9.93)	(9.32)	(9.67)	(9.47)	(9.42)
BIAS	0.228***	0.237***	0.228***	0.230***	0.228***	0.229***
	(30.59)	(29.44)	(30.59)	(30.78)	(30.52)	(30.70)
Country, Industry, and Year Fixed Effects	Included	Included	Included	Included	Included	Included
N	49,482	45,190	49,482	49,482	49,482	49,482
R^2	0.378	0.367	0.380	0.382	0.380	0.384

(continued)

Table 3 (continued)

The table reports the relation between individual capital gains tax rates and expected returns, estimated conditional and unconditional on systematic risk, market risk premiums, and the returns on risk-free investments. We report results for our base sample comprising firm-year observations from 27 countries with non-zero capital gains tax rates over the 1990 to 2004 period (see Table 1). The table reports OLS coefficient estimates and (in parentheses) *t*-statistics based on robust standard errors clustered by firm from regressing realized buy-and-hold returns *RET* (Panel A) or implied cost of capital *COC* (Panel B) on the tax variables (*CGRATE* and *DIVPEN*) plus controls. Models (1) and (2) contain the unconditional estimation for the full sample and the sample without Japan, respectively. In Models (3) to (6), we interact *CGRATE* with three binary indicator variables (either separately or combined) and include the main effects and the interaction terms in the model. We set $BETA_{High}$ to '1' for firm-years whose systematic risk (*BETA*) is above the yearly median. MRP_{High} is equal to '1' for observations in country-years with market risk premiums (*MRP*) above the sample-period median. We set RFR_{Low} to '1' for observations in country-years with risk-free rates (*RFR*) falling below the 30th percentile of the sample-period distribution. In line with Guenther and Sansing (2010), we demean the continuous *CGRATE* variable (using the sample mean) when computing the interaction terms. For details on the dependent and control variables see Table 2. We include an intercept, country, Campbell (1996) industry, and year fixed effects in the regressions, but do not report the coefficients. We also report *p*-values from *F*-tests comparing the sum of two coefficients to zero. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed).

Table 4: Analyses for Subsets of Sample Countries

Subset of Base Sample (Countries with Partitioning Variables PART=1)	*(1) Substantive Changes in Tax Rate (ΔCGRATE)*	*(2) Corruption Index (CORRUPT)*	*(3) Foreign Direct Investments (FDI)*	*(4) Total Institutional Ownership (INSTOWN)*	*(5) Total Market Turnover (TURNOVER)*
Panel A: Buy-and-hold Returns as Dependent Variable					
(1) CGRATE	0.777***	0.695***	1.081***	-0.417***	0.120*
	(15.63)	(13.50)	(13.82)	(-4.60)	(1.67)
P-value: $PART_1=PART_0$	[0.013]	[0.000]	[0.000]	[0.000][a]	[0.710]
(2) CGRATE*$BETA_{High}$	-0.292***	-0.238***	-0.155***	-0.247***	-0.217***
	(-8.16)	(-7.82)	(-3.62)	(-6.08)	(-4.72)
P-value: $PART_1=PART_0$	[0.000]	[0.001]	[0.076]	[0.000]	[0.003]
(3) CGRATE*MRP_{High}	-1.236***	-1.537***	-1.886***	-0.326***	-0.188**
	(-27.13)	(-31.34)	(-29.29)	(-4.46)	(-2.24)
P-value: $PART_1=PART_0$	[0.374]	[0.000]	[0.000]	[0.183]	[0.008][a]
(4) CGRATE*RFR_{Low}	-0.575***	-0.318***	-0.492***	-0.078	-0.582***
	(-10.18)	(-6.00)	(-5.84)	(-1.23)	(-6.67)
P-value: $PART_1=PART_0$	[0.000]	[0.000]	[0.000]	[0.882]	[0.000]
Dividend Penalty and Control Variables	Included	Included	Included	Included	Included
Country, Industry, and Year Fixed Effects	Included	Included	Included	Included	Included
N	123,813	131,255	104,791	58,086	51,417
R^2	0.091	0.085	0.108	0.193	0.234
Panel B: Implied Cost of Capital as Dependent Variable					
(1) CGRATE	0.053***	0.054***	0.086***	0.046***	0.050***
	(8.54)	(8.43)	(10.57)	(3.47)	(4.60)
P-value: $PART_1=PART_0$	[0.939]	[0.810]	[0.000]	[0.055]	[0.425]
(2) CGRATE*$BETA_{High}$	0.010**	0.008**	0.019***	0.004	0.013*
	(2.14)	(2.05)	(3.40)	(0.69)	(1.70)
P-value: $PART_1=PART_0$	[0.052][a]	[0.942]	[0.056][a]	[0.318]	[0.170]
(3) CGRATE*MRP_{High}	-0.053***	-0.099***	-0.070***	-0.025**	-0.046***
	(-9.67)	(-16.45)	(-8.89)	(-2.44)	(-3.70)
P-value: $PART_1=PART_0$	[0.090][a]	[0.000]	[0.000]	[0.743]	[0.440]
(4) CGRATE*RFR_{Low}	-0.027***	-0.002	-0.068***	-0.077***	-0.079***
	(-3.96)	(-0.34)	(-7.05)	(-7.75)	(-7.79)
P-value: $PART_1=PART_0$	[0.544]	[0.001][a]	[0.000]	[0.000]	[0.000]
Dividend Penalty and Control Variables	Included	Included	Included	Included	Included
Country, Industry, and Year Fixed Effects	Included	Included	Included	Included	Included
N	41,991	45,779	35,040	8,895	7,601
R^2	0.391	0.377	0.423	0.469	0.594

(continued)

Table 4 (continued)

The table reports cross-sectional variations of the conditional relation between individual capital gains tax rates and expected returns. We report results for subsets of countries from our base sample comprising 27 countries with non-zero capital gains tax rates over the 1990 to 2004 period (see Table 1). We use the following five partitioning variables to identify sample subsets (*PART*=1): (1) countries with at least one substantive change in capital gains tax rates exceeding 5 percentage points (Δ*CGRATE*); (2) countries with below average levels of the corruption index (*CORRUPT*); (3) countries with below average market integration as measured by the total inflows and outflows of foreign direct investments (*FDI*); (4) countries with below average total institutional ownership (*INSTOWN*); and (5) countries with below average total market turnover (*TURNOVER*). For variable details see Table 1. The table reports OLS coefficient estimates and (in parentheses) *t*-statistics based on robust standard errors clustered by firm from regressing *RET* (Panel A) or *COC* (Panel B) on the tax variables (*CGRATE* and *DIVPEN*), interaction terms of *CGRATE* with binary indicators for high systematic risk, high market risk premiums, and low risk-free rates, plus controls (see Model 6 in Table 3). We only tabulate the main variables of interest but include the full set of controls and fixed effects. We also report *p*-values from *F*-tests comparing *CGRATE* and the interaction terms (e.g., $CGRATE*BETA_{High}$) from the subset of tabulated countries (*PART*=1) to the same coefficients for the *PART*=0 countries (not tabulated). The superscript [a] indicates *p*-values that are significant but opposite to our prediction. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed).

Table 5: Analyses Around Substantive Changes in Firm Risk, Market Risk Premiums, and Risk-Free Rates

Subset of Base Sample (Firm-Years Surrounding Substantive Changes)	*RET as Dependent Variable*		*COC as Dependent Variable*	
	(1) Substantive Increases	*(2) Substantive Decreases*	*(1) Substantive Increases*	*(2) Substantive Decreases*
Panel A: Analysis Surrounding Substantive Changes in Systematic Risk (BETA)				
(1) CGRATE	1.250***	1.128***	0.074***	0.086***
	(3.16)	(3.83)	(3.24)	(2.59)
(2) CGRATE*$BETA_{High}$	-0.120**	-0.146**	-0.000	-0.022***
	(-2.32)	(-2.43)	(-0.06)	(-2.84)
P-value: (1)+(2) = 0	[0.004]	[0.001]	[0.001]	[0.051]
Dividend Penalty and Control Variables	Included	Included	Included	Included
Country-Year and Industry Fixed Effects	Included	Included	Included	Included
N	40,845	37,237	11,331	11,421
R^2	0.171	0.110	0.447	0.434
Panel B: Analysis Surrounding Substantive Changes in Market Risk Premiums (MRP)				
(1) CGRATE	0.495***	-0.271***	0.014	-0.018
	(4.58)	(-2.60)	(0.99)	(-1.45)
(2) CGRATE*MRP_{High}	-0.161***	-0.125***	-0.023***	0.013***
	(-2.93)	(-2.71)	(-3.16)	(2.69)
P-value: (1)+(2) = 0	[0.003]	[0.000]	[0.508]	[0.679]
Dividend Penalty and Control Variables	Included	Included	Included	Included
Country, Industry, and Year Fixed Effects	Included	Included	Included	Included
N	20,319	66,384	6,289	27,229
R^2	0.111	0.055	0.391	0.338
Panel C: Analysis Surrounding Substantive Changes in Risk-Free Rates (RFR)				
(1) CGRATE	0.264***	-0.005	0.008	0.012
	(2.97)	(-0.08)	(0.80)	(1.57)
(2) CGRATE*RFR_{Low}	0.010	-0.746***	-0.014***	-0.019***
	(0.30)	(-13.91)	(-4.30)	(-2.89)
P-value: (1)+(2) = 0	[0.002]	[0.000]	[0.448]	[0.305]
Dividend Penalty and Control Variables	Included	Included	Included	Included
Country, Industry, and Year Fixed Effects	Included	Included	Included	Included
N	68,052	66,326	28,294	14,617
R^2	0.054	0.134	0.356	0.461

(continued)

Table 5 (continued)

The table reports the relation between individual capital gains tax rates and expected returns around substantive changes in the conditioning variables. We report results for subsets of firm-years from our base sample comprising 27 countries with non-zero capital gains tax rates over the 1990 to 2004 period (see Table 1). The table reports OLS coefficient estimates and (in parentheses) *t*-statistics based on robust standard errors clustered by firm from regressing *RET* or *COC* on the tax variables (*CGRATE* and *DIVPEN*) plus controls around substantive changes in systematic firm risk (Panel A), country-level market risk premiums (Panel B), and risk-free rates (Panel C). For each analysis we include up to eight years (i.e., *t*–4 to *t*+3) surrounding substantive increases or decreases (*t*=0) in the conditioning variables, but only for as long as there is no confounding change within the event window. We conduct a pre-post comparison around substantive changes by including the main effects and the interaction term of *CGRATE* with one of the following three binary indicators in the model. We set $BETA_{High}$ to '1' for firm-years following the switch from below to above (preceding the switch from above to below) median firm-level systematic risk (*BETA*) in a given year. MRP_{High} is equal to '1' for firm-years following an increase (preceding a decrease) in market risk premiums (*MRP*) exceeding (falling below) the 85^{th} (15^{th}) percentile of annual sample-period changes. RFR_{Low} is equal to '1' for firm-years following a decrease (preceding an increase) in country-level risk-free rates (*RFR*) falling below (exceeding) the 15^{th} (85^{th}) percentile of annual sample-period changes. We only tabulate the main variables of interest but include the full set of controls and fixed effects (see Models 3 to 5 in Table 3). In Panel A, we replace the country and year fixed effects with separate fixed effects for each country-year combination. In Panels B and C, we include the raw values of *MRP* and *RFR*, respectively, as additional controls. We also report *p*-values from *F*-tests comparing the sum of two coefficients to zero. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed).

Table 6: Analysis of Expected Returns Relation Across Deciles of Systematic Risk

RET as Dependent Variable	*Low*				*BETA Deciles*					*High*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
Risk Variables (Means):										
BETA	-0.847	0.026	0.290	0.472	0.641	0.814	1.000	1.217	1.519	2.330
MRP	4.7%	5.7%	7.0%	7.6%	7.4%	7.5%	7.6%	7.5%	7.2%	6.1%
RFR	4.2%	4.3%	4.3%	4.3%	4.3%	4.3%	4.0%	3.8%	3.3%	3.4%
Tax Variables:										
CGRATE	0.268**	0.239***	-0.188**	-0.267***	-0.349***	-0.533***	-0.616***	-0.777***	-0.920***	-0.643***
	(1.96)	(2.89)	(-2.31)	(-3.10)	(-4.14)	(-6.18)	(-7.09)	(-8.29)	(-8.59)	(-4.26)
DIVPEN	0.027	0.085*	-0.153***	-0.168***	-0.056	-0.204***	-0.080*	0.028	0.111**	0.372***
	(0.35)	(1.88)	(-3.74)	(-4.28)	(-1.43)	(-4.99)	(-1.91)	(0.58)	(2.17)	(5.56)
Control Variables	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Country, Industry, and Year Fixed Effects	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
N	15,199	15,192	15,192	15,190	15,189	15,197	15,191	15,191	15,193	15,184
R^2	0.083	0.064	0.092	0.091	0.092	0.095	0.103	0.110	0.109	0.084

The table reports the relation between individual capital gains tax rates and expected returns, estimated separately for portfolios formed by ranking observations by systematic risk. Each portfolio represents a subset of firm-years from our base sample comprising 27 countries with non-zero capital gains tax rates over the 1990 to 2004 period (see Table 1). We form decile portfolios by ranking firm-years based on systematic risk in any given year (*BETA*). The table reports OLS coefficient estimates and (in parentheses) *t*-statistics based on robust standard errors clustered by firm from regressing *RET* on the tax variables (*CGRATE* and *DIVPEN*) plus controls. We only tabulate the main variables of interest but include the full set of controls and fixed effects (see Model 1 in Table 3). We also report the means of the ranking variable (*BETA*) and the two other risk variables (*MRP* and *RFR*) for each portfolio. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed).

Table 7: Descriptive Statistics for Analysis of Capital Gains Tax Rate Changes in the United States

Panel A: Mean Market Risk Premium and Risk-Free Interest Rate in Periods Surrounding U.S. Tax Rate Changes in 1978, 1997, and 2003

Variables	*Event #1: RA78 (November 1978)*	*Event #2: TRA97 (May 1997)*	*Event #3: JGTRRA03 (May 2003)*
Capital Gains Tax Rate:			
CGRATE	From 35% to 28%	From 28% to 20%	From 20% to 15%
Market Risk Premium:			
Return Variability (RETVAR)	0.046	0.043	0.043
Implied Risk Premium (MKTCOC)	5.7%	2.7%	3.7%
Median Beta (MEDBETA)	1.188	0.880	0.729
	(Period of High Market Risk Premium)	(Period of Medium Market Risk Premium)	(Period of Medium Market Risk Premium)
Risk-Free Interest Rate:			
1-Month T-Bills (RFR)	8.2%	5.1%	1.7%
	(Period of High Risk-Free Interest Rates)	(Period of Medium Risk-Free Interest Rates)	(Period of Low Risk-Free Interest Rates)

Panel B: Distributional Characteristics

(N = 1,290,929)	*Mean*	*Std. Dev.*	*P1*	*P25*	*Median*	*P75*	*P99*
Dependent Variable:							
Buy-and-hold Returns (RET)	1.1%	12.6%	-30.5%	-5.8%	0.4%	7.1%	40.2%
Tax Variable:							
Capital Gains Tax Rate (CGRATE)	23.7%	5.1%	15.0%	20.0%	20.0%	28.0%	35.0%
Dividend Penalty (DIVPEN)	0.214	0.164	0.000	0.069	0.233	0.245	0.583
Control Variables:							
Systematic Risk (BETA)	1.045	0.666	-0.203	0.568	0.984	1.428	2.980
Log (Market Value) (SIZE)	12.084	1.777	9.285	10.657	11.869	13.325	16.502
Book-to-Market Ratio (BMR)	0.742	0.562	-0.005	0.366	0.622	0.970	2.767
Inflation (INFL)	0.3%	0.3%	-0.4%	0.1%	0.3%	0.5%	1.2%

The sample comprises 1,290,929 firm-month observations from the United States over the period 11/1976 to 5/2005 with sufficient data in Compustat and CRSP. We consider three regulatory changes of capital gains tax rates: (1) the Revenue Reconciliation Act of 1978 (RA78), (2) the Taxpayer Relief Act of 1997 (TRA97), and (3) the Jobs and Growth Tax Relief and Reconciliation Act of 2003 (JGTRRA03). Panel A presents the capital gains tax rate (*CGRATE*) and various proxies for the market risk premium and risk-free rate. (1) Return variability (*RETVAR*) is the standard deviation of monthly index returns over the event period. (2) The implied risk premium (*MKTCOC*) equals the internal rates of return from a discounted cash flow valuation model minus the risk-free rate (Damodaran 2012, p. 106). (3) Median beta (*MEDBETA*) equals the monthly median of firms' systematic risk. We measure a firm's systematic risk (*BETA*) as the coefficient from a one-factor market model that regresses the firm's monthly excess returns on the excess returns of the value-weighted market index over the 60 months leading up to month *t*. We require at least 24 months of data. (4) The risk-free interest rate (*RFR*) is the 1-month Treasury bill rate in month *t*. The panel reports event-period means of each variable (covering the 48 months surrounding the event). In Panel B, we report descriptive statistics for the variables used in the regression analyses. We use monthly buy-and-hold returns (*RET*) as dependent variable. The tax variables are as defined in Table 2. Aside from *BETA* we include the following controls: *SIZE* is the natural logarithm of the market value of equity in US$ million. Book-to-market (*BMR*) is the ratio of the accounting book value to the market value of equity. Accounting values are as of the fiscal year-end and market values as of the quarter-end prior to month *t*. Inflation (*INFL*) is the monthly change in the consumer price index. Except for the tax variables and *INFL*, we truncate all variables at the 1st and 99th percentile.

Table 8: Regression Analysis of Capital Gains Tax Rate Changes in the United States

RET as Dependent Variable	*(1)* *Full Period* *(November 1976 to May 2005)*	*(2)* *Event #1:* *RA78* *(November 1978)*	*(3)* *Event #2:* *TRA97* *(May 1997)*	*(4)* *Event #3:* *JGTRRA03* *(May 2003)*
Tax Variables:				
CGRATE	0.017	-0.505***	0.025	-0.399***
	(0.35)	(-3.23)	(0.18)	(-3.54)
P-value for Differences across Coefficients				
RA78 = TRA97		—— [0.008] ——		
RA78 = JGTRRA03		———— [0.558] ————		
TRA97 = JGTRRA03			—— [0.014] ——	
DIVPEN	0.013	–	–	–
	(0.73)			
Control Variables:				
BETA	0.000	0.008*	0.003	-0.006
	(0.09)	(1.71)	(0.95)	(-1.04)
SIZE	0.002***	-0.003**	0.003***	0.000
	(3.53)	(-2.47)	(5.30)	(0.25)
BMR	0.010***	0.002	0.010***	0.011***
	(5.52)	(0.72)	(5.49)	(6.88)
INFL	-1.786*	-5.807**	4.417	-3.649*
	(-1.68)	(-2.35)	(1.57)	(-1.65)
Industry Fixed Effects	Included	Included	Included	Included
N	1,290,929	102,682	252,835	223,334
R^2	0.004	0.034	0.007	0.016

The table reports the relation between individual capital gains tax rates and expected returns for the full sample and in the 48-month periods surrounding each of three regulatory changes of capital gains tax rates in the United States: (1) the Revenue Reconciliation Act of 1978 (RA78), (2) the Taxpayer Relief Act of 1997 (TRA97), and (3) the Jobs and Growth Tax Relief and Reconciliation Act of 2003 (JGTRRA03). The table reports OLS coefficient estimates and (in parentheses) *t*-statistics based on robust standard errors clustered by firm and year from regressing realized buy-and-hold returns (*RET*) on the tax variable (*CGRATE*) plus controls. In Model 1, we also include *DIVPEN* in the estimation. For variable details see Table 7. We include an intercept and one-digit SIC industry fixed effects in the regressions, but do not report the coefficients. We also report *p*-values from *F*-tests comparing the *CGRATE* coefficients across events. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed).

Table A1: Panel of Personal Tax Rates for Capital Gains and Dividends Over the Period 1990 to 2004 (by Country)

Panel A: Maximum Statutory Capital Gains Tax Rates for Individuals (in Percent)

	1990	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Argentina	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Australia	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	23.5	23.5	23.5	23.5	23.5
Austria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Belgium	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brazil	30.0	30.0	30.0	30.0	25.0	25.0	25.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Canada	37.1	37.1	37.1	39.3	39.9	39.9	39.7	38.7	37.7	36.6	31.9	23.2	23.2	23.2	23.2
Chile	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	45.0	45.0	45.0	45.0	40.0	40.0	40.0
China	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Colombia	30.0	30.0	30.0	30.0	30.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Czech Republic	–	–	–	–	–	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denmark	0.0	0.0	0.0	0.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	43.0	43.0	43.0	43.0
Finland	23.8	27.8	27.9	25.0	25.0	25.0	28.0	28.0	28.0	28.0	29.0	29.0	29.0	29.0	29.0
France	18.1	18.1	18.1	19.4	19.4	19.4	19.4	20.9	20.9	26.0	26.0	26.0	26.0	26.0	26.0
Germany	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Greece	–	–	–	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hong Kong	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hungary	–	–	40.0	40.0	20.0	10.0	10.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	0.0
India	32.0	32.0	32.0	32.0	20.0	20.0	20.0	20.0	20.0	22.0	23.4	22.0	21.0	22.0	0.0
Indonesia	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Ireland	50.0	50.0	50.0	40.0	40.0	40.0	40.0	40.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Israel	–	–	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	15.0
Italy	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	12.5	12.5	12.5	12.5	12.5	12.5	12.5
Japan	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	26.0	10.0	10.0
Korea (South)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Malaysia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
New Zealand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Norway	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Pakistan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Peru	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Philippines	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Poland	–	–	40.0	40.0	45.0	45.0	44.0	44.0	44.0	0.0	0.0	0.0	0.0	0.0	19.0
Portugal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Russian Federation	–	–	–	–	–	0.0	35.0	35.0	35.0	35.0	35.0	13.0	13.0	13.0	13.0
Singapore	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.5	10.0	10.0
Spain	11.2	11.2	10.6	37.3	37.3	37.3	20.0	20.0	20.0	20.0	18.0	18.0	18.0	15.0	15.0
Sweden	25.0	25.0	25.0	25.0	25.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Switzerland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taiwan	0.6	0.6	0.6	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Thailand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turkey	50.0	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
United Kingdom	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
United States	28.0	28.0	28.0	28.0	28.0	28.0	28.0	20.0	20.0	20.0	20.0	20.0	20.0	15.0	15.0
Venezuela	30.0	30.0	30.0	30.0	34.0	34.0	34.0	34.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

(continued)

Table A1 (continued)

Panel B: Maximum Statutory Dividend Tax Rates for Individuals (in Percent)

	1990	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
Argentina	10.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Australia	15.2	15.2	15.2	23.0	23.0	19.5	19.8	19.5	19.5	19.5	22.0	26.4	26.4	26.4	26.4
Austria	25.0	25.0	25.0	25.0	22.0	22.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Belgium	25.0	25.0	25.0	25.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Brazil	13.0	13.0	13.0	0.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canada	41.3	42.1	43.1	46.8	47.9	47.9	35.1	34.3	33.4	32.7	32.3	31.3	31.3	31.3	31.3
Chile	35.0	35.0	35.0	35.0	33.0	30.0	30.0	30.0	45.0	45.0	35.3	35.3	32.9	28.6	28.1
China	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Colombia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Czech Republic	–	–	–	–	–	25.0	25.0	25.0	25.0	25.0	15.0	15.0	15.0	15.0	15.0
Denmark	46.9	45.0	45.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	43.0	43.0	43.0	43.0
Finland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
France	39.9	39.9	39.9	41.8	41.8	42.6	39.0	43.4	41.9	41.9	40.8	40.1	35.6	33.5	33.9
Germany	28.9	29.4	28.2	27.8	33.8	35.6	35.3	34.8	34.3	34.2	31.1	25.6	25.6	25.6	23.7
Greece	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hong Kong	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hungary	–	–	10.0	10.0	10.0	10.0	10.0	27.0	35.0	46.0	46.0	46.0	46.0	46.0	35.0
India	62.0	62.0	62.0	52.0	40.0	40.0	40.0	0.0	0.0	0.0	0.0	0.0	35.0	0.0	0.0
Indonesia	35.0	35.0	35.0	35.0	35.0	30.0	30.0	30.0	30.0	30.0	30.0	35.0	35.0	35.0	35.0
Ireland	35.8	35.7	32.0	30.7	30.7	32.0	32.5	34.4	39.9	39.3	44.0	42.0	42.0	42.0	42.0
Israel	–	–	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Italy	37.1	39.6	50.4	50.4	50.3	50.3	50.3	50.3	12.5	12.5	12.5	12.5	12.5	12.5	12.5
Japan	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	43.6	43.6	43.6	43.6	10.0
Korea (South)	55.0	55.0	55.0	55.0	48.5	48.0	48.0	48.0	48.0	44.0	44.0	44.0	39.6	39.6	39.6
Malaysia	35.0	35.0	35.0	34.0	34.0	32.0	30.0	30.0	30.0	30.0	29.0	29.0	28.0	28.0	28.0
Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	25.0	25.0	25.0	25.0
New Zealand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9	8.9	8.9	8.9	8.9
Norway	28.6	25.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0.0	0.0	0.0
Pakistan	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Peru	10.0	10.0	10.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	4.1
Philippines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	10.0	10.0	10.0	10.0	10.0
Poland	–	–	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	15.0	15.0	15.0	19.0
Portugal	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	20.0	20.0	20.0
Russian Federation	–	–	–	–	–	15.0	15.0	15.0	15.0	15.0	15.0	13.0	13.0	6.0	6.0
Singapore	33.0	33.0	33.0	30.0	30.0	30.0	28.0	28.0	28.0	28.0	28.0	26.0	22.0	0.0	0.0
South Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spain	46.0	46.0	46.0	46.0	46.0	38.4	38.4	38.4	38.4	27.2	27.2	27.2	27.2	23.0	23.0
Sweden	66.2	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Switzerland	40.9	40.9	41.5	42.4	42.4	42.4	42.4	42.4	42.4	42.4	42.1	41.5	41.0	40.4	40.4
Taiwan	40.0	40.0	40.0	15.0	15.0	15.0	15.0	15.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
Thailand	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	10.0	10.0	10.0	10.0	10.0	10.0
Turkey	50.0	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.2	31.2	31.2	23.5	22.5
United Kingdom	20.0	20.0	20.0	25.0	25.0	25.0	25.0	25.0	25.0	33.3	25.0	25.0	25.0	25.0	25.0
United States	28.0	31.0	31.0	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.1	38.6	15.0	15.0
Venezuela	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.0	34.0	34.0	34.0

Table A2: Additional Sensitivity Analyses of Conditional Relation between Capital Gains Tax Rates and Expected Returns

Models 3 to 5 in Table 3 Serve as Base Specification	*RET as Dependent Variable* (1) *CGRATE** $BETA_{High}$	*RET as Dependent Variable* (2) *CGRATE** MRP_{High}	*RET as Dependent Variable* (3) *CGRATE** RFR_{Low}	*COC as Dependent Variable* (1) *CGRATE** $BETA_{High}$	*COC as Dependent Variable* (2) *CGRATE** MRP_{High}	*COC as Dependent Variable* (3) *CGRATE** RFR_{Low}
(1) Alternative Control Variables:						
- Include MRP and RFR	-0.261***	-1.031***	-0.168***	-0.003	-0.079***	-0.043***
	(-10.10)	(-24.98)	(-4.37)	(-0.86)	(-16.78)	(-8.62)
- Include MRP and RFR_{real}	-0.261***	-1.307***	-0.365***	-0.001	-0.081***	-0.037***
	(-9.87)	(-31.85)	(-10.23)	(-0.16)	(-16.76)	(-7.53)
- Include GDP Growth	-0.259***	-1.024***	-0.281***	-0.003	-0.079***	-0.045***
	(-9.48)	(-23.10)	(-7.21)	(-0.87)	(-14.84)	(-9.02)
- Include Inflation	-0.246***	-1.027***	-0.266***	-0.003	-0.073***	-0.048***
	(-9.49)	(-24.68)	(-7.11)	(-0.91)	(-15.51)	(-9.88)
- Replace DIVPEN with DIVRATE	-0.263***	-1.025***	-0.315***	-0.003	-0.073***	-0.039***
	(-10.14)	(-24.86)	(-8.55)	(-0.76)	(-15.40)	(-8.29)
(2) Alternative Proxies for Market Risk Premium and Risk-Free Rate:						
- Return Variability (RETVAR)	–	-0.522***	–	–	0.001	–
		(-15.15)			(0.38)	
- Implied Risk Premium (MKTCOC)	–	-0.483***	–	–	-0.025***	–
		(-14.14)			(-6.41)	
- Median Beta (MEDBETA)	–	-0.605***	–	–	-0.053***	–
		(-17.72)			(-12.20)	
- Real Risk-Free Interest Rates (RFR_{real})	–	–	-0.479***	–	–	-0.032***
			(-13.87)			(-6.85)
(3) Alternative Clustering and Fixed Effects:						
- Two-Way Clustering by Firm and Year	-0.262***	-1.040***	-0.292	-0.003	-0.073***	-0.041***
	(-2.93)	(-3.25)	(-0.92)	(-0.73)	(-5.58)	(-4.78)
- Clustering by Country-Industry	-0.262***	-1.040***	-0.292	-0.003	-0.073***	-0.041***
	(-3.38)	(-5.02)	(-1.59)	(-0.49)	(-6.05)	(-3.18)
- Firm Fixed Effects	-0.247***	-0.689***	-0.094**	-0.004	-0.049***	-0.029***
	(-6.81)	(-14.89)	(-2.18)	(-1.04)	(-8.78)	(-5.32)
(4) Alternative Sample Composition:						
- All Countries with Data Available	-0.085***	-0.487***	-0.326***	-0.004	-0.062***	-0.010***
	(-4.62)	(-14.61)	(-14.22)	(-1.29)	(-13.58)	(-3.27)
- Limit Influence of Large Sample Countries (U.S.A. and Japan)	-0.102***	-0.636***	-0.006	-0.005	-0.043***	-0.045***
	(-3.66)	(-14.52)	(-0.16)	(-1.17)	(-7.70)	(-8.31)
- Eliminate ΔCGRATE Years	-0.240***	-1.013***	-0.304***	-0.004	-0.080***	-0.042***
	(-8.96)	(-23.20)	(-7.96)	(-1.17)	(-16.05)	(-8.34)
(5) Alternative Tax Rates:						
- Becker, Jacob, and Jacob (2013) Tax Rates	-0.226***	-0.978***	-0.133***	0.002	-0.039***	-0.011***
	(-10.16)	(-27.58)	(-4.58)	(0.55)	(-9.52)	(-3.16)

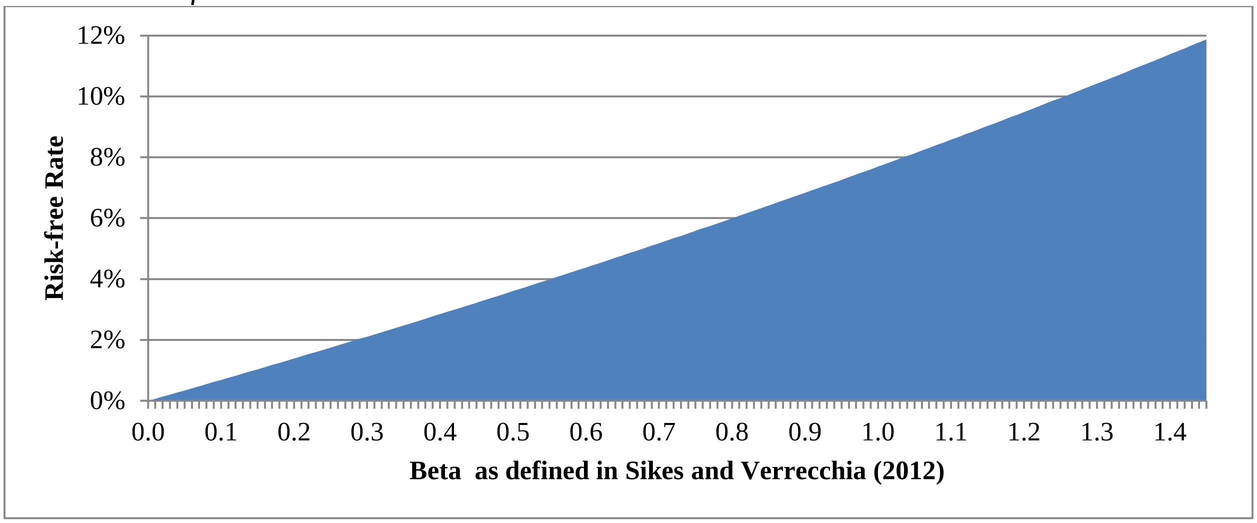
(continued)

Table A2 (continued)

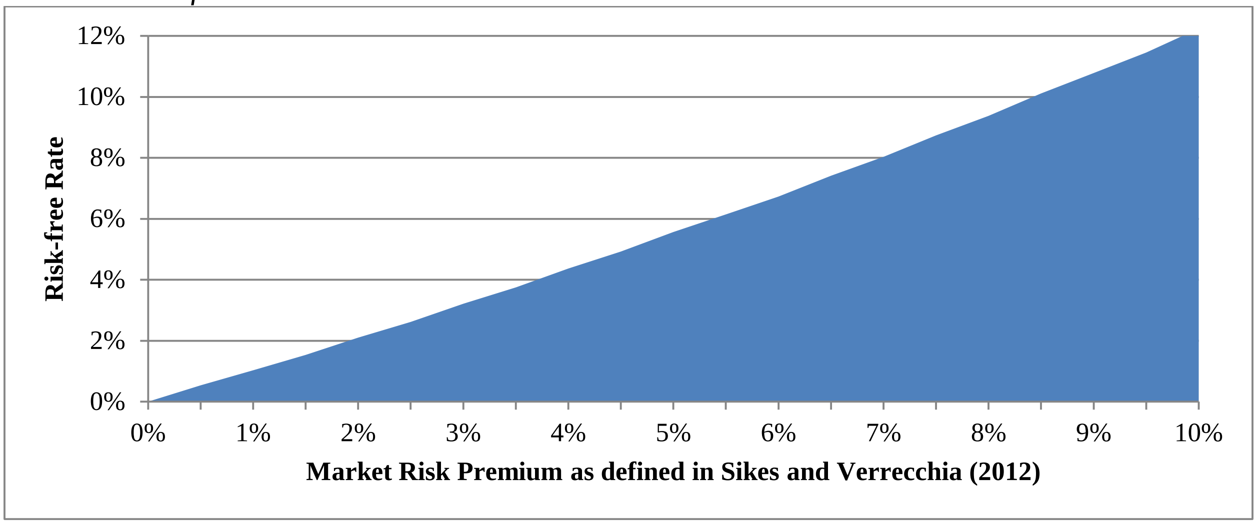
The table reports various sensitivity analyses of the conditional relation between individual capital gains tax rates and expected returns. The base sample comprises firm-year observations from 27 countries with non-zero capital gains tax rates over the 1990 to 2004 period (see Table 1). Buy-and-hold returns (*RET*) and implied cost of capital (*COC*) serve as dependent variables. We report results for the following specifications: First, we use alternative control variables and include the raw values of the market risk premium (*MRP*) and risk-free interest rate (*RFR*) in the model. We do this with nominal risk-free rates as well as with real risk-free rates, applying the following formula: $(1+RFR_{real})*(1+\text{Inflation}) = (1+RFR)$. We also either include the average annual growth in GDP over the previous three years or inflation measured as the annual change in the consumer price index as additional controls. Finally, we replace *DIVPEN* with *DIVRATE* in the model. Second, we employ different proxies for the computation of the market risk premium. Specifically, we use (i) the country-year standard deviation of daily returns on the local market index (*RETVAR*) in line with Mayfield (2004), (ii) the country-year value-weighted mean implied cost of capital less the risk-free rate (*MKTCOC*) in line with Damodaran (2012), and (iii) the country-year median of firms' systematic risk (*MEDBETA*) to create the binary indicator for high versus low market risk premium. We also use the real risk-free rates (RFR_{real}) to create the binary indicator for low versus high risk-free investment returns. Third, we use alternative fixed effects structures as well as alternative clustering criteria when computing standard errors. That is, we apply (i) two-way clustering by firm and year, (ii) clustering by country-industry combinations, and (iii) we replace the country and industry fixed effects with firm fixed effects. Fourth, we change the composition of the sample. That is, we (i) add all observations from countries without capital gains taxation for individuals (see Table A1 in the appendix), (ii) limit the influence of large sample countries by only including randomly selected 14,000 (5,000) firm-years for each the U.S.A. and Japan in the *RET* (*COC*) analyses, and (iii) drop observations in years with capital gains tax rate changes exceeding 5 percentage points ($\Delta CGRATE$) from the sample. Fifth, we replace our capital gains and dividend tax rates with the rates from Becker, Jacob, and Jacob (2013), Table 2, where available. Unless indicated otherwise, we include the full set of control variables and fixed effects (see Models 3 to 5 in Table 3), but only report OLS coefficient estimates (*t*-statistics with firm clustering) for the interaction term of *CGRATE* with the binary indicator variables representing firm-years with high systematic risk ($BETA_{High}$), high market risk premiums (MRP_{High}), and low risk-free rates (RFR_{Low}). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed).

Figure A1: Risk Parameters and the Relation between the Capital Gains Tax Rate and Expected Returns

Panel A: Risk-free Rate and Beta



Panel B: Risk-free Rate and Market Risk Premium



The shaded area in Panel A(B) shows the values of the risk-free rate and beta (market risk premium), as defined in Sikes and Verrecchia (2012), for which the derivative of expected returns with respect to the capital gains tax rate in equation (4) of Appendix 3 is negative, conditional on the assumed values for the other parameters. See Appendix 3 for details.