Capital Gains Tax Overhang and Payout Policy

(preliminary; please do not quote without consent of authors)

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ABSTRACT

Jin (2006) documents that tax-sensitive institutional investors with large embedded capital gains are reluctant to sell their shares, creating upward stock price pressure. This price pressure should reduce a firm's incentive to repurchase its shares. Consistent with this argument, we find that embedded capital gains of tax-sensitive institutional investors in a firm's stock reduce the probability that the firm repurchases shares and the number of shares repurchased. Controlling for these investors' holdings and the embedded gains of a combined set of tax-sensitive and tax-insensitive institutional investors allows us to account for selection- or performance-based alternative explanations. We also find that embedded capital gains of tax-sensitive institutional investors increase the probability that a firm pays a dividend and the amount of the dividend, suggesting that firms treat repurchases and dividends as substitutes. The results further our understanding of how investor-level taxes affect firms' payout decisions.

Absent agency conflicts, firm managers choose actions that maximize shareholder value. However, shareholders are not homogeneous and may have different preferences, complicating corporate decision-making even if agency conflicts are not present. One area of decision-making that should be especially sensitive to shareholder characteristics is payout policy, since the tax consequences of different forms of payout vary among shareholders. Prior literature has focused on how investor tax status conditions the selection of stocks with different payout profiles ("clientele" effects) and how firms set payout policy in response to perceived market-wide preferences ("catering"). However, how payout policy responds to the tax status of a firm's *existing* shareholder base has received less attention. As Graham (2006) argues in his recent review of the corporate finance and taxation literature, we still have much to learn about the effect of investor-level taxes on payout policy.

Existing studies classify shareholders by tax status and focus on how a firm's payout decisions vary with the holdings of shareholders in these different tax classes (e.g., Poterba and Summers 1985; Perez-Gonzalez 2000; Desai and Jin 2007). However, we contend that it is important to consider not just the size of these holdings but also the amount of capital gains embedded in them. It is well-documented that capital gains in a stock can create a "lock-in" effect: tax-sensitive investors are reluctant to sell shares and realize taxable gains (e.g., Feldstein, Slemrod, and Yitzhaki 1980; Landsman and Shackelford 1995; Reese 1998; Klein 2001, Blouin, Raedy and Shackelford 2003; Ivkovic, Poterba and Weisbenner 2005; Jin 2006; among others). Jin (2006) finds evidence that the order imbalance resulting from this supply constraint places upward pressure on the firm's stock price. This raises the cost (to non-tendering shareholders) of a share repurchase by the firm. We therefore predict that the probability that a firm repurchases shares and the number of shares that it repurchases, conditional on repurchasing, both decrease

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with the amount of capital gains embedded in tax-sensitive investors' holdings of the firm's stock.[1]

Consistent with our hypothesis, we find that the embedded capital gains of tax-sensitive institutional investors decrease both the probability that a firm repurchases shares and, conditional on a repurchase, the number of shares repurchased. We seek further evidence by examining the impact of exogenous tax regime changes. The capital gains rate was reduced from 28 percent to 20 percent in 1997 and from 20 percent to 15 percent in 2003. A reduction in the tax rate should reduce the tax overhang and therefore the effect of embedded capital gains in the holdings of tax-sensitive investors on repurchases. We find that the negative relationship between the probability of a repurchase and these embedded gains is significantly weaker in the period immediately after each tax cut than in the period immediately before. In fact, this relationship briefly becomes positive right after the 1997 tax cut. This result is consistent with the tax cut releasing a previously pent-up supply of shares from tax-sensitive institutional investors with embedded gains.[2]

The negative effect of capital gains tax overhang on share repurchases may lead to a reduction in overall payout level. Alternatively, firms may respond to the overhang by substituting dividends for repurchases. The prior literature is mixed regarding whether or not firms view repurchases and dividends as substitutes (e.g., Brown et al. 2007; Blouin et al. 2007; Fama and French 2001; Grullon and Michaely 2002). We find that dividends increase with the embedded gains of tax-sensitive institutional investors. Thus, dividends in our setting do indeed appear to be substitutes for repurchases.

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[1] Note that this argument does not require a firm's management to be aware of the composition of the firm's shareholders.
[2] We would expect the effect of the 1997 tax cut to be stronger than the effect of the 2003 cut, since the latter was a smaller tax cut and was also accompanied by a cut in the dividend tax rate.

This finding is contrary to the survey evidence of Brav et al. (2008), who report that the executives whom they polled responded that investor-level taxes are of second-order importance in their decisions to return capital via dividends as opposed to via repurchases. The authors conclude that this is probably due to fact that the marginal investor is likely to be an institutional investor, and many institutional investors are tax-insensitive. Our study identifies a set of tax-sensitive *institutional* investors and focuses on the effects of embedded capital gains of these investors on payout policy. The argument of Brav et al. (2008) would suggest that these investors are more likely to be marginal investors than are tax-sensitive *retail* investors.

A key feature of our approach is that we are able to control for the holdings of the tax-sensitive institutional investors as well as the embedded capital gains in the holdings of an aggregated set of both tax-sensitive and tax-insensitive institutional investors.[3] Establishing a causal relationship between shareholder tax status and payout policy is generally difficult, since investors may select stocks on the basis of their payout profile. This makes the results of existing papers difficult to interpret. Controlling for the holdings of tax-sensitive shareholders allows us to disentangle the direction of the relationship between tax status and payouts by filtering out any relationship that is driven by selection. Controlling for the capital gains of a larger set of institutional investors, some of whom are tax-insensitive, allows us to rule out the possibility that the long-run performance of the firm, rather than the capital gains tax overhang, is responsible for our results. Thus we are able to provide relatively uncontaminated evidence of the effect of shareholder tax status on payout policy.

Another possible criticism of existing studies is that they are based on the premise that managers are aware of the tax status of their shareholder base, which seems unrealistic for many

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[3] We compute embedded capital gains using the methodology of Huddart and Narayanan (2002), Frazzini (2006), and Jin (2006). See section II for a description of this methodology.

firms. Our hypothesis - that capital gains embedded in the holdings of tax-sensitive investors affect payout policy - requires no such assumption. If tax-sensitive investors have large embedded capital gains, then the firm's stock price will be high relative to the firm's fundamentals, as Jin (2006) shows. Management, aware that the firm's stock price appears relatively high, may respond by reducing repurchases even if it is unaware that the high price is driven by capital gains tax overhang.[4]

The paper proceeds as follows. In Section I, we review the relevant literature. Section II includes a summary of our data and empirical measures and methodologies. In Section III, we discuss the results. In Section IV, we offer concluding remarks.

I. Literature Review

This paper contributes to two streams of the literature. The first examines the relationship between investor-level tax preferences and payout policy. Within this literature, there are two primary hypotheses: (1) that investors select stocks based in part on the personal tax cost associated with firms' payout policies, and (2) that firms set payout policy to match the tax-driven preferences of their investors.[5] The second literature to which this paper contributes investigates whether investors' capital gains in a stock affect their willingness to sell their shares and realize taxable gains, and whether, as a result, these embedded gains affect the stock price.

Dividends have historically been taxed in the U.S. at a lower tax rate than capital gains. Even when, as is the case at present, the tax rate on dividends and capital gains are the same, capital gains are generally considered tax-advantaged because of an investor's discretion over the

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[4] We are able to more precisely distinguish between tax-sensitive and tax-sensitive investors by examining different types of institutional investors. We also have the advantage of being able to compute fairly precise estimates of the embedded capital gains of institutional investors each quarter using 13(f) filing data from Thomson Financial and following methods employed by Huddart and Narayanan (2002), Frazzini (2006), and Jin 2006.
[5] Graham (2006) reviews corporate finance literature on taxes and payout policy and we refer readers to it for a more extensive review of the literature.

timing of their realization. One would expect, then, that more tax-sensitive investors would prefer to hold stocks paying few or no dividends.

Many studies of investor-level tax preferences begin with the premise that retail investors are more tax-sensitive than institutional investors. Consistent with this premise, Graham and Kumar (2006) examine a sample of stock holdings and trades at a brokerage house from 1991 to 1996 and find that retail investors prefer non-dividend paying stocks while institutional investors prefer dividend paying stocks. As further evidence that institutional investors are less tax-sensitive, Dhaliwal et al. (1999) find that the percentage of a firm's shares owned by institutional investors increases by six percent in the year following a dividend initiation.

There is also evidence of variation in tax-sensitivity within both the retail and institutional investor groups. For example, Graham and Kumar (2006) find that retail investors in lower tax brackets tend to hold higher dividend yield stocks than retail investors in higher tax brackets.[6] Strickland (1996) finds that, among institutional investors, money managers, which are likely to be tax-sensitive, and mutual funds, which may also be tax-sensitive (Huddart and Narayanan 2002; Sialm and Starks 2008), hold low-dividend yield stocks, while untaxed institutions (i.e., pension funds) show no preference for low-dividend yield stocks.

While investors appear to take into account the match between their tax status and firms' payout policies in selecting stocks, firms may also tailor their payout policy to fit investor tax preferences. Consistent with this argument, Perez-Gonzalez (2000) finds that, on average, a U.S. firm pays out 30 percent fewer dividends if its largest shareholder is an individual than if it is an institution. Poterba and Summers (1985) find similar results for a sample of U.K. firms from 1950 to 1983. However, Brav et al. (2005) find in a survey of 384 financial executives that

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[6] Graham and Kumar (2006) also find that older investors hold higher dividend yield stocks than younger investors. They argue that this is consistent with behavioral self-control or regret-avoidance explanations.

executives believe institutions are in fact indifferent between dividends and repurchases and that payout polices have little impact on their investor clientele.

One limitation of the literature linking investor-level tax preferences to payout policy is that establishing the direction of causality is difficult. For example, a firm may pay low dividends because its investor base is tax-sensitive, or a low-dividend firm may have a tax-sensitive investor base because tax-sensitive investors choose to hold low-dividend stocks. Grinstein and Michaely (2005) confront the identification issue by estimating a VAR model in order to establish Granger causality. They find support for the idea that institutional investors prefer dividend-paying stocks, but not for the idea that firms adjust their payout policy in response to institutional holdings of their stock.

A larger set of papers have confronted the identification issue by treating the 2003 Tax Act as an exogenous shock to the tax consequences of both dividends and share repurchases, and the effect of its passage on payout decisions. The act, which was enacted in May 2003, reduced the dividend tax rate from 38.6 percent to 15 percent and the capital gains tax rate from 20 percent to 15 percent for individual investors. Graham (2006) argues that the sharp fall in the dividend tax rate should lead to an increase in payout through dividends, since the tax disadvantage of dividends was reduced significantly. Consistent with Graham's (2006) assertion, Chetty and Saez (2004) and Julio and Ikenberry (2004) both find that dividend initiations increased following the 2003 Tax Act. Chetty and Saez (2004) find that firms already paying a dividend increased the amount of dividends they paid, while Blouin et al. (2004) provide evidence that firms increased the amount of both regular and special dividends that they paid. Chetty and Saez

(2005) refine this set of results by showing that firms with relatively high levels of non-taxed institutional ownership did not increase dividends following the tax rate change.[7]

Of course, firms are unlikely to make dividend and repurchase decisions separately. Since the 2003 Tax Act reduced the tax rate on dividends by much more than it reduced the tax rate on repurchases, Blouin et al. (2007) predict that firms substituted from repurchases to dividends following its enactment, especially if they are owned primarily by individual investors. They find that this is indeed the case.[8] Also consistent with this argument, Brown et al. (2007) find that, relative to previous years, firms that initiated dividends in 2003 were more likely to reduce repurchases. While the 2003 Tax Act is plausibly exogenous, the prediction that it impacted payout policy by altering tax considerations may not be reasonable. For example, Brav et al. (2008) argue that the tax rate changes implemented by the act could not have been of first order importance for payout policy, since they applied only to retail investors and the marginal investor is more likely to be an institutional investor. In fact, Brav et al. (2008) find that aggregate repurchases have grown by a much larger percentage than aggregate dividends since the 2003 Tax Act.[9]

If, in fact, the marginal investor is an institutional investor, then perhaps a better avenue for investigating the interplay of investor tax preferences and payout policy is to exploit cross-sectional variation in the tax-sensitivity of institutional investors. Using the same Independent

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[7] Chetty and Saez (2005) also find that the response to the tax cut was greatest among firms whose executives had high share ownership. Similarly, Brown et al. (2007) find that executives with higher ownership were more likely to increase dividends after the 2003 Tax Act, and they find no relationship between executive ownership and dividend increases prior to the 2003 Tax Act.

[8] Blouin et al. (2007) note that just because they expect for firms to have substituted share repurchases with dividends following the 2003 Tax Act does not mean that they expect share repurchases to have declined. Rather, they claim that share repurchases should have increased since the capital gains tax rate for individual investors also decreased. However, Blouin et al. (2007) expect for the percentage increase in dividends to exceed the percentage increase in repurchases.

[9] The evidence in prior literature is mixed regarding whether or not firms view repurchases and dividends as substitutes (e.g., Brown et al. 2007; Blouin et al. 2007; Fama and French 2001; Grullon and Michaely 2002).

Adviser Public Disclosure (IAPD) database that we use, Desai and Jin (2007) identify the types of clients served by a sample of investment advisers. They then classify these institutional investors as tax-sensitive or tax-insensitive depending on the tax status of their clients, and use instrumental variables to isolate the effect of investor tax preferences on payout decisions and vice versa. Desai and Jin (2007) find support for effects in both directions.

The second literature to which this paper contributes examines the effect of capital gains lock-in on stock price. The lock-in effect holds that tax-sensitive investors demand compensation for the capital gains taxes that they owe upon realization of the gain. This lock-in effect constrains the supply of shares available in the market, and hence may create positive price pressure on the stock. Papers that document this price effect include Landsman and Shackelford (1995) in the case of RJR Nabisco's leveraged buyout, Reese (1998) in the case of initial public offerings, and Ayers, Lefanowicz, and Robinson (2003) in the case of premiums paid in mergers and acquisitions. In addition, Blouin, Raedy and Shackelford (2003) find temporary price increases around announcements of quarterly earnings and additions to the S&P 500 Index caused by investors deferring their sales of appreciated stocks until the capital gain qualifies for preferential long-term capital gains tax treatment.

Using the IAPD data, Jin (2006) finds that large cumulative capital gains discourage and that large cumulative capital losses encourage selling by institutions serving tax-sensitive clients. He does not find that this relationship holds for institutions serving tax-exempt clients. In addition, Jin (2006) finds that for stocks held primarily by tax-sensitive institutions, tax-related underselling by the tax-sensitive institutions with large cumulative capital gains impacts stock prices during large earnings surprises.

Our paper weds the two literatures that we have discussed in this section. Our prediction that the embedded capital gains of tax-sensitive institutional investors affect payout decisions is based on the capital gains lock-in effect documented in prior literature. However, our evidence can also be interpreted as indirect support for the existence of a lock-in effect, since there is no reason to expect a relationship between payout policy and embedded capital gains in the holdings of tax-sensitive investors in the absence of this effect. Although many papers study the effect of dividend tax capitalization (see Shackelford and Shevlin (2001) for a review), we are unaware of any paper that examines the effect of capital gains tax capitalization on payout policy.

II. Data, Measures, and Empirical Methodologies

A. Data

Institutional investment managers who exercise investment discretion of $100 million or more in Section 13(f) securities must report to the Securities and Exchange Commission (SEC) holdings of more than 10,000 shares or holdings valued in excess of $200,000. Data on these holdings are available from Thomson Financial. Thomson Financial divides institutional investors into the following five types: banks, insurance companies, investment companies (open-ended or closed-end mutual funds), independent investment advisers, and others (i.e., endowments, foundations, employee stock ownership plans, pensions, etc.).

In order to identify which institutional investors have tax-sensitive individual clients, we collect data on the client types of investment advisers using the SEC's Investment Adviser Public Disclosure (IAPD) database.[10] According to Abarbanell, Bushee and Raedy (2003), there is overlap between the investment companies and independent investment advisers in Thomson Financial. In addition, beginning in 1998, Thomson Financial misclassified many investment

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[10] http://www.adviserinfo.sec.gov/IAPD/Content/IapdMain/iapd_SiteMap.aspx

companies and independent investment advisers by including them in the type "other." Thus, we begin our search for investment adviser client types by compiling a list of all institutional investors classified as an investment company, an independent investment adviser, or "other" in Thomson Financial in years 1997 through 2005. We then check whether the institutional investor from Thomson Financial is in the IAPD database. If it is, we collect data on the investment adviser's client types.

The Form ADV, which SEC-registered investment advisers must file, lists the following ten client types: individuals (other than high net-worth individuals); high net-worth individuals; banking or thrift institutions; investment companies (including mutual funds); pension and profit-sharing plans (other than plan participants); other pooled investment vehicles (e.g., hedge funds); charitable organizations; corporations or other businesses not listed above; state or municipal government entities; and "others" such as non-U.S. government entities.[11] Investment advisers must provide the approximate percentage of their business represented by each client type: none, up to 10 percent, 11-25 percent; 26-50 percent; 51-75 percent; or more than 75 percent. We classify an institutional investor as "tax-sensitive" if over 50 percent of its clientele consists of high-net worth individuals.[12]

We also include in our analysis a larger group of institutional investors that includes both the tax-sensitive institutional investors just referenced as well as a set of investment advisers that are tax-*insensitive*. This allows us to examine the effect of capital gains embedded in the holdings of

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[11] The Form ADV, which registered investment advisers must file with the SEC, defines a "high net-worth individual" as "an individual with at least $750,000 managed by [the investment adviser], or whose net worth [the investment adviser] reasonably believes exceeds $1,500,000, or who is a 'qualified purchaser' as defined in section 2(a)(51)(A) of the Investment Company Act of 1940. The net worth of an individual may include assets held jointly with his or her spouse." The category "individuals" on the Form ADV includes trusts, estates, 401(k) plans and IRAs of individuals and their family members.

[12] Other papers that use the IAPD data to identify tax-sensitive institutional investors include Desai and Jin (2007), Jin (2006), Jin and Kothari (2008), and Sikes (2008).

tax-sensitive investors while controlling for gains in general. This is important, since firms are known to repurchase more shares after periods of stock price appreciation. The tax-insensitive investors that we include in this group are investment advisers with over 50 percent of their clients consisting of pensions, state & local governments, or charitable organizations. We identify 376 "tax-sensitive" institutional investors and 145 "tax-insensitive" institutional investors.

The sample period for our main tests is 1995-2007. This contrasts with Jin (2006), who uses similar data but begins his sample in 1980. We only observe a snapshot of the IAPD data on investment adviser client types as of the end of 2006. The IAPD data is available on the SEC's website for all investment advisers that are currently registered with the SEC or were registered with the SEC over the previous two years. The further back we go in our merging of the IAPD clientele data with the quarterly holdings data from Thomson Financial, the more our measures of the embedded capital gains and holdings of the institutional investors are underestimated in the earlier years of our sample period. This is because we are only able to classify an investment adviser as tax-sensitive or as tax-insensitive if the investment adviser is currently registered with the SEC or was registered in the previous two years.[13]

B. Measures

We follow prior studies (Huddart and Narayanan 2002; Frazzini 2006; Jin 2006) in developing our measure of institutional investors' cumulative capital gains. Using quarterly holdings data from Thomson Financial and stock price data from the Center in Research on Security Prices (CRSP), we measure the capital gain by institutional investor, by firm, by quarter. In measuring the gain, we assume that the institutional investor uses highest-in first-out

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[13] To our knowledge, Jin (2006) and Desai and Jin (2007) face the same issue with the IAPD data. In untabulated sensitivity tests, we expand our sample period to 1980-2007. The results are qualitatively the same as those reported in the paper.

(HIFO) in calculating realized gains on sales. Under U.S. tax law, institutions can designate the

lot of stocks to be sold. With highest-in, first-out, an institution sells shares that it purchased at

the highest price first in order to minimize capital gains or maximize capital losses.[14] We use the

turnover-weighted average daily closing price over the quarter to estimate the purchase or sales

price.[15] Consistent with the standard approach in corporate finance studies, we exclude from the

sample firms in the financial services industry (SIC codes in the 6000s) and utilities (SIC codes

in the 4900s).

C. Research Design

C.1   Embedded Capital Gains & Probability of Repurchase

We first estimate the effect that tax-sensitive institutional investors' embedded capital gains

have on the probability that a firm will repurchase shares. We estimate the following probit

regression:

Repurchase = α + β_1CapGains(TaxSensitive) + β_2CapGains(All) + β_3Holdings(TaxSensitive)

+ β_4Holdings(All) + β_5Return_Lag1 + β_6Return_Lag2 + β_7Return_Lag3 + β_8Return_Lag4 +

β_9CashFlow/Assets + β_{10}Cash/Assets + β_{11}Market/Book + β_{12}Dividends/Income +

β_{13}Ln(Assets) + β_{14}(Leverage-TargetLeverage) + ε (1)

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[14] Jin (2006) calculates his measure of an institution's cumulative capital gain (1) assuming that institutions sell shares proportionally (i.e., all shares are equally likely to be sold, regardless of purchase date and tax basis) and (2) assuming HIFO. His empirical results do not differ qualitatively between the two methods; thus, he reports the results using the HIFO method. Moreover, he refers readers to Dickson, Shoven, and Sialm (2000) who discuss the benefit of using the HIFO allocation rule when selling stocks.

[15] For robustness, Jin (2006) calculates the purchase price using three different measures: closing price at the end of the quarter, average of beginning- and end-of-quarter prices, and turnover weighted average daily closing price during the quarter. His results are qualitatively the same regardless of which measure he uses. He tabulates the results using the turnover weighted average daily closing price.

For brevity, we omit subscripts. Observations are firm-quarter. The dependent variable is measured in quarter q, and with the exception of Return_Lag2, Return_Lag3, and Return_Lag4, all independent variables are measured in quarter q-1.[16]

The dependent variable *Repurchase* equals one if the firm repurchases stock during the quarter and zero otherwise. We consider a repurchase to have occurred if repurchases/assets is greater than 0.01.[17] Following Blouin and Krull (2008), we measure repurchase as a change in treasury stock (quarterly Compustat data98) scaled by worldwide assets (data44). If there is a net decrease in treasury stock, we set repurchases equal to zero. For those firms that do not use the treasury stock method, we measure net repurchases as total repurchases from the statement of cash flows (data93) less decreases in preferred stock (data55). Our primary independent variable of interest is *CapGains(TaxSensitive)*, which equals the capital gains embedded in the holdings of tax-sensitive institutional investors in a firm's stock divided by the firm's market capitalization. As explained above, in measuring the embedded capital gains of tax-sensitive institutional investors, we assume that the institutional investors follow the highest-in first-out method for sales and we use a turnover-weighted average price over the quarter to determine basis and sales price. We expect a negative coefficient on *CapGains(TaxSensitive)*, consistent with the amount of the embedded capital gains of tax-sensitive institutional investors being negatively associated with the probability that a firm will repurchase shares.

The embedded capital gains of tax-sensitive institutional investors may appear to affect repurchases simply because these gains proxy for the long-run performance of the firm, which may be independently linked to payout policy. We therefore control for the combined capital

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[16] As explained in Section IV, we also estimate the probit regression where we replace CapGains(TaxSensitive) and CapGains(All) with CapGains(TaxSensitive)/CapGains(All) and replace Holdings(TaxSensitive) and Holdings(All) with Holdings(TaxSensitive)/Holdings(All).

[17] Similarly, Dittmar (2000) requires repurchases scaled by market value to be greater than 0.01.

gains of both tax-sensitive and tax-insensitive institutional investors. This control aids in the identification of the effect of capital gains tax overhang on repurchases. *CapGains(All)* equals gains embedded in the holdings of both the tax-sensitive and tax-insensitive institutional investors, divided by the firm's market capitalization.

We also account for the possibility of clientele or catering effects by controlling for *Holdings(TaxSensitive)* and *Holdings(All)*. *Holdings(TaxSensitive)* equals the end-of-quarter holdings of tax-sensitive institutional investors, divided by total firm assets. *Holdings(All)* equals the end-of-quarter holdings of both tax-sensitive and tax-insensitive institutional investors, divided by the firm's market capitalization. Since we observe the holdings of only a small fraction of all investors, the holdings variable should generally not be large. To mitigate the effects of possible outliers, we drop observations where *Holdings(All)* exceeds 0.5.

We chose the remaining control variables based on Dittmar (2000), who investigates the relationship between share repurchases and various motives for share repurchases put forth in prior literature (e.g., distribute excess cash flow, signal undervaluation, alter leverage ratios, fend off takeover attempts, counter the dilution effects of stock options). The undervaluation hypothesis predicts that firms repurchase their shares when their stock is undervalued. As explained by Dittmar (2000), one cannot determine with certainty if a firm is undervalued; however, a history of low returns is one indication of undervaluation. Thus we control for prior stock market performance. The variable *Return_Lag1* equals the quarterly stock return in quarter q-1. The variables *Return_Lag2*, *Return_Lag3*, and *Return_Lag4* are the quarterly stock returns over quarter q-2, q-3, and q-4, respectively.[18]

In a survey of 384 financial executives, Brav et al. (2005) find that firms repurchase shares when they have residual cash flow after investment spending. The variable *CashFlow/Assets*

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[18] Controlling for market-adjusted returns instead of raw returns has a negligible impact on the results.

equals the ratio of net income before taxes plus depreciation and changes in deferred taxes and other deferred charges to total assets. The variable *Cash/Assets* equals the ratio of cash and equivalents to total assets. As explained by Dittmar (2000), if a firm's need to distribute excess capital significantly affects its repurchase decision, then *CashFlow/Assets* and *Cash/Assets* will be positively related to the probability of repurchasing, holding investment opportunities constant. The variable *Market/Book* controls for a firm's investment opportunities and equals the market value of equity plus debt divided by the book value of assets.

We include the variable *Dividends/Income* to control for the possibility that firms that pay fewer dividends are more likely to repurchase shares. It equals the ratio of cash dividends paid to net income.

We include the natural log of a firm's total assets, *Ln(Assets)*, to control for information asymmetry. The undervaluation hypothesis holds that one reason that a firm repurchases shares is to signal to investors that the firm is undervalued. In order for the undervaluation hypothesis to hold true, there must be information asymmetry between managers and investors. According to Vermaelen (1981), information asymmetry is likely to be greater among smaller firms since analysts and the popular press are less likely to follow smaller firms.

The leverage hypothesis predicts that a firm repurchases shares when the firm's leverage ratio is less than the firm's target leverage ratio. To control for this possibility, we include the variable *Leverage-TargetLeverage*, which equals the difference between a firm's net debt-to-asset ratio (where debt is measured as debt minus cash and equivalents) and the firm's target net leverage ratio. Following Dittmar (2000), we measure a firm's target leverage ratio as the median net debt-to-asset ratio of all firms with the same two-digit code. A negative coefficient on *Leverage-TargetLeverage* will support the leverage hypothesis.

All of the control variables from Dittmar (2000) are winsorized at the 1ˢᵗ and 99ᵗʰ percentiles to mitigate the effects of possible outliers. An observation is excluded from the study if any of the above variables is missing for the firm-quarter.

C.2   Embedded Capital Gains & Amount Repurchased

Next, we examine whether the size of the embedded capital gains of tax-sensitive institutional investors is negatively associated with the amount of shares repurchased by the firm, conditional on the firm repurchasing shares (i.e., repurchases/assets $\geq$ 0.01). We estimate an OLS regression with firm fixed effects where the dependent variable equals repurchases divided by total assets, winsorized at the 99th percentile, and the independent variables are the same as those in regression (1). As explained above, we follow Blouin and Krull (2008) in constructing our measure of repurchases, and similar to Dittmar (2000), we set the variable *Repurchase/Asset* equal to zero if repurchases/total assets is less than or equal to 0.01. All of our predictions for the independent variables in the OLS regression are the same as they are in the probit regression.

C.3   Embedded Capital Gains & Probability of Repurchase-Tax Regime Changes

Next, we examine whether the relationship between embedded capital gains of tax-sensitive institutional investors and firms' repurchase decisions varies across tax regimes. As mentioned above, the 2003 Tax Act reduced the divided tax rate from 38.6 percent to 15 percent and the capital gains tax rate from 20 percent to 15 percent for individual investors. The capital gains tax rate is the rate that applies to gains from stock repurchases. We expect that embedded capital gains of tax-sensitive institutional investors will have a larger negative effect on the probability that a firm repurchases shares during the quarters prior to the 2003 Tax Act when the capital gains tax rate was 20 percent (versus 15 percent following the 2003 Tax Act).

Because the 2003 Tax Act changed the dividend tax rate in addition to the capital gains tax rate, which likely affected a firm's overall payout policy, we also examine changes around the Taxpayer Relief Act of 1997 (the 1997 Tax Act). The 1997 Tax Act changed the capital gains tax rate that applies to individual investors but did not change the dividend tax rate. On May 7, 1997, the capital gains tax rate that applies to capital gains of individual investors decreased from 28 percent to 20 percent.[19] Similar to our expectation regarding changes in repurchase behavior surrounding the 2003 Tax Act, we expect that the negative relationship between embedded capital gains of tax-sensitive institutional investors and the probability that a firm repurchases shares to be stronger during the quarters prior to the 1997 Tax Act when the capital gains tax rate was 28 percent (versus 20 percent after the 1997 Tax Act).

In order to test the differential effects before and after the 1997 and 2003 Tax Acts, we re-estimate the probit regression outlined above twice: once for the 1997 Tax Act and once for the 2003 Tax Act. We include an indicator variable ($I_{pre\text{-}taxcut}$) to test whether the relationship between the probability of repurchase and the size of the tax-sensitive investors' embedded capital gain varies across tax regimes. The 1997 Tax Act reduced the tax rate on capital gains of individual investors from 28 percent to 20 percent and became effective in May 1997. We exclude observations from the second quarter of 1997. The sample includes the nine quarters before and the nine quarters after the second quarter of 1997. The indicator variable $I_{pre\text{-}taxcut}$ equals one for the nine quarters before the second quarter of 1997, and equals zero for the nine quarters following the second quarter of 1997. The 2003 Tax Act was enacted in May 2003. Although the tax rate changes applied retroactively to the beginning of 2003, firms would not have known this when they decided whether or not to repurchase shares during the first quarter of 2003. Thus, we exclude the second quarter of 2003 and set $I_{pre\text{-}taxcut}$ equal to one for the nine

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[19] The rate change was announced on May 2, 1997.

quarters preceding the second quarter of 2003 and equal to zero for the nine quarters following the second quarter of 2003. We interact the indicator variable $I_{pre-taxcut}$ with *CapGains(TaxSensitive)*, *CapGains(All)*, *Holdings(TaxSensitive)*, and *Holdings(All)*. For both tax rate changes, we expect the coefficient on *CapGains(TaxSensitive)* × $I_{pre-taxcut}$ to be negative, consistent with the negative relationship between the amount of embedded capital gains of tax-sensitive institutional investors and a firm's probability of repurchasing shares being stronger when the capital gains tax rate is higher.

C.4   Embedded Capital Gains & Probability of Paying Dividend

A firm that forgoes or reduces repurchases in response to a capital gains tax overhang might simply retain the cash that it would have used to repurchase shares. Alternatively, such a firm might pay extra dividends to distribute the cash. Embedded capital gains effectively reduce the tax advantage of repurchases relative to dividends as a means of distributing cash to shareholders. To test whether firms substitute dividends for repurchases when facing a capital gains tax overhang, we estimate a probit regression where the dependent variable is an indicator variable equal to one if the firm pays a dividend during the quarter and equal to zero otherwise. The independent variables are the same as those in regression (1).

If large embedded capital gains of tax-sensitive institutional investors are positively associated with the probability that a firm will pay a dividend, then the coefficient on *CapGains(TaxSensitive)* will be positive. We also estimate an OLS regression with firm fixed effects where we investigate the effect of embedded capital gains of tax-sensitive institutional investors on the amount of dividend paid. The dependent variable equals the amount of dividends paid scaled by total assets. The independent variables are the same as those in

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regression (1), with the exception of dividends/income, which is excluded because dividends now represent the dependent variable.

III. Empirical Results

Table I presents summary statistics for the key variables in the sample used in our study. *Repurchases/assets*, which can be found in the first row of the table, are summarized only for observations for which repurchases/assets greater than or equal to 0.01. This represents 8.8 percent of all observations in the sample. *CapitalGains(TaxSensitive)/CapitalGains(All)* cannot be computed if neither tax-sensitive nor tax-insensitive investors have a gain embedded in the stock, leaving only 82,853 observations for this variable.

We begin our analysis by examining whether the probability that a firm undertakes a repurchase is affected by the embedded capital gains of tax-sensitive institutional investors using a probit specification. Table II reports the results. The observations are firm-quarters over the years 1995-2007. Heteroskedasticity-robust standard errors clustered at the firm level are reported in parentheses below the coefficient estimates. All regressions include quarter fixed effects. The constant term is omitted from the presentation of all results in the paper for brevity.

In the first column, we include only four independent variables: capital gains and holdings for tax-sensitive institutional investors as well as for tax-sensitive and tax-insensitive institutional investors combined. As predicted, the coefficient on *CapGains(TaxSensitive)* is negative and statistically significant at the 5% level. This indicates that the likelihood that a firm repurchases shares does indeed decrease with the embedded capital gains of tax-sensitive institutional investors. The coefficient on *CapGains(All)* is positive and significant. This may indicate that firms with better long-run performance are more likely to repurchase shares. We return to this possible explanation shortly. At the bottom of the table, we report the marginal

effects of the capital gains and holdings variables, estimated at the mean value of each of the independent variables. The marginal effect of *CapGains(TaxSensitive)* equals -0.512. The standard deviation of *CapGains(TaxSensitive)* equals 0.015. In terms of economic significance, a one standard deviation increase in *CapGains(TaxSensitive)* leads to an 0.75 percent increase in the probability of a repurchase taking place, which is 8.89 percent of the unconditional probability of 8.44 percent.

In column (2), we report the results of estimating the probit regression with all of the control variables included. The coefficient on *CapGains(TaxSensitive)* remains negative and is now statistically significant at the 1% level. The coefficient on *CapGains(All)* remains positive and significant. The coefficient on *Holdings(TaxSensitive)* is positive and significant at the 1% level, suggesting that all else equal, ownership by tax-sensitive institutional investors is positively associated with the probability that a firm will repurchase shares. This is consistent with tax-sensitive individual investors (and the institutional investors trading on their behalf) preferring stocks that repurchase shares to stocks that do not repurchase shares, holding all else constant.

All of the lagged stock return variables in column (2) are negative and statistically significant at the one percent level. This suggests that the worse a firm's recent stock market performance, the more likely it is to repurchase shares, and is consistent with the undervaluation hypothesis. The coefficient on *CashFlow/Assets* is positive and significant at the 1% level, suggesting that a firm's decision to repurchase shares is positively associated with its need to distribute excess capital. The positive and significant coefficient on *Market/Book* suggests that more valuable firms are more likely to repurchase shares. The positive coefficient on *CapGains(All)* and *Market/Book*, combined with the negative coefficients on lagged returns, are consistent with

firms repurchasing shares after periods of good long-run performance but poor short-run performance.

The coefficient on *Dividends/Income* is positive and significant, suggesting that repurchasing shares is positively associated with the amount of dividends that a firm pays and that the two forms of payout methods are not substitutes for one another but rather complements. The coefficient on *Ln(Assets)* is positive and significant, suggesting that larger firms are more likely to repurchase shares. Unlike the interpretation of the negative and significant coefficients on the lagged return variables, the positive and significant coefficient on *Ln(Assets)* is inconsistent with the undervaluation hypothesis, which predicts that smaller firms with greater information asymmetry between managers and investors are more likely to repurchase shares than larger firms where there is less information asymmetry. The coefficient on *Leverage-TargetLeverage* is negative and significant. This result supports the leverage hypothesis, which predicts that firms repurchase shares when the firm's leverage ratio is less than the firm's target leverage ratio.

As the coefficient on *Ln(Assets)* suggests, small firms are less likely to repurchase stocks. For example, the unconditional probability that a firm in the sample with a market capitalization of $1 billion or less repurchases stocks in a given quarter is 5.59 percent, compared to 16.66 percent for firms with a market capitalization exceeding $1 billion. To focus on the set of firms with a reasonably high ex ante probability of repurchasing stock, we restrict the sample to firms with a market capitalization exceeding $1 billion in column (3). The number of observations falls from 110,422 to 28,490, and the Pseudo R-squared is slightly lower than in column (2).

Although the statistical significance of *CapGains(TaxSensitive)* declines to the 10 percent level, the economic significance more than doubles when the minimum size requirement is

imposed, with the marginal effect increasing in magnitude from -0.530 in column (2) to -1.323 in column (3). With the exception of the coefficients on *Holdings(All)*, *Market/Book*, and *Leverage-TargetLeverage*, which are insignificant in column (3), the results for the control variables are qualitatively the same in column (3) as they are in column (2).

Columns (1) through (3) present results on the effect of tax-sensitive investors' embedded capital gains on the probability of a repurchase, controlling for the capital gains of the broader set of tax-sensitive and tax-insensitive investors. An alternative is to simply look at the effect of the percentage of embedded capital gains of both tax-sensitive and tax-insensitive investors in the sample that belong to tax-sensitive investors. In column (4), we remove the variables *CapGains(TaxSensitive)*, *CapGains(All)*, *Holdings(TaxSensitive)*, and *Holdings(All)*, and add the variables *CapGains(TaxSensitive)/CapGains(All)* and *Holdings(TaxSensitive)/Holdings(All)* in their place.

Consistent with our prediction, the coefficient on *CapGains(TaxSensitive)/CapGains(All)* is negative and significant (at the 10% level), further supporting to our expectation that embedded capital gains of tax-sensitive institutional investors are negatively related to the probability that a firm repurchases shares. Consistent with the positive and significant coefficient on *Holdings(TaxSensitive)* in columns (2) and (3), the coefficient on *Holdings(TaxSensitive)/Holdings(All)* is positive and significant. With the exception of the coefficient on *Dividends/Income*, which is insignificant in column (4), the results for the control variables in column (4) are qualitatively the same as they are in column (2).

The results in Table II support the hypothesis that a firm is less likely to repurchase shares when tax-sensitive institutional investors have large capital gains embedded in the firm's stock. We next investigate whether an increase in tax-sensitive investors' embedded capital gains leads

a firm to repurchase fewer shares, conditional on a repurchase occurring. Table III presents the results of this investigation using OLS regressions with firm fixed effects. The observations are firm-quarters over the years 1995-2007. All regressions include quarter fixed effects. Heteroskedasticity-robust standard errors clustered at the firm level are reported in parentheses below the coefficient estimates.

In column (1), only the capital gains and holdings variables are included as independent variables in the regression. Consistent with our expectation, the coefficient on *CapGains(TaxSensitive)* is negative and significant at the 10% level, suggesting that embedded capital gains of tax-sensitive institutional investors have a negative impact on the amount of shares that a firm repurchases. The point estimate implies that a one standard deviation increase in the embedded capital gains of tax-sensitive institutional investors results in an decrease in the amount repurchased, conditional on a repurchase, which is approximately eight percent and 12 percent of the unconditional mean and median repurchase amount, respectively.

Column (2) reports the results with inclusion of all of the control variables. The coefficient on *CapGains(TaxSensitive)* remains negative and statistically significant at the 10% level. Consistent with the probit regression results in Table I, the coefficients on *CashFlow/Assets* and *Market/Book* are positive and statistically significant and the coefficients on *Dividends/Income* and *Leverage-TargetLeverage* are negative and statistically significant. Unlike in the probit regression results in columns (2) and (3) of Table II that suggest that dividends and repurchases are perhaps compliments, the coefficient on *Dividend/Income* is negative and significant, suggesting that the greater the amount of dividends a firm pays as a percent of income, the less the firm repurchases as a percent of assets.

As we did in column (3) of Table II, we remove from the sample all firms with a market capitalization of less than $1 billion and re-estimate the effect of the capital gains of tax-sensitive investors. The results are shown in column (3). The coefficient on *CapGains(TaxSensitive)* increases in magnitude to -0.420 and is statistically significant at the 1% level. In column (4), we remove the variables *CapGains(TaxSensitive), CapGains(All), Holdings(TaxSensitive),* and *Holdings(All),* and add the variables *CapGains(TaxSensitive)/CapGains(All)* and *Holdings(TaxSensitive)/Holdings(All).* Consistent with the negative coefficient on *CapGains(TaxSensitive)* in columns (1)-(3), the coefficient on *CapGains(TaxSensitive)/CapGains(All)* is negative and significant at the 10% level.

We believe that controlling for the holdings of tax-sensitive investors and the capital gains of the larger set of tax-sensitive and tax-insensitive investors allows us to cleanly identify the effect of the embedded capital gains of tax-sensitive investors on repurchases. However, to provide further support for our hypothesis, we now investigate whether the effect of these capital gains on repurchases is stronger when the capital gains tax rate is higher, as one would expect if a capital gains tax overhang is indeed driving the results. Table IV presents the results of this investigation.

Column (1) of Table IV studies the effect of changes surrounding the 1997 Tax Act, which reduced the capital gains tax rate for individual investors from 28 percent to 20 percent. The second studies the effect of changes surrounding the 2003 Tax Act, which reduced the rate from 20 percent to 15 percent. In each column, we estimate a probit regression in which the dependent variable is an indicator taking a value of one if a repurchase took place and zero otherwise. We utilize in each an indicator variable $I_{pre\text{-}taxcut}$ that equals one (zero) for the nine quarters preceding (following) the quarter in which the tax cut was enacted (we exclude the

quarter in which the tax cut was enacted). In addition to including this indicator variable separately in the regression specification, we interact this variable with the capital gains and holdings variables. Both regressions include quarter fixed effects. Heteroskedasticity-robust standard errors clustered at the firm level are reported in parentheses below the coefficient estimates.

For each of the tax cuts, the coefficient on the interaction $CapGains(TaxSensitive) \times I_{pre\text{-}taxcut}$ is negative and significant, suggesting that the negative relationship between embedded capital gains of tax-sensitive institutional investors and the probability that a firm will repurchase shares is stronger when the capital gains tax rate for individual investors is higher. The coefficient on $CapGains(TaxSensitive)$ is negative but statistically insignificant. Consistent with the results in Table II, the coefficient on $CapGains(All)$ is positive and significant at the 10 percent level for the 1997 tax cut and at the five percent level for the 2003 Tax Cut. The coefficient on $CapGains(All) \times I_{pre\text{-}taxcut}$ is positive and statistically significant for both tax cuts.

To further investigate the effects of the exogenous change in capital gains tax rates on the response of repurchases to the embedded capital gains of tax-sensitive institutional investors, we run the probit regression in column (2) of Table II cross-sectionally quarter-by-quarter. The time series of the marginal effect of $CapGains(TaxSensitive)$ is plotted in Figure I. The dashed lines indicate the two quarters (1997Q2 and 2003Q2) in which the capital gains tax cuts were enacted. Consistent with the results in Table IV, an increase in the marginal effect is observable around both the 1997 and 2003 tax cuts.

In fact, in the four quarters after the 1997 tax cut, which was the larger of the two tax cuts, the marginal effect of embedded capital gains in the holdings of tax-sensitive investors is actually positive. This pattern suggests a dynamic story of repurchase decisions. Firms appear

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to have avoided repurchasing shares when tax-sensitive institutional investors had large embedded capital gains prior to the second quarter of 1997 (when the tax cut was enacted) because of the high capital gains tax rate. There was effectively pent-up supply of the stock of these firms because tax-sensitive institutional investors were reluctant to sell. The 1997 tax cut released some of this pent-up supply by reducing the cost of selling for these tax-sensitive institutional investors. As a result, firms with tax-sensitive institutional investors with large embedded capital gains were more likely to repurchase shares after the tax cut to effectively absorb the released supply of shares. As a result, the marginal effect is positive from the third quarter of 1997 through the second quarter of 1998. After firms had absorbed the released pent-up supply, the effect of embedded capital gains of tax-sensitive institutional investors on the probability of repurchasing became negative again.

The evidence presented thus far indicates that firms are less likely to repurchase shares and repurchase fewer shares when their tax-sensitive investors have embedded capital gains. Faced with the price pressure created by capital gains overhang, firms may simply reduce their payouts to shareholders. Alternatively, if firms have at least a loose payout target, they may simply shift their payouts from repurchases to dividends. We next investigate whether capital gains overhang results in greater dividend payment.

Table V presents the results of this investigation. We examine the effects of embedded capital gains on both the probability that a firm pays dividends and the amount of the dividend paid, conditional on a dividend being paid. Columns (1) and (2) replicate the probit specifications of columns (2) and (3) from Table II, with the exception that the dependent variable is now an indicator variable for dividends rather than an indicator variable for repurchases. We examine the effect for all firms in the sample (column (1)) and for firms with a

market capitalization greater than $1 billion (column (2)), since in general small firms are less likely to repurchase shares. Likewise, columns (3) and (4) replicate the OLS regression with firm fixed effects from columns (3) and (4) of Table III, the dependent variable (repurchases/assets) replaced by dividends/assets. For consistency, we use the same set of control variables that we use in Tables II and III, though we exclude the control variable *Dividend/income*, since dividends are the independent variable. The observations are firm-quarters over the years 1995-2007. Heteroskedasticity-robust standard errors clustered at the firm level are reported in parentheses below the coefficient estimates.

In column (1), the coefficient on *CapGains(TaxSensitive)* is positive and significant. This indicates that an increase in the embedded capital gains of tax-sensitive institutional investors increases the probability that a firm pays a dividend. As anticipated, column (2) shows that this result is larger when we restrict the sample to large firms. In column (3), the coefficient on *CapGains(TaxSensitive)* is again positive and significant. This indicates that an increase in the embedded capital gains of tax-sensitive institutional investors increases the amount of dividends that a firm pays, conditional on the firm paying a dividend. As column (4) shows, the result is stronger when we restrict the sample to large firms.

The results in Table V, combined with the results in Tables II and IV that the probability that a firm repurchases shares decreases with the amount of the embedded capital gains of tax-sensitive institutional investors, suggest that firms treat repurchases and dividends as substitutes. However, this finding is inconsistent with the results of Desai and Jin (2007). They find that tax-sensitive institutional investors own significantly fewer shares in firms with higher dividend payouts. Moreover, they find that the negative relationship between ownership by tax-sensitive institutional investors and the amount of dividends a firm pays is explained by these institutions

gravitating towards low dividend paying firms and by firms altering their payout policy to the preferences of their institutional investors.[20]

IV. Conclusion

In this paper, we examine the effect of investor level taxes on payout policy from a completely new angle. Prior papers that study the effect of investor-level taxes on payout policy primarily focus on the dividend tax rate. We focus on the capital gains tax rate. We test whether the capital gains tax overhang, in the form of embedded capital gains in the holdings of tax-sensitive investors, impacts corporate payout policy. We find that gains embedded in the holdings of tax-sensitive investors reduce both the probability and level of share repurchases. This supports our contention that the upward price pressure from the supply constraint created by the reluctance of tax-sensitive investors to sell shares with embedded gains makes firms reluctant to repurchase stock. Controlling for the holdings of tax-sensitive investors and for gains embedded in the aggregated holdings of tax-sensitive and tax-insensitive investors allows us to disentangle the causal effect of gains embedded in the holdings of tax-sensitive investors alone. Furthermore, we show that two exogenous reductions in the capital gains tax rate both decreased the effects of these embedded gains on repurchases.

It is well-established that firms are more likely to repurchase shares after periods of low returns and less likely to purchase shares after periods of high returns. A common explanation

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[20] We have attempted but have been unable to replicate Desai and Jin's (2007) results. There are several differences in our methodologies that could explain why we are unable to replicate their results. First, Desai and Jin (2007) consider investment advisers whose primary clientele consists of either high net-worth individuals or hedge funds to be tax-sensitive. We only classify investment advisers whose primary clientele consists of high net-worth individuals to be tax-sensitive. Second, because tax-sensitivity varies within banks and mutual funds, Desai and Jin (2007) cannot directly classify them as dividend-averse or non-dividend-averse. Rather they assume that banks and mutual funds have the same ratio of dividend-averse shareholders as imputed from the institutional shareholders, which they are able to classify as dividend-averse or non-dividend-averse. Desai and Jin (2007) admit that this assumption is not precise but that they are unaware of any systematic bias that would result from the assumption. We exclude mutual funds and banks since it is impossible to determine which among these are tax-sensitive and which are tax-insensitive. Third, Desai and Jin's (2007) sample period is 1980-1997. Our sample period is 1995-2007, although our results are qualitatively the same as those reported in the tables if we expand our sample period to 1980-2007. We will continue our attempts to reconcile these differences.

for this is that firms prefer to repurchase shares when their stock is undervalued in order to time the market. If this is the case, then either managers are irrational or they think investors can be fooled. Our results suggest that managers are not irrational in choosing when they will repurchase shares. Rather, our results suggest that managers rationally respond to the lock-in of capital gains by tax-sensitive institutional investors.

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Table I: Summary Statistics

This table presents summary statistics for the sample of firms used in this study. The sample consists of firm-quarter observations for the period 1995Q1 through 2007Q4. Following the approach of Blouin and Krull (2008), repurchases are computed as change in treasury stock (quarterly Compustat data98) if this change is positive. For those firms that do not use the treasury stock method, net repurchases are total repurchases from the statement of cash flows (data93) less decreases in preferred stock (data55). Total assets are data44. *Repurchases/assets* are winsorized at the 99th percentile. Only repurchases exceeding 1% of total assets are treated as repurchases. *CapGains(TaxSensitive)* and *CapGains(All)* are gains embedded in holdings of tax-sensitive investors and the combined portfolios of tax-sensitive and tax-insensitive investors respectively (see text for description), divided by firm market capitalization. *Holdings(TaxSensitive)* and *Holdings(All)* are the the values of the holdings in a stock of tax-sensitive investors and the combined portfolios of tax-sensitive and tax-insensitive investors respectively, divided by the firm's market capitalization. An observation is included in the sample only if *Holdings(All)* is less than 50% of the firm's total market capitalization. *Return* is the prior quarter stock return. *CashFlow* is pretax income (data23) + depreciation and amortization (data5). *Cash* is cash and short-term investments (data36). *Market/book* is the ratio of the market value of assets to book value of assets. Market value of assets is market capitalization + long-term debt (data51) + debt in current liabilities (data45). *Dividends/income* is cash dividends from the statement of cash flows (data89) divided by net income (data69). *Leverage* is defined as long-term debt + debt in current liabilities - cash and short-term investments. Target leverage is the median leverage in the quarter for firms in the same 2-digit SIC code. *CashFlow*, *Cash*, *Market/book*, *Dividends/income*, *Assets*($millions$) and *Leverage − TargetLeverage* are winsorized at the 1st and 99th percentiles.

	Num. Obs.	Mean	Std. Dev.	25th ptcl.	Median	75th pctl.
Repurchases/assets	9,322	0.039	0.036	0.016	0.025	0.046
CapGains(TaxSensitive)	110,422	0.007	0.015	0.000	0.001	0.007
CapGains(All)	110,422	0.013	0.021	0.000	0.003	0.017
CapGains(TaxSensitive)/CapGains(All)	82,853	0.546	0.371	0.195	0.550	0.966
Holdings(TaxSensitive)	110,422	0.036	0.050	0.005	0.019	0.046
Holdings(All)	110,422	0.071	0.068	0.019	0.052	0.102
Holdings(TaxSensitive)/Holdings(All)	110,422	0.543	0.357	0.222	0.524	0.948
Return	110,422	0.047	0.352	-0.130	0.016	0.173
CashFlow/assets	110,422	0.012	0.083	0.005	0.027	0.047
Cash/assets	110,422	0.193	0.231	0.021	0.088	0.295
Market/book	110,422	2.015	2.241	0.907	1.352	2.244
Dividends/income	110,422	0.232	0.915	0.000	0.000	0.109
Assets ($ millions)	110,422	1,690.2	5,055.9	88.8	280.5	979.4
Leverage - TargetLeverage	110,422	-0.053	0.328	-0.255	-0.032	0.151

Table II: Probability of repurchase and capital gains overhang

This table presents a series of probit regressions in which the dependent variable is an indicator taking a value of 1 if the firm repurchased shares during the quarter and 0 otherwise. The firm is considered to have repurchased shares if $repurchases/assets > 0.01$. All specifications include quarter effects. The results reported in columns (1), (2) and (4) are for all firms in the sample. The results reported in column (3) are for firms with a market capitalization exceeding \$1 billion only. A constant term is estimated in each of the regressions but is omitted from the table. $CashFlow$, $Cash$, $Market/book$, $Dividends/income$, $Assets(\$millions)$ and $Leverage - TargetLeverage$ are all lagged one quarter. Heteroskedasticity-robust standard errors clustered at the firm level are reported in parentheses.

	(1)	(2)	(3)	(4)
CapGains(TaxSensitive)	-3.360**	-4.293***	-5.734*	
	(1.505)	(1.584)	(3.142)	
CapGains(All)	6.657***	5.600***	4.524**	
	(1.033)	(1.152)	(2.027)	
CapGains(TaxSensitive)/CapGains(All)				-0.070*
				(0.038)
Holdings(TaxSensitive)	0.324	1.394***	2.070**	
	(0.387)	(0.423)	(1.038)	
Holdings(All)	0.292	-0.678**	-0.729	
	(0.283)	(0.316)	(0.680)	
Holdings(TaxSensitive)/Holdings(All)				0.169***
				(0.047)
Return_Lag1		-0.264***	-0.447***	-0.359***
		(0.027)	(0.055)	(0.031)
Return_Lag2		-0.234***	-0.404***	-0.297***
		(0.025)	(0.049)	(0.029)
Return_Lag3		-0.179***	-0.325***	-0.238***
		(0.024)	(0.050)	(0.027)
Return_Lag4		-0.131***	-0.261***	-0.189***
		(0.021)	(0.048)	(0.026)
CashFlow/assets		4.902***	7.678***	6.262***
		(0.434)	(0.697)	(0.436)
Cash/assets		0.024	-0.204	0.028
		(0.117)	(0.220)	(0.131)
Market/book		0.028***	0.012	0.025***
		(0.008)	(0.011)	(0.008)
Dividends/income		0.028***	0.031**	0.015
		(0.008)	(0.014)	(0.010)
ln(Assets)		0.136***	0.063**	0.135***
		(0.010)	(0.024)	(0.011)
Leverage - TargetLeverage		-0.376***	-0.034	-0.289***
		(0.087)	(0.130)	(0.095)
Marginal effects				
CapGains(TaxSensitive)	-0.512	-0.530	-1.323	
CapGains(All)	1.015	0.692	1.044	
CapGains(TaxSensitive)/CapGains(All)				-0.010
Holdings(TaxSensitive)	0.049	0.172	0.478	
Holdings(All)	0.045	-0.084	-0.168	
Holdings(TaxSensitive)/Holdings(All)				0.025
Minimum market cap	None	None	\$1 billion	None
Observations	110,422	110,422	28,490	82,853
Pseudo R2	0.010	0.089	0.060	0.083

***, ** and *: significant at 1%, 5% and 10% levels respectively.

Table III: Amount of repurchase and capital gains overhang

This table presents a series of OLS regressions. The dependent variable is repurchases/assets. An observation is only included in the sample if $repurchases/assets > 0.01$ for that quarter. All specifications include firm and quarter fixed effects. The results reported in columns (1), (2) and (4) are for all firms in the sample. The results reported in column (3) are for firms with a market capitalization exceeding \$1 billion only. A constant term is estimated in each of the regressions but is omitted from the table. $CashFlow$, $Cash$, $Market/book$, $Dividends/income$, $Assets (\$millions)$ and $Leverage - TargetLeverage$ are all lagged one quarter. Heteroskedasticity-robust standard errors clustered at the firm level are reported in parentheses.

	(1)	(2)	(3)	(4)
CapGains(TaxSensitive)	-0.183*	-0.183*	-0.420***	
	(0.109)	(0.109)	(0.161)	
CapGains(All)	0.214***	0.108	0.223**	
	(0.071)	(0.077)	(0.106)	
CapGains(TaxSensitive)/CapGains(All)				-0.005*
				(0.003)
Holdings(TaxSensitive)	0.034	0.039	0.051	
	(0.030)	(0.031)	(0.049)	
Holdings(All)	-0.059**	-0.046*	-0.078**	
	(0.024)	(0.024)	(0.032)	
Holdings(TaxSensitive)/Holdings(All)				0.000
				(0.003)
Return_Lag1		0.004	0.002	0.003
		(0.003)	(0.004)	(0.003)
Return_Lag2		0.001	-0.001	0.001
		(0.003)	(0.004)	(0.003)
Return_Lag3		-0.001	-0.002	-0.001
		(0.002)	(0.003)	(0.003)
Return_Lag4		0.000	0.001	-0.000
		(0.002)	(0.004)	(0.002)
CashFlow/assets		0.036**	0.040	0.045*
		(0.016)	(0.032)	(0.024)
Cash/assets		-0.002	0.001	-0.003
		(0.012)	(0.018)	(0.013)
Market/book		0.002***	0.001	0.002***
		(0.001)	(0.001)	(0.001)
Dividends/income		-0.001*	-0.001	-0.001*
		(0.001)	(0.001)	(0.001)
ln(Assets)		-0.003	-0.002	-0.003
		(0.002)	(0.004)	(0.003)
Leverage - TargetLeverage		-0.020***	-0.012	-0.018**
		(0.007)	(0.010)	(0.008)
Minimum market cap	None	None	\$1 billion	None
Observations	9,322	9,322	4,746	8,226
Adjusted R2	0.251	0.278	0.316	0.291

***, ** and *: significant at 1%, 5% and 10% levels respectively.

Table IV: Repurchases, capital gains, and tax rate reductions

This table investigates how the sensitivity of the probability of a repurchase to the embedded capital gains of tax-sensitive institutional investors changed with tax cuts in 1997 and 2003. The results of two probit regressions are presented. The dependent variable in each is an indicator variable equal to 1 if the firm made a repurchase in the quarter and 0 otherwise. A repurchase is considered to have occurred if $repurchases/assets > 0.01$. The sample period used in each test is the union of the 9 quarters immediately before and the 9 quarters immediately after the quarter in which a capital gains tax rate reduction was implemented (the "tax cut quarter"). The first tax cut quarter is 1997Q2, when the capital gains tax rate was reduced from 28% to 20%. Results for the period around this tax cut quarter are presented in column (1). The second tax cut quarter is 2003Q2, when the capital gains tax rate was reduced from 20% to 15%. Results for the period around this tax cut quarter are presented in column (2). The indictor variable I_{TaxCut} is equal to 1 in the 9 quarters immediately before the tax cut quarter and 0 in the 9 quarters immediately after the tax cut quarter. All specifications include quarter effects. A constant term is estimated in each of the regressions but is omitted from the table. $CashFlow/assets$, $Cash/assets$, $Market/book$, $Dividends/income$, $ln(Assets)$ and $Leverage - TargetLeverage$, all lagged one quarter, are included in the regressions, but these coefficients are omitted for brevity. Heteroskedasticity-robust standard errors clustered at the firm level are reported in parentheses.

	1997 tax cut	2003 tax cut
CapGains(TaxSensitive)	-0.217	-0.349
	(0.333)	(0.314)
CapGains(TaxSensitive) $\times I_{pre-taxcut}$	-1.035**	-0.650*
	(0.504)	(0.394)
CapGains(All)	0.460*	0.548**
	(0.253)	(0.218)
CapGains(All) $\times I_{pre-taxcut}$	0.724**	0.522*
	(0.364)	(0.276)
Holdings(TaxSensitive)	0.112	0.185**
	(0.097)	(0.090)
Holdings(TaxSensitive) $\times I_{pre-taxcut}$	0.253	0.056
	(0.156)	(0.112)
Holdings(All)	-0.070	-0.067
	(0.075)	(0.066)
Holdings(All) $\times I_{pre-taxcut}$	-0.201*	-0.089
	(0.118)	(0.087)
Return_Lag1	-0.027***	-0.025***
	(0.005)	(0.004)
Return_Lag2	-0.026***	-0.022***
	(0.005)	(0.004)
Return_Lag3	-0.008	-0.022***
	(0.005)	(0.004)
Return_Lag4	-0.011**	-0.012***
	(0.005)	(0.004)
CashFlow/assets	0.589***	0.485***
	(0.062)	(0.067)
Cash/assets	-0.008	0.017
	(0.021)	(0.016)
Market/book	0.002	0.006***
	(0.001)	(0.001)
Dividends/income	0.005***	0.001
	(0.001)	(0.001)
ln(Assets)	0.015***	0.015***
	(0.002)	(0.001)
Leverage - TargetLeverage	-0.050***	-0.039***
	(0.016)	(0.012)
Observations	39,753	42,835
Pseudo R2	0.079	0.089

***, ** and *: significant at 1%, 5% and 10% levels respectively.

Table V: Dividends and capital gains overhang

This table investigates how embedded capital gains in the holdings of tax-sensitive institutional investors affect cash dividends. Columns (1) and (2) present probit regressions, where the dependent variable is an indicator equal to 1 if the firm paid dividends during the quarter and 0 otherwise. Columns (3) and (4) present OLS regressions with firm fixed effects in which the dependent variable is dividends/assets. All specifications include quarter effects. The results reported in columns (1) and (3) are for all firms in the sample. The results reported in column (2) and (4) are for firms with a market capitalization exceeding $1 billion only. A constant term is estimated in each of the regressions but is omitted from the table. $CashFlow$, $Cash$, $Market/book$, $Dividends/income$, $Assets(\$millions)$ and $Leverage - TargetLeverage$ are all lagged one quarter. Heteroskedasticity-robust standard errors clustered at the firm level are reported in parentheses.

	Probit		OLS with firm FE	
	(1)	(2)	(3)	(4)
CapGains(TaxSensitive)	4.517**	7.891**	0.028*	0.055**
	(1.890)	(3.570)	(0.015)	(0.026)
CapGains(All)	0.409	0.084	-0.022**	-0.038**
	(1.338)	(2.377)	(0.010)	(0.016)
Holdings(TaxSensitive)	3.601***	3.766***	0.013***	0.002
	(0.563)	(1.221)	(0.005)	(0.007)
Holdings(All)	-3.190***	-4.111***	-0.012***	-0.009*
	(0.418)	(0.843)	(0.004)	(0.005)
Return_Lag1	-0.077***	-0.190***	-0.001***	-0.001
	(0.019)	(0.050)	(0.000)	(0.001)
Return_Lag2	-0.074***	-0.163**	-0.001***	-0.001
	(0.019)	(0.079)	(0.000)	(0.001)
Return_Lag3	-0.067***	-0.153*	-0.001**	-0.001
	(0.020)	(0.085)	(0.000)	(0.001)
Return_Lag4	-0.080***	-0.230***	-0.000	-0.001
	(0.019)	(0.069)	(0.000)	(0.001)
CashFlow/assets	2.212***	5.909***	0.008**	0.023***
	(0.415)	(0.775)	(0.003)	(0.008)
Cash/assets	-2.295***	-2.482***	0.000	-0.009**
	(0.146)	(0.327)	(0.003)	(0.004)
Market/book	0.002	-0.034*	0.001***	0.001***
	(0.015)	(0.020)	(0.000)	(0.000)
ln(Assets)	0.315***	0.372***	-0.004***	-0.004***
	(0.013)	(0.033)	(0.001)	(0.001)
Leverage - TargetLeverage	-0.839***	-0.469***	-0.008***	-0.010***
	(0.093)	(0.156)	(0.002)	(0.003)
Minimum market cap	None	$1 billion	None	$1 billion
Observations	111,624	29,109	36,226	15,990
Pseudo R2	0.212	0.223		
Adjusted R2			0.737	0.746

***, ** and *: significant at 1%, 5% and 10% levels respectively.

Figure I: Equilibrium mixed strategy probabilities

This figure depicts for each quarter the marginal effect associated with β_1 from the cross-sectional probit regression

$$Repurchase = \alpha + \beta_1 CapGains(TaxSensitive) + \beta_2 CapGains(All) + \beta_3 Holdings(TaxSensitive)$$
$$+ \beta_4 Holdings(All) + \beta_5 Return\_Lag1 + \beta_6 Return\_Lag2 + \beta_7 Return\_Lag3 + \beta_8 Return\_Lag4$$
$$+ \beta_9 CashFlow/Assets + \beta_{10} Cash/Assets + \beta_{11} Market/Book + \beta_{12} Dividends/Income$$
$$+ \beta_{13} Ln(Assets) + \beta_{14}(Leverage - TargetLeverage) + \epsilon,$$

estimated quarter-by-quarter. The first vertical dashed line marks the quarter in which the Taxpayer Relief Act of 1997 was enacted. The second vertical dashed line marks the quarter in which the 2003 Tax Act was enacted.