Stockholders' Unrealized Capital Gains Position and the Market Response to Earnings Announcements

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Abstract:

I examine whether stockholders' average unrealized capital gains position in the equity of a given firm affects their response to the firm's quarterly earnings announcements. Stockholders' unrealized capital gains can affect their individual trading decisions via the capital gains tax "lock-in effect" or the tax-irrational bias known as the "disposition effect." Prior literature is unclear about whether these two effects are significant determinants of the market reaction to earnings news. I design new tests that incorporate trade-by-trade data as well as quarterly institutional holdings data, and find robust evidence supporting the disposition effect. However, I also find that this announcement-window disposition effect is mitigated when tax incentives are stronger or more salient. Finally, I demonstrate that the disposition effect has important implications for measuring the degree to which the market incorporates earnings news. First, the disposition effect moderates the degree to which both opinion divergence and the differential precision of pre-announcement earnings information are reflected in abnormal trading volume. Second, the disposition effect diminishes the price adjustment to earnings news during the announcement window.

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1. Introduction

This paper investigates the manner in which investor-level unrealized capital gains affect the stock-level market response to public disclosures. I refer to the average unrealized capital gains position of the holders of a stock as stockholders' "capital gains overhang" (CGO). The relation between stockholders' CGO and the market response to public disclosures is unclear because there are competing predictions about how investors consider their unrealized capital gains position when trading. Capital gains tax incentives motivate stockholders to defer the sale of stocks in a *gain* position. This behavior is referred to as the capital gains "lock-in effect" (Holt and Shelton 1962). In contrast, prospect theory preferences motivate stockholders to defer the sale of stocks in a *loss* position (Kahneman and Tversky 1979; Shefrin and Statman 1985). This psychological "disposition" to sell winners too early and hold losers too long is referred to as the "disposition effect" (Shefrin and Statman 1985).

Theoretical models of trade predict that public disclosures generate trading volume to the extent that they a) resolve differences in predisclosure information asymmetry or b) generate differential interpretations about a firm's future prospects (Bamber et al. 2011). I focus on one specific type of public disclosure: earnings announcements. Prior literature validates earnings announcements as a type of trade-inducing information event that is of considerable interest to both market participants and researchers. This extensive literature also identifies other determinants of trading behavior around earnings announcements that can be measured and controlled for in order to isolate the incremental effect of stockholders' CGO.[1]

[1] Kothari (2001), Verrecchia (2001), and Bamber et al. (2011), among others, provide extensive reviews of prior research examining the market reaction to earnings announcements.

Evidence of both the lock-in effect and disposition effect have been observed in various capital markets settings, but the role of these two effects around earnings announcements remains unclear. Both effects are predicted to affect the level of portfolio rebalancing trade that occurs around earnings disclosures (Shackelford and Verrecchia 2002; Frazzini 2006), but in opposite directions. Both effects should also have important implications for the degree to which the *information* contained in earnings disclosures is reflected in trading patterns. Some of these implications have not been explored in prior research. I perform my study in two stages. In the first stage, I examine the relation between stockholders' CGO and the level of abnormal trading volume around earnings announcements for evidence of the lock-in effect and disposition effect. I find a significant relation in the direction predicted by the disposition effect, although the relation is weaker in magnitude when tax incentives are stronger or more salient. In the second stage of my study, I present evidence on the implications of the observed disposition effect for our understanding of how earnings information is incorporated into capital markets.

More specifically, in the first stage of my analysis I estimate a proxy for stockholders' CGO at the time earnings are announced using quarterly institutional holdings data (Frazzini 2006; Jin 2006). To test the relation between CGO and abnormal announcement-window trading volume, I regress transaction-based measures of abnormal trading volume on my CGO proxy and relevant control variables. I find that, on average, the relation between CGO and abnormal trading volume is positive, which is the direction predicted by the disposition effect. The estimated coefficients from my regressions suggest that, for the average announcement in my sample, the marginal effect of stockholders being in an aggregate unrealized gain instead of unrealized loss position at the time earnings are announced leads to an additional 11% increase in trading volume during the announcement window.

The observed positive relation between my CGO proxy and abnormal trading volume is stronger among seller-initiated trades, providing additional evidence that the observed relation is driven by shareholders considering their unrealized capital gains position. Furthermore, while the observed relation is generally positive, it is less positive during times when tax incentives are stronger or more salient. I demonstrate this in two ways. First, I show that the association between CGO and abnormal trading volume reverses for earnings announcements during the month of December. Second, in untabulated sensitivity tests, I find a negative interaction between my CGO proxy and time-series changes in the spread between short-term and long-term capital gains tax rates, consistent with findings from prior tax research (Blouin et al. 2003; Hurtt and Seida 2004).

In the second stage of my study, I demonstrate that the disposition effect has important implications for the degree to which the market incorporates earnings news during the announcement window. Prior literature has focused on the relation between the absolute magnitude of unexpected earnings and abnormal trading volume as a measure of opinion divergence about the information contained in the earnings disclosure (Bamber 1987; Bamber et al. 2011). Similarly, prior theoretical and empirical work has examined the relation between absolute announcement-window price change and abnormal trading volume as a measure of the differential precision of pre-announcement earnings information among investors (Kim and Verrecchia 1997; Verrecchia 2001; Bamber et al. 2011; Barron et al. 2011). I find that stockholders' CGO moderates both of these relations.

In the second stage I also test Frazzini's (2006) prediction that the disposition effect leads to a negative relation between stockholders' CGO and abnormal announcement-window returns, and find evidence consistent with this prediction. The negative relation is significant for both

good and bad news earnings announcements, but is larger in magnitude among good news announcements. In the case of good news announcements, the incremental three-day abnormal return associated with being in an aggregate unrealized gain (vs. unrealized loss) position is an economically meaningful -1.2%. These findings are consistent with the disposition effect causing, or at least contributing to, a short-window under-reaction to earnings news, and support the long-window association between stockholders' CGO and post-earnings-announcement drift documented by Frazzini (2006).

The findings from my study contribute to existing research along multiple dimensions. Existing research is unclear about the role of stockholders' CGO around earnings announcements. In this regard, Blouin et al. (2003) write that they "look forward to studies that integrate the behavioral finance papers that fail to find investor-tax rationality, with studies, such as this one, that do find tax-rational behavior" (Blouin et al. 2003, p. 626). My study represents progress towards this integration. Examining the interplay between the lock-in effect and disposition effect around earnings announcements is an important research question, because the two effects have very different implications for the degree to which trading patterns convey earnings information. I find robust evidence of a disposition effect in announcement-window trading activity that *diminishes* the price response to earnings news during the announcement window. I show that the effect also impacts the degree to which abnormal trading volume reflects opinion divergence and the differential precision of pre-announcement information. These findings extend prior literature that assumes that investors trade in *direct* proportion to proxies for these earnings characteristics (e.g. Bamber 1987; Kandel and Pearson 1995; Bamber et al. 1997; Garfinkel and Sokobin 2006; Garfinkel 2009). Notably, the theoretical work motivating these measures does not consider investors with prospect-theory preferences (Kim

and Verrecchia 1997; Verrecchia 2001). My results suggest that future research should consider the implications from prospect theory when developing predictions about how investors process earnings information and make earnings-related trading decisions.

In the context of the drift found by Frazzini (2006), my results also suggest that a wealth transfer may take place around earnings announcements, from investors more prone to the disposition effect to those who are tax-rational and/or less prone to the disposition effect. That is, investors prone to the disposition effect sell too quickly when earnings indicate good news and hold stocks too long when earnings indicate bad news. However, this type of wealth transfer is less likely to occur when capital gains tax incentives are stronger or more salient to investors. This may be of interest to regulators who are interested in leveling the playing field among investors as well as legislators interested in the effect of capital gains tax incentives on investor behavior.

2. Motivation

2.1. The relation between stockholders' CGO and abnormal trading volume around earnings announcements

Shackelford and Verrecchia (2002) develop a theoretical model that demonstrates how stockholders' CGO can impact the level of rebalancing trade that occurs around public disclosures. While Shackelford and Verrecchia (2002) model the lock-in effect, the intuition from their model can also be applied to the disposition effect. In the model, a public disclosure provides new information about the expected value of a risky asset, which prompts rebalancing trade from investors who are overweighted in the risky asset to investors who are underweighted

in the risky asset, relative to the optimal risk-sharing equilibrium in the market. All investors in the market face short-term capital gains tax rates that are higher than long-term capital gains tax rates. For good news disclosures, overweighted stockholders face a choice between selling their shares at the time of the disclosure and paying higher taxes on their certain profits, or retaining their shares and paying lower taxes on uncertain profits at liquidation.[2]

Under these circumstances, Shackelford and Verrecchia (2002) show that overweighted investors in an unrealized gain position will sell less at the time of the disclosure than they would in the absence of capital gains taxes. While Shackelford and Verrecchia (2002) focus on "good news" disclosures, capital gains tax incentives provide similar, albeit weaker, incentives for investors in an unrealized loss position to sell more at the time of the disclosure (Blouin et al 2003).[3] Thus, generally, the lock-in effect predicts a *negative* relation between stockholders' CGO and abnormal announcement-window trading volume.

While this prediction is intuitive within an expected utility framework, research in both experimental and archival settings has demonstrated that investors often do not act in accordance with expected utility theory. In particular, research on the disposition effect finds that investors are reluctant to realize stocks in a loss position, despite the tax-irrationality of such behavior. [4] Shefrin and Statman (1985) introduce a four-element theoretical framework to motivate the disposition effect. The first two elements of the framework are prospect theory and mental accounting (hereafter, PT-MA). Prospect theory suggests that investors possess an S-shaped

[2] Jin (2006) notes that, in addition to the difference in short-term vs long-term capital gains rates, taxable investors face other incentives to defer the sale of appreciated stock such as the ability to reset capital gains upon inheritance, to time sales such that they combine capital gains with capital losses, and to exploit the "charitable contribution" option (Jin 2006, p. 1401).

[3] Under U.S. tax law, investors face limits on the tax deductions that they are allowed to claim from capital losses.

[4] The disposition effect has been documented in the portfolios of individual stock investors (Odean 1998; Shapira and Venezia 2001; Grinblatt and Keloharju 2001), professional futures traders (Locke and Mann 2005; Coval and Shumway 2005), as well as individual home owners (Genesove and Mayer 2001). See Kaustia (2010) for a review of the literature.

value function that is concave (risk-averse) over gains and convex (risk-loving) over losses (Kahneman and Tversky 1979). Mental accounting is invoked to propose that the relevant reference point for determining a gain or loss for a particular stock transaction is the investor's cost basis in that individual stock (e.g. Thaler 1985). The third element describes investors' emotional motivation to seek the pride associated with recognizing gains and to avoid the regret associated with realizing losses. The final element relates to investors' self-control, and notes that investors are more likely to exhibit self-control over their tax-irrational behavior when tax incentives are stronger or more salient.

Investors who exhibit the disposition effect trade in the opposite manner of the tax-rational investors in Shackelford and Verrecchia's (2002) model. They are more (less) likely to sell shares when they are in an unrealized gain (loss) position at the time of the public disclosure. Thus, the disposition effect predicts a *positive* relation between stockholders' CGO and abnormal announcement-window trading volume. Given that the lock-in effect predicts a negative relation between stockholders' CGO and abnormal trading volume, while the disposition effect predicts a positive relation, it is unclear which type of behavior dominates around earnings announcements. Furthermore, if some investors are tax-sensitive while others are disposition-prone, the *average* association between stockholders' CGO and abnormal trading volume may not be significant in either direction.

Prior research in this area remains unclear. Studies by Blouin et al (2003) and Jin (2006) examine whether capital gains tax incentives have *any* discernible effect on the market response to earnings announcements. Accordingly, both studies are designed to examine isolated effect of tax incentives. Blouin et al. (2003) document a second-order relation between variation in the strength of tax incentives over time and both abnormal trading volume and returns around

earnings announcements.[5] However, they do not examine the direct relation between stockholders' CGO and these outcomes. Jin (2006) finds a direct relation between stockholders' CGO and abnormal *returns* around earnings announcements, but only for the limited subset of earnings announcements that he chooses to examine (announcements where tax incentives are most likely to play a dominant role).[6] Although these studies find evidence consistent with the lock-in effect, they do not rule out Shefrin and Statman's (1985) conjecture that investors may generally exhibit the disposition effect, but exert self-control when the tax consequences of their behavior are stronger or more salient.

While I believe that my study is the first to examine the disposition effect in the short window around earnings announcements, Frazzini (2006) reports long-window evidence which suggests that the disposition effect may be a determinant of the market response to earnings news. Frazzini (2006) examines the monthly abnormal returns to a trading strategy where portfolios are first sorted on recent earnings news and then on stockholders' CGO. Frazzini (2006) predicts that prices will be slow to adjust following earnings announcements when earnings news and stockholders' CGO have the same sign. As predicted, he finds that stockholders' CGO moderates post-earnings-announcement drift. Frazzini (2006) interprets his results as consistent with the disposition effect generating an underreaction to earnings news at the time of the announcement. However, he does not directly examine trading volume or returns around earnings announcements. This makes it difficult to reconcile his results with those reported in the tax literature.

[5] Using an alternate, but similar, research design, Hurtt and Seida (2004) document similar evidence of second-order tax effects across time. However, the authors find that some of their results are not robust to the sensitivity analyses that they perform.

[6] Jin (2006) develops an investor-level proxy for unrealized capital gains position from the periodic 13-F filings of institutional investors. He then classifies each institutional investor as tax-sensitive or tax-insensitive based on Investment Advisor Public Disclosure (IAPD) data and examines extreme negative earnings surprises for firms with high levels of tax-sensitive institutional ownership.

My study is designed to provide new evidence that can help bridge this gap in prior literature. I examine the average relation between stockholders' CGO and abnormal trading volume among a large panel of quarterly earnings announcements for evidence of an overall positive (disposition effect) or negative (lock-in effect) association. The evidence I provide should be relevant to capital market participants and researchers because CGO effects can have important implications for the degree to which capital markets incorporate earnings information. I examine some of these implications in the second part of my study.

In order to provide additional support that the evidence I observe is caused by sellers considering their unrealized capital gains in their trading decisions, I also examine two secondary predictions about the relation between stockholders' CGO and abnormal trading volume. First, I predict that any observed relation between stockholders' CGO and abnormal trading volume should be greater in magnitude for seller-initiated trades than buyer initiated trades. This is because capital gains effects directly apply to holders of the stock, but buyers are only indirectly affected through any supply shortage or liquidity premium that they face when sellers are reluctant to transact.

Second, I examine Shefrin and Statman's (1985) prediction that investors will exhibit tax-loss selling during the month of December. Shefrin and Statman (1985) state:

> We conjecture that tax planning in general, and loss realization in particular, is disagreeable and requires self-control. Should this be the case, then it is reasonable to expect that self-motivation is easier in December than other months because of its perceived deadline characteristic. Thus, a concentration of loss realizations in December is consistent with our behavioral framework, but inconsistent with [that of a] rational individual. (Shefrin and Statman 1985, p. 785)

Shefrin and Statman (1985) argue that disposition-prone investors will be less reluctant to realize losses in December, when year-end tax deadlines are most salient. In contrast, they expect rational tax-sensitive investors to engage in tax-loss selling throughout the year, whenever they face tax holding-period deadlines. Thus, to the extent that at least some investors are disposition-prone, I expect the relation between stockholders' CGO and abnormal announcement-window trading volume to be incrementally more negative for earnings announcements that occur during the month of December. This is similar to the argument in Blouin et al. (2003) that if at least some investors exhibit the lock-in effect, the relation between stockholders' CGO and abnormal announcement-window trading volume will be more negative during years when tax rate incentives are stronger. For robustness, I also (untabulated) examine this prediction from Blouin et al (2003).

2.2. CGO effects and the degree to which capital markets incorporate earnings information

Both the lock-in effect and disposition effect can generate trading frictions that drive trading activity away from the level of rebalancing trade that would occur around a public disclosure in the absence of capital gains considerations. Therefore, in the second stage of my study, I examine how these trading frictions affect the degree to which capital markets incorporate earnings information. I focus on two implications that arise from capital gains trading frictions. First, prior literature predicts and finds that earnings information will generate trading volume to the extent that earnings information either resolves differences in predisclosure information asymmetry or generates differential interpretations about the firm's future prospects (Bamber et al. 2011). Prior literature develops proxies for the magnitude of these types of information-related disagreement, and tests for a *direct* relation between these proxies and

abnormal trading volume. However, for any level of information-related disagreement, investors subject to capital gains effects may be more or less likely to trade on this disagreement. Therefore, I examine the degree to which stockholders' CGO moderates the relation between these types of proxies and abnormal trading volume. Prior literature examines the absolute magnitude of unexpected earnings as a proxy for earnings-related opinion divergence (Bamber 1987; Bamber et al. 2011). Similarly, prior theoretical and empirical work has examined absolute announcement-window price change as a proxy for the differential precision of pre-announcement earnings information (Kim and Verrecchia 1997; Verrecchia 2001; Bamber et al. 2011; Barron et al. 2011). I predict that the relations between these proxies and abnormal trading volume will be stronger in magnitude when CGO effects predict increased liquidity. Therefore, the lock-in effect predicts that these relations will be stronger in magnitude when stockholders are in an unrealized *loss* position, while the disposition effect predicts that the relations will be stronger in magnitude when stockholders are in an unrealized *gain* position.

Finally, I examine the relation between stockholders' capital gains overhang and abnormal announcement-window returns. Both tax-rational behavior and the disposition effect predict that any changes in the relative supply of equity generated by sellers' capital gains will result in price pressure (Shackelford and Verrecchia 2002; Frazzini 2006). This hypothesized price effect is a key component of Frazzini's (2006) motivation for examining the relation between the disposition effect and post-earnings-announcement drift, and also motivates the pricing tests in Blouin et al. (2003) and Jin (2006). The lock-in effect predicts a *positive* relation between stockholders' CGO and returns, because potential buyers must offer a price premium to stockholders who are reluctant to realize their gains. For the disposition effect, it is stockholders in a loss position who must be offered a premium to transact, leading to a *negative* relation

between stockholders' CGO and returns. It is important to note that a positive relation between stockholders' capital gains overhang and abnormal returns will *amplify* the price response to earnings news, while a negative relation will *diminish* the price response to earnings news. Table 1 summarizes the competing predictions from the lock-in and disposition effect examined in each stage of my study.

[INSERT TABLE 1 HERE]

3. Sample Selection and Measurement of Stockholders' CGO

3.1. Sample Selection

My study incorporates data from a number of different sources. Accounting data is obtained from Compustat, daily stock price and share volume data is from CRSP, and analyst forecast data is from the monthly I/B/E/S summary file. My study also incorporates stock quotes and detailed trade data from the NYSE's Trade and Quote (TAQ) database, as well as 13-F institutional holdings data from the Thompson Reuters CDA/Spectrum database. Following prior literature (Lee 1992, Bhattacharya 2001), my study includes TAQ trades with a condition code of "regular sale" between 9:30 AM and 4:15 PM EST, excluding each day's opening trade.

I use the Thompson Reuters 13-F database (also referred to as S34) to compute my CGO proxy. It contains holdings information for all registered institutional investment managers who file form 13-F with the SEC. Any investment entity with over $100 million under its control is required to file form 13-F, and smaller entities who choose to report their holdings are also included in the database. Small holdings of less than 10,000 shares or $200,000 in a single asset are not required to be reported and therefore may be omitted from the holdings data if not

voluntarily disclosed by the institution. Form 13-F is required to be filed quarterly with the SEC. Following Frazzini (2006), the stock price at the quarterly report date is used as a proxy for each institution's buying or selling price each quarter. Clearly, an institution's actual transaction price is generally different from the price at the report date. To the extent that stock prices follow a random walk after a purchase or sale, any measurement error due to this data limitation should generate noise in my proxy but not bias the results in any particular direction (Frazzini 2006, p. 2024 – 2025).

Using these data, I examine a sample of quarterly earnings announcements of NYSE/AMEX listed firms for the years 1994, the first year for which TAQ data is available during the entire [-250, -2] day window prior to the earnings announcement, through 2007. I obtain earnings announcement dates from the Compustat quarterly file, and require each firm-quarter observation in the primary sample to have sufficient data to calculate $AVOL_{TOTAL\ TRADES}$, CGO_{it}, and the control variables defined in equation (3), resulting in a sample size of 55,245 firm-quarter observations for 2,430 unique firms. I require each firm-quarter observation in my sample to have available quarterly earnings forecasts from a minimum of three different analysts.[7] All continuous variables are winsorized at 1% and 99% to mitigate the impact of outliers.

3.2. The Capital Gains Overhang

I construct a measure of investors' weighted average unrealized capital gain or loss position in a given stock. This requires an assumption about stockholders' aggregate reference price ("cost basis") at any given point in time. Following Frazzini (2006), I use the time series of

[7] I impose this restriction because my analysis includes measures of analyst-based unexpected earnings and pre-announcement forecast dispersion.

net purchases by 13-F institutional investors to compute the firm-level weighted average reference price on a given date. Specifically, the reference price (RP) is calculated as

$$RP_t = \phi^{-1} \sum_{n=0}^{t} V_{t,t-n} P_{t-n} \tag{1}$$

where $V_{t,t-n}$ is the number of shares purchased at date *t-n* that are still held by the original purchasers at date t, ϕ is a normalizing constant such that $\phi = \sum_{n=0}^{t} V_{t,t-n}$, and P_t is the stock price at the end of month *t*. When a stock is purchased several times, and partially sold at different dates, it is assumed that investors use the purchase price of the shares sold as the basis for computing capital gains and losses. To maintain consistency with Frazzini (2006), I assume that investors use a first-in, first-out (FIFO) mental accounting method to associate shares sold with their cost basis.[8] Given this estimated average reference price, investors' estimated average unrealized capital gain/loss position in a given stock, referred to as the capital gains overhang (*CGO*), can be defined for firm *i* at any given time *t* as

$$CGO_{it} = \frac{P_{it} - RP_{it}}{P_{it}} \tag{2}$$

CGO_{it} is intended to represent the best estimate of a stock's deviation from its cost basis for the representative investor. The ideal measure of CGO_{it} would incorporate the holdings data of all shareholders at time *t*, as opposed to estimating a proxy using the observed quarterly holdings of 13-F institutions. While it is not possible to obtain holdings data for all shareholders, Frazzini (2006) repeats his analysis on a subsample for which he is able to combine retail

[8] Frazzini (2006) notes that his results are robust to alternately using LIFO, HIFO, the last trading price, the last buying price, or averages of past buying and selling prices when constructing the reference price. Based on his analysis, along with the volume-based sensitivity analysis I perform, I believe that my results would also remain robust to alternate inventory cost basis assumptions.

investor data from a discount brokerage with his institutional data, and does not find a noticeable difference in results using the combined reference price. Furthermore, I perform sensitivity analysis using an alternate volume-based measure of CGO_{it} introduced by Grinblatt and Han (2005), which incorporates the historical trading volume of all shareholders. I find that all inferences from the results presented in the paper remain unchanged.

For ease of interpretation, I employ a binary measure of investors' unrealized gain/loss position, CGO_DUMMY_{it}, which is equal to 1 when $CGO_{it} > 0$ and zero otherwise.[9] In untabulated analysis, I find that my results are stronger using the continuous CGO_{it} measure, consistent with the reported results representing a conservative estimate of the impact of stockholders' CGO on market behavior.

4. Tests of the relation between Stockholders' Capital Gains Overhang and Abnormal Announcement-Window Trading Volume

4.1. Model Development

I employ a transaction-based measure of abnormal trading volume to examine investor trading behavior around earnings announcements. Specifically, I estimate abnormal three-day volume, $AVOL_{ijt}$ as

$$AVOL_{ijt} = \ln\left(\frac{\text{Number of firm } i \text{ trades by investor group } j \text{ during three-day earnings announcement interval } t}{\text{Median number of firm } i \text{ trades by investor group } j \text{ during three-day non-announcement intervals}}\right)$$

[9] This coding includes four firm-quarter observations for which $CGO=0$ in the unrealized loss sample. Results are identical if these very few observations are instead deleted or included in the gain sample.

where the three-day earnings announcement interval is measured from days [-1,+1] relative to Compustat quarterly earnings announcement date t , and the non-announcement period includes all contiguous three-day periods from trading days [-250, -2] relative to the earnings announcement date, excluding any three-day periods containing previous earnings announcements.[10] In primary analyses I examine all trades, denoted $AVOL_{TOTAL\ TRADES}$, but I also separately calculate additional measures of $AVOL_{ijt}$ for buyer-initiated and seller-initiated trades in order to test the prediction that capital gains incentives have a stronger effect on sellers than buyers.[11]

To test for a relation between stockholders' capital gains overhang and abnormal announcement-window trading volume, controlling for previously identified determinants of abnormal trading around earnings announcements, I estimate the following OLS model:

$$AVOL_{ijt} = \alpha_0 + \alpha_1 CGO\_DUMMY_{it} + \alpha_2 ABS\_UE_{it} + \alpha_3 SIZE_{it} + \alpha_4 DISPERSION_{it} + \alpha_5 ABS\_RETURN_{it} + \alpha_6 MKT\_TURN_{it} + \alpha_7 PRICE_{it} + \alpha_8 AVG\_TURN_{it} + \alpha_9 MOMENTUM_{it} + \varepsilon_{it} \quad (3)$$

where $AVOL_{ijt}$ is abnormal trading volume as defined earlier in this section, and CGO_DUMMY_{it} is a binary measure equal to one when CGO_{it} is greater than zero, and zero otherwise. If tax incentives (the disposition effect) affect investors' announcement-related trading decisions, I expect to observe a negative (positive) coefficient on CGO_DUMMY_{it} (α_1). I also predict that the coefficient on CGO_DUMMY_{it} in equation (3) will be larger in magnitude when the dependent measure is $AVOL_{SELLER\text{-}INITIATED\ TRADES}$ than when the dependent measure is

[10] I use the most common non-announcement window found in related literature (e.g. Bamber 1986, 1987; Atiase and Bamber 1994; Bamber et al. 1997; Ahmed et al. 2003; Barron et al. 2011). I scale by the median level of non-announcement trading and examine the natural log of this ratio to mitigate the impact of skewness in the distribution of trading volume (Bamber et al. 2011).

[11] Trades are classified as buyer or seller-initiated using the Lee-Ready (1991) algorithm.

$AVOL_{BUYER\text{-}INITIATED\ TRADES}$. I also include a number of control variables identified in prior literature as associated with either $AVOL_{ijt}$ or CGO_DUMMY_{it}.

I include four controls which proxy for information-related determinants of announcement-window trading volume: the absolute value of unexpected earnings (ABS_UE_{it}), the absolute value of firm *i*'s cumulative return for the three-day window centered on earnings announcement date *t* (ABS_RETURN_{it}), the natural log of market value of equity at the beginning of quarter *t* ($SIZE_{it}$), and pre-announcement analyst forecast dispersion ($DISPERSION_{it}$) (Bamber 1986, 1987, Bamber et al. 1997). I control for the effect of market-wide trading by including the natural log of NYSE/AMEX share turnover during the three-day event window (MKT_TURN_{it}) (Bamber et al. 1997). I include the natural log of closing price at the beginning of quarter *t* ($PRICE_{it}$) as an inverse proxy for commission and structural bid/ask spread transaction costs (Utama and Cready 1997). Finally, I include the average monthly share turnover for firm *i* over the prior twelve months (AVG_TURN_{it}) and the 11-month buy-and-hold return for firm *i* beginning twelve months prior to the month of the earnings announcement ($MOMENTUM_{it}$) to control for any mechanical correlation between these variables and my measure of CGO_{it} (Grinblatt and Han 2005; Frazzini 2006). Formal variable definitions appear in Appendix A.

To test for any effects from December tax-loss selling around earnings announcements, re-estimate the model in equation (3) and add an interaction term for earnings announcements that occur during December. Specifically, I examine the interaction between CGO_DUMMY_{it} and *DECEMBER*, a binary variable equal to 1 for earnings announcements that occur during the month of December, and zero otherwise. I predict a negative coefficient on $CGO\_DUMMY_{it}*DECEMBER_{it}$ ($\alpha_3 < 0$).

4.2. Descriptive Statistics and Univariate Results

Table 2 presents descriptive statistics for the variables included in equation (3), both for the full sample (N=55,245), and separately for the unrealized gain (N=15,830) and loss (N=39,415) samples. The mean value of $AVOL_{TOTAL\ TRADES}$ (0.448) in the sample represents an increase in total trades of roughly 56.5% during the announcement window, relative to the median number of non-announcement trades. *CGO* is negatively skewed, which is to be expected given that the measure is bounded above at 1, but unbounded at the bottom of the distribution. The means of all of the variables presented in Table 2 are significantly different across unrealized gain and loss observations ($p < 0.01$). Consistent with a disposition effect, $AVOL_{ijt}$ is significantly higher for unrealized gain observations than unrealized loss observations for all four measures presented. Further, the difference in mean abnormal volume is larger for $AVOL_{SELLER\text{-}INITIATED\ TRADES}$ than $AVOL_{BUYER\text{-}INITIATED\ TRADES}$. Figure 1 displays the differences in mean $AVOL_{TOTAL\ TRADES}$ and $AVOL_{SELLER\text{-}INITIATED\ TRADES}$ between unrealized gain and unrealized loss observations for each year in the sample. All differences are positive and significant ($p < 0.01$) for each year in the sample period. Figure 2 presents graphical evidence of a December effect in the relation between stockholders' capital gains overhang and abnormal announcement-window trading volume.

[INSERT TABLE 2 HERE]

[INSERT FIGURE 1 HERE]

[INSERT FIGURE 2 HERE]

Table 3 presents Pearson correlations among the variables included in equation (3). All of the correlations presented in Table 3 are statistically significant ($p < 0.01$), except for those

between *SIZE* and both $AVOL_{TOTAL\ TRADES}$ and $AVOL_{BUYER\text{-}INITIATED\ TRADES}$ and between *ABS_UE* and $AVOL_{BUYER\text{-}INITIATED\ TRADES}$. Consistent with the disposition effect, *CGO* is positively correlated with all measures of *AVOL*, and the largest correlation is with $AVOL_{SELLER\text{-}INITIATED\ TRADES}$ (0.098). Of the control variables, *ABS_RETURN* is the most highly correlated with the measures of *AVOL*, which is consistent with the well-documented contemporaneous relation between price changes and volume (Karpoff 1987).

[INSERT TABLE 3 HERE]

4.3. Multivariate Results

Table 4 presents the results of OLS regressions of equation (3). *T*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and calendar quarter (Petersen 2009).

[INSERT TABLE 4 HERE]

The coefficients on *CGO_DUMMY* are positive and significant ($p < 0.01$) across all specifications of *AVOL* in Panels A and B, consistent with the presence of a disposition effect in abnormal announcement-window trading volume. Panel A reports the results of estimating equation (4) with $AVOL_{TOTAL\ TRADES}$ as the dependent measure. The coefficient for *CGO_DUMMY* is 0.068. In order to interpret the economic significance of this result, I examine the marginal effect of stockholders' CGO on abnormal trading volume.[12] Evaluated at the sample mean, the marginal effect of stockholders being in an aggregate unrealized gain instead of unrealized loss position at the time of the announcement leads to an additional 11.0% of abnormal announcement-window trades. For comparison, the marginal effect of a one standard

[12] I examine the marginal effect because the dependent measure is log transformed.

deviation increase in *ABS_UE* evaluated at the sample mean only leads to an additional 1.5% of abnormal announcement-window trades.

Panel B examines the presence of the disposition effect among buyer- and seller-initiated trades. As predicted, untabulated Wald tests from multivariate multiple regressions confirm that the coefficient on *CGO_DUMMY* is significantly larger ($p < 0.01$) when equation (3) is estimated using $AVOL_{SELLER\text{-}INITIATED\ TRADES}$ than when using $AVOL_{BUYER\text{-}INITIATED\ TRADES}$ as the dependent measure.

Panel C reports the results of re-estimating equation (3) including the *CGO*DECEMBER* interaction (as well as the *DECEMBER* constitutive term). [13] Consistent with Shefrin and Statman's (1985) framework, there is a negative and significant ($p < 0.01$) coefficient on *CGO*DECEMBER*.[14] A Wald test indicates that the sum of the coefficients on *CGO* and *CGO*DECEMBER* is not significantly different from zero, consistent with the disposition effect being eliminated during the month of December. Across all panels in Table 4, the control variables included in equation (3) are significant as predicted with the exception of *AVG_TURN*, which is insignificant in most specifications, and *DISPERSION* which is insignificant in all specifications.

In untabulated analysis, I also replicate the tests in Blouin et al. (2003) for my sample period and variable definitions. Consistent with Blouin et al. (2003), I find modest but statistically significant evidence of a negative interaction between *CGO* and the spread between

[13] There are 922 December earnings announcements. These are roughly evenly distributed with respect to which of the firm's fiscal quarters (one through four) the announced earnings relate to. In robustness tests, I relaxed many of the sample selection constraints and found similar results among a sample with a larger number of December earnings announcements.

[14] My findings around earnings announcements support the more general evidence of December tax-loss selling documented by Sikes (2012).

short-term and long-term enacted capital gains rates, as well as a negative interaction between *CGO* and an indicator variable for periods when the long-term capital gains rate is relatively high compared to historical levels.[15] My replication is not as powerful as the tests in Blouin et al. (2003) because I examine a shorter time-series with less variation in tax rates. While these secondary results confirm that capital gains tax incentives mitigate the disposition effect, the overall set of results presented in this section suggest that, except in December, the disposition effect is a more important determinant than the lock-in effect for the average market reaction to earnings announcements.

5. Testing the effects of stockholders' CGO on the degree to which equity markets incorporate earnings information

5.1. Model Development

I predict that investors' capital gains incentives will affect the extent to which aggregate trading volume reflects investors' disagreement. To test this prediction, I re-estimate the model from stage one, including interactions between *CGO_DUMMY*ABS_UE* and *CGO_DUMMY*ABS_RETURN*:

$$\begin{aligned} AVOL_{TOTAL\_TRADES} = {} & \alpha_0 + \alpha_1 CGO\_DUMMY_{it} + \alpha_2 ABS\_UE_{it} + \alpha_3 CGO\_DUMMY_{it} * ABS\_UE_{it} \\ & + \alpha_4 ABS\_RETURN_{it} + \alpha_5 CGO\_DUMMY_{it} * ABS\_RETURN_{it} \\ & + \sum_k \alpha_k CONTROLS_{ikt} + \varepsilon_{it} \end{aligned} \quad (4)$$

[15] I also repeat the analyses in my study and the replication of Blouin et al. (2003) using a measure of *CGO* based on a reference price which only includes purchases within one year prior to the earnings announcement date, in order to align the capital gains proxy with the short-term capital gains tax holding period during my sample. While weaker in magnitude, all qualitative inferences from my analyses as well as the Blouin et al. (2003) replication remain unchanged.

where all variables are as defined in equation (3) above. Tax incentives (the disposition effect) predict negative (positive) coefficients on the interactive terms CGO_DUMMY_{it}*ABS_UE_{it} (α_3) and CGO_DUMMY_{it}*ABS_RETURN_{it} (α_5).

The lock-in effect and disposition effect are also predicted to affect abnormal announcement-window returns. To test this prediction, controlling for previously identified determinants of abnormal returns around earnings announcements, I estimate the following OLS model:

$$CAR_{(-1,+1)} = \beta_0 + \beta_1 CGO\_DUMMY_{it} + \beta_1 UE_{it} + \beta_2 NONLINEAR_{it} + \beta_3 LOSS_{it} + \beta_4 ROA_{it} + \beta_5 DISPERSION_{it} + \beta_6 PRICE_{it} + \beta_7 AVG\_TURN_{it} + \varepsilon_{it} \quad (5)$$

where $CAR_{(-1,+1)}$ is firm *i*'s three-day cumulative abnormal return around earnings announcement date *t*, relative to the Fama-French-momentum four-factor benchmark return (Carhart 1997). The lock-in effect (the disposition effect) predicts a positive (negative) coefficient on CGO_DUMMY_{it} (β_1).

While $CAR_{(-1,+1)}$ is adjusted for common risk factors (i.e. beta, firm size, book-to-market, momentum), I also control for a number of previously identified determinants of abnormal returns around earnings announcements. I control for *UE*, the signed equivalent of *ABS_UE* defined above. I allow for a non-linear earnings return-relation (Freeman and Tse 1992) by including *NONLINEAR*, defined as *UE***ABS_UE*. I also include a *LOSS* indicator, equal to 1 when reported quarterly income before extraordinary items is negative, and zero otherwise (Hayn 1995). I include *ROA*, defined as income before extraordinary items scaled by beginning-of-quarter total assets (Balakrishnan et al. 2010, Chen et al. 2011). Finally, I include three

variables from the abnormal volume model that may also impact abnormal returns, *DISPERSION*, *PRICE*, and *AVG_TURN*, as defined in equation.[16]

5.2. Results

[INSERT TABLE 5 HERE]

Table 5 presents the results of OLS regressions of equation (4). The dependent measure is $AVOL_{TOTAL\ TRADES}$ and *t*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. Table 5 provides evidence on the extent to which the coefficients on *ABS_UE* and *ABS_RETURN* vary with stockholders' capital gains overhang. In columns (1) and (2) I examine each proxy individually, and in column (3) I include interaction for both proxies in the same model. The coefficients on each interaction term are positive and significant ($p < 0.01$), as predicted by the disposition effect. My results indicate that the examined proxies for earnings-related disagreement and the differential precision of pre-announcement information are stronger determinants of trading behavior when stockholders are in an unrealized gain position than when stockholders are in an unrealized loss position.

Figure 3 presents univariate evidence on the relation between stockholders' CGO and abnormal returns around earnings announcements. The disposition effect predicts that abnormal announcement-window returns will be more negative around earnings announcements when stockholders are in an aggregate unrealized gain versus loss position. The figure presents the mean three-day cumulative abnormal returns around unrealized gain and loss observations, for each decile of unexpected earnings. Consistent with the predictions from the disposition effect, the mean *CAR* is more negative for unrealized gain observations than unrealized loss

[16] Barron et al. (2009) identify a negative relation between forecast dispersion and returns, and Bhushan (1994) finds that price and average turnover exhibit inverse relations with the return reaction to earnings announcements.

observations over all deciles of unexpected earnings. Untabulated Satterthwaite *t*-statistics indicate that the differences in mean *CAR* are statistically significant at the 0.01 (0.05) level for six (seven) out of ten deciles of unexpected earnings.

[INSERT FIGURE 3 HERE]

[INSERT TABLE 6 HERE]

Table 6 presents the results of OLS regressions of equation (5). The dependent measure in equation (5) is $CAR_{(-1,+1)}$, and the disposition effect predicts a negative coefficient on *CGO_DUMMY*. As in previous tables, *t*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. Column 1 presents the results of estimating equation (5) on the full sample. Consistent with the disposition effect, the coefficient of -0.007 on *CGO_DUMMY* indicates that, *ceteris paribus*, abnormal returns are 0.7% lower around earnings announcements where stockholders are in an unrealized gain position relative to earnings announcements where stockholders are in an unrealized loss position. Control variables in column 1 are significant as predicted with the exception of *AVG_TURN*, *PRICE* and *DISPERSION*, which are statistically insignificant.

To confirm that my results are not confined to one type of earnings news, columns 2 and 3 separately estimate equation (5) on good ($UE > 0$) and bad ($UE < 0$) news announcements, respectively. I find that the coefficient on *CGO_DUMMY* is negative ($p < 0.01$) for both good and bad news announcements, which is consistent with Frazzini's (2006) prediction that the disposition effect causes the market to underreact to earnings news when news and capital gains have the same sign. In the case of good news announcements, the incremental negative three-day

abnormal return associated with being in an aggregate unrealized gain position is an economically meaningful -1.2%.

6. Discussion

6.1. Robustness Tests

In addition to the analysis presented above, I performed several tests to examine whether my findings are sensitive to my research design choices. Some of these have been footnoted throughout the text. One aspect of my research design which may limit the generalizability of my results is my sample selection procedure. I require each firm-quarter observation in my sample to have available quarterly earnings forecasts from a minimum of three different analysts. However, my results may differ with analyst coverage (e.g. Lang and Lundholm 1996; Hong et al. 2000; Gleason and Lee 2003). In this regard, prior literature suggests that the impact of the disposition effect is likely to be even greater among firms with weaker information environments and greater valuation uncertainty (Kumar 2009). Accordingly, I analyze whether my results vary with the strength of the firm's information environment by allowing the coefficients in equation (3) to vary with the level of analyst following. In untabulated analysis, I relaxed the analyst following requirement and examined a seasonal random walk measure of earnings surprise, allowing me to include firms with no or low analyst following in the analysis. Consistent with a stronger disposition effect among firms with weaker information environments, the coefficient on *CGO_DUMMY* decreases monotonically as analyst coverage increases, but is always positive and significant among no, low, and high analyst-coverage firms.

Another key aspect of my research design is the measurement of my variables of interest. I repeated all of my analyses using more conventional turnover-based and market-model based

measures of abnormal trading volume to ensure that my findings are not sensitive to my choice of a transaction-based measure of abnormal volume. Some univariate results are sensitive to these alternate measures, but all inferences from the multivariate tests remain unchanged. Using these measures, I also examined a longer time series from 1985 – 2011 and found similar results to those presented in the paper.

I also test whether my findings are sensitive to my use of *CGO* as a proxy for the representative investor's unrealized capital gain/loss position in any given stock. In untabulated tests, I repeated my analysis using an alternate proxy for stockholders' aggregate reference price using each stock's historical series of prices and turnover, following the methodology developed by Grinblatt and Han (2005). This alternate CGO proxy incorporates the trading history of all shareholders in a given stock, does not require the availability of 13-F filing data, and employs monthly data to provide a more timely proxy.[17] This analysis also allows me to examine the sensitivity of my results to varying levels of institutional ownership. Unsurprisingly, prior literature finds that the disposition effect is more pronounced for less sophisticated investors (Dhar and Zhu 2006). Thus, my results may be stronger among firms with greater proportions of individual ownership relative to those with ownership concentrated among sophisticated institutional investors. However, individual investors are also more likely to be tax-sensitive than institutional investors. I find that my results are robust to the alternate CGO proxy, and that the disposition effect decreases monotonically as institutional ownership increases, but is always positive and significant among no, low, and high institutional ownership firms.

[17] While the alternate measure addresses the potential measurement error concerns of *CGO*, it suffers from other limitations which justify its use as an alternate, instead of primary, proxy for the capital gains overhang in my study. Namely, it does not incorporate directly observed holdings data for *any* of the firm's shareholders, instead relying on assumed trading patterns implied from aggregate trading volume.

Taken together, the robustness tests performed in this section confirm that my findings are robust to alternate sample selection requirements and variable definitions. The results of the sensitivity analysis also provide additional evidence in support of the behavioral theories motivating the study by demonstrating that my results are stronger among firms with weaker information environments and less sophisticated investors.[18]

6.2. Conclusion

This paper presents robust evidence that the disposition effect documented in the behavioral finance literature can be observed in the market response to earnings announcements, even after controlling for information-related determinants of trade around earnings announcements. In addition to finding evidence of a positive relation between stockholders' CGO and abnormal trading volume around earnings announcements, I find that this relation is stronger among seller-initiated trades than buyer-initiated trades and exhibits a seasonal December effect. In sensitivity analysis, I find that this relation is stronger among less sophisticated investors and for firms with weaker information environments, consistent with the behavioral explanation. While my results are generally consistent with the disposition effect determining the relation between stockholders' CGO and abnormal trading volume, they indicate that investors' tax-irrational preferences are mitigated when tax incentives are stronger or more salient. Therefore, my results should be interpreted as clarifying, but not directly contradicting, the results presented in Blouin et al. 2003 and Jin (2006).

My results should also be of interest to researchers who treat abnormal trading volume as a *proxy* for investor disagreement about earnings (e.g. Garfinkel 2009; Garfinkel and Sokobin

[18] All untabulated analyses are available from the author upon request.

2006), as I show that both the level of abnormal trading volume and the degree to which abnormal trading volume reflects disagreement are affected by stockholders' CGO.

In the context of the drift found by Frazzini (2006), my results suggest that a wealth transfer may take place around earnings announcements, from investors more prone to the disposition effect to those less prone to the disposition effect, as well as from investors prone to the disposition effect to the government in the form of higher capital gains tax payments. However, beyond presenting evidence of systematically predictable announcement-window abnormal returns, I do not directly examine the welfare implications of the disposition effect on investors' earnings-related trading decisions. Future archival or experimental research may wish to further examine the welfare implications of this behavior.

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Appendix A

Variable Definitions

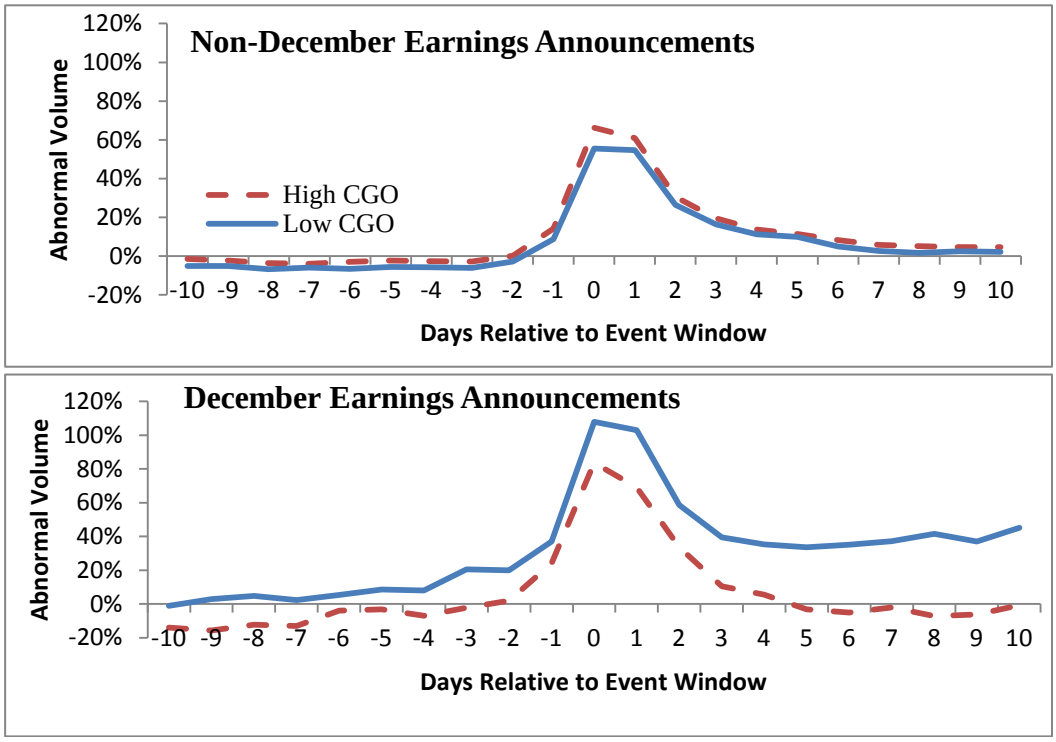
AVOL$_j$	$\ln\left(\frac{\text{Number of firm } i \text{ trades by investor group } j \text{ during three-day earnings announcement interval } t}{\text{Median number of firm } i \text{ trades by investor group } j \text{ during three-day non-announcement intervals}}\right)$ Where the three-day earnings announcement interval is measured from days [-1,+1] relative to Compustat quarterly earnings announcement date t , and the non-announcement period includes all contiguous three-day periods from trading days [-250, -2] relative to the earnings announcement date, excluding any three-day periods containing previous earnings announcements. Investor groups j are defined as: *TOTAL TRADES* = All trades within TAQ sample selection requirements *BUYER-INITIATED TRADES* = Buyer-Initiated Trades, classified using the Lee-Ready (1991) algorithm *SELLER-INITIATED TRADES*= Seller-Initiated Trades, classified using the Lee-Ready (1991) algorithm
CGO	Capital Gains Overhang, defined as the percentage deviation of the aggregate reference price from the current end-of-month price $(P_t - RP_t)/P_t$. The reference price is defined as $RP_t = \phi^{-1}\sum_{n=0}^{t} V_{t,t-n}P_{t-n}$, where $V_{t,t-n}$ is the number of shares purchased by observable 13-F institutions at date t-n that are still held by the original purchasers at date t, ϕ is a normalizing constant such that $\phi = \sum_{n=0}^{t} V_{t,t-n}$, and P_t is the stock price at the end of month t.
CGO_DUMMY	A binary variable equal to 1 when *CGO* > 0, and zero otherwise.
ABS_UE	100* (The absolute value of I/B/E/S actual EPS for quarter t minus the most recent mean I/B/E/S consensus quarter t EPS forecast prior to the earnings announcement, scaled by beginning of quarter t stock price in Compustat).
SIZE	The natural log of market value of equity at the beginning of quarter t.
DISPERSION	The natural log of preannouncement dispersion, measured as the standard deviation of the most recent I/B/E/S consensus EPS forecast for quarter t prior to the earnings announcement scaled by beginning of quarter t stock price in Compustat.
ABS_RETURN	Absolute value of the cumulative return over the three-day window centered on the earnings announcement.
MKT_TURN	The natural log of the percentage of all NYSE/AMEX firms' outstanding shares that are traded over the three-day event window.

PRICE	The natural log of closing price at the beginning of quarter *t*.
AVG_TURN	Average monthly share turnover for the prior twelve months
MOM	The 11-month buy-and-hold return on firm *i* beginning 12 months prior to the month of the earnings announcement
DECEMBER	equals 1 if the earnings announcement date occurs during December, and 0 otherwise
ABS_SUE	abs($EARNINGS_t - EARNINGS_{t-4}$) scaled by the standard deviation of *EARNINGS* over the previous twenty quarters (minimum of eight quarters of data required) , where *EARNINGS* is defined as income before extraordinary items scaled by beginning of quarter total assets.
$\boldsymbol{CAR_{(-1,+1)}}$	Three-day cumulative abnormal return around earnings announcement date *t*, relative to the Fama-French-momentum four-factor benchmark return (Carhart 1997)
UE	100* (I/B/E/S actual EPS for quarter *t* minus the most recent mean I/B/E/S consensus quarter *t* EPS forecast prior to the earnings announcement, scaled by beginning of quarter *t* stock price in Compustat).
NONLINEAR	*UE**abs(*UE*)
LOSS	Equals 1 if reported earnings before extraordinary items are negative, and 0 otherwise.
ROA	Income before extraordinary items scaled by beginning of quarter total assets.

Figure 1: Annual Differences in Mean Abnormal Announcement-Window Volume when Stockholders are in a Gain vs Loss Position at the time of the Earnings Announcement

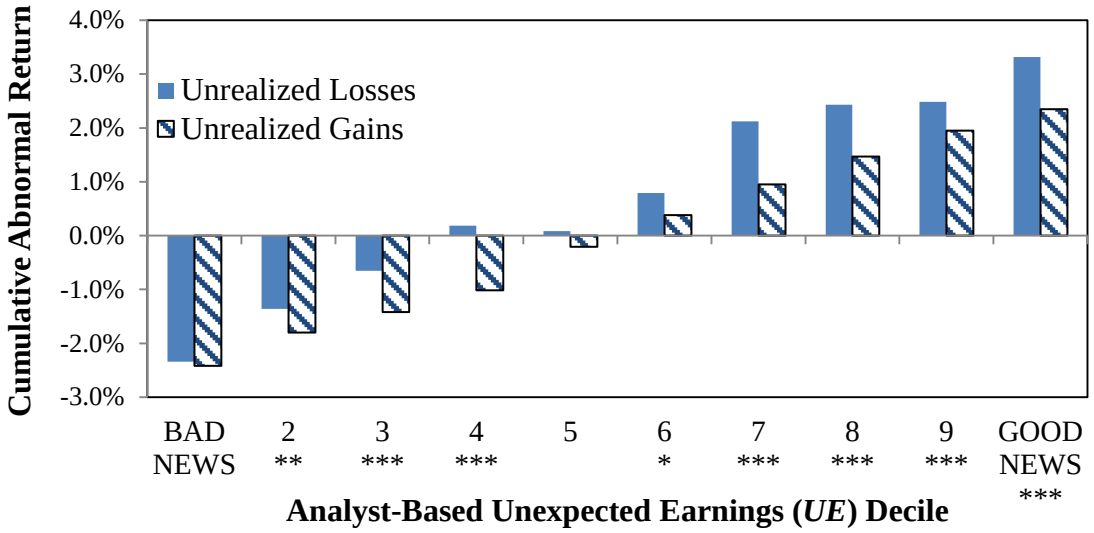
This figure depicts annual differences in mean abnormal announcement-window trading volume between earnings announcements where stockholders are in an aggregate unrealized gain versus aggregate unrealized loss position at the time of the announcement (gain – loss). Unrealized gain observations are observations where capital gains overhang is greater than zero ($CGO > 0$) and unrealized loss observations are observations where the capital gains overhang is less than or equal to zero ($CGO <= 0$). Differences in means are displayed for two different measures of abnormal trading volume ($AVOL$). The solid bar depicts differences in exp($AVOL_{TOTAL\ TRADES}$), while the striped bar depicts differences in exp($AVOL_{SELLER\text{-}INIT\ TRADES}$). CGO, $AVOL_{TOTAL\ TRADES}$, and $AVOL_{SELLER\text{-}INIT\ TRADES}$ are defined in Appendix A. All annual volume differences are statistically significnat at the 1% level based on (two-tailed) Satterthwaite *t*-statistics for groups with unequal variance.

Figure 2: Abnormal trading volume around quarterly earnings announcements for high and low capital gains overhang quintiles, Non-December vs. December Earnings Announcements



This figure plots abnormal volume for high versus low CGO quintiles, for subsamples of earnings announced outside of the month of December and those announced during December. The solid lines plot the low CGO quintile and the dashed lines plot the high CGO quintile. The figure plots daily abnormal volume in event time around quarterly earnings announcements. Specifically, I compute daily abnormal volume (as opposed to 3-day AVOL) and regress the daily abnormal volume on event day fixed effects, following the procedure in Landsman et al (2011) and Huddart et al (2009). The figure plots the coefficient estimates from the regression, which represent conditional mean AVOL on each event day.

Figure 3: Average Three-Day Cumulative Abnormal Returns Around Earnings Announcements Based on Stockholders' Unrealized Gain/Loss Position



This figure depicts mean three-day cumulative abnormal returns around earnings announcements separately for observations where stockholders are in an aggregate unrealized gain versus aggregate unrealized loss position at the time of the announcement. Unrealized gain observations are observations where capital gains overhang is greater than zero ($CGO > 0$) and unrealized loss observations are observations where the capital gains overhang is less than or equal to zero ($CGO < =0$). Three-day cumulative abnormal returns centered on the earnings announcement date ($CAR_{(-1,+1)}$) are calculated relative to benchmark returns from the Fama-French-Momentum four-factor model (Carhart 1997).Average three-day cumulative abnormal returns are presented for each decile of unexpected earnings (*UE*). The solid (striped) bar depicts average three day cumulative abnormal returns for earnings announcements where stockholders are in an unrealized loss (gain) position. *CGO*, $CAR_{(-1,+1)}$, and *UE* are formally defined in Appendix A. Stars indicate statistically significant differences in mean cumulative abnormal returns between the unrealized gain and loss sample for each decile of unexpected earnings. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively based on Satterthwaite *t*-statistics for groups with unequal variances.

Table 1
Summary of Predictions

Prediction	Lock-In Effect[†]	Disposition Effect[‡]
The relation between stockholders' CGO and abnormal trading volume around earnings announcements:		
A) The relation between CGO and abnormal trading volume is	Negative	Positive
B) The magnitude of the relation between CGO and trading volume is stronger for seller-initiated than buyer-initiated trades	Yes	Yes
C) The relation between CGO*December and trading volume is	?	Negative
CGO effects and the degree to which capital markets incorporate earnings information		
A) The relation between |unexpected earnings| and trading volume is stronger when investors are in a	Loss Position	Gain Position
B) The relation between |stock return| and trading volume is stronger when investors are in a	Loss Position	Gain Position
C) The Relation between CGO and abnormal stock return is	Positive	Negative

"CGO" stands for "Capital Gains Overhang," and refers to stockholders' aggregate unrealized gain/loss position in the firm's equity at the time earnings are announced.

[†]"Lock-In Effect" refers to tax-sensitive investors' reluctance to sell stocks in a *gain* position due to capital gains tax incentives.

[‡]"Disposition Effect" refers to investors' reluctance to sell stocks in a *loss* position due to prospect theory preferences (Kahneman and Tversky 1979).

Table 2
Descriptive Statistics

Variable	Statistic	Full Sample (N=55,245)	Unrealized Loss Sample (N=15,830)	Unrealized Gain Sample (N=39,415)
$AVOL_{TOTAL\ TRADES}$	Mean	0.448	0.367	0.480
	Median	0.410	0.329	0.439
	St. Dev.	0.445	0.459	0.435
$AVOL_{BUYER\text{-}INITIATED\ TRADES}$	Mean	0.458	0.379	0.489
	Median	0.434	0.359	0.462
	St. Dev.	0.479	0.501	0.466
$AVOL_{SELLER\text{-}INITIATED\ TRADES}$	Mean	0.440	0.353	0.475
	Median	0.404	0.318	0.436
	St. Dev.	0.464	0.476	0.454
CGO	Mean	0.028	-0.474	0.230
	Median	0.142	-0.202	0.216
	St. Dev.	0.589	0.901	0.137
ABS_UE	Mean	0.346	0.765	0.178
	Median	0.081	0.179	0.061
	St. Dev.	1.207	2.020	0.554
SIZE	Mean	7.697	7.118	7.929
	Median	7.597	6.985	7.826
	St. Dev.	1.477	1.499	1.402
DISPERSION	Mean	-7.177	-6.510	-7.445
	Median	-7.255	-6.579	-7.477
	St. Dev.	1.181	1.283	1.021
ABS_RETURN	Mean	0.046	0.057	0.041
	Median	0.031	0.039	0.029
	St. Dev.	0.047	0.058	0.041
MKT_TURN	Mean	-3.973	-3.962	-3.977
	Median	-3.908	-3.899	-3.919
	St. Dev.	0.323	0.301	0.331
PRICE	Mean	3.336	2.839	3.536
	Median	3.399	2.907	3.559
	St. Dev.	0.666	0.697	0.535
AVG_TURN	Mean	6.800	6.651	6.860
	Median	6.821	6.640	6.901
	St. Dev.	1.642	1.616	1.649
MOMENTUM	Mean	0.149	-0.134	0.263
	Median	0.112	-0.159	0.196
	St. Dev.	0.390	0.326	0.354

This table presents descriptive statistics for the full sample, unrealized gain, and unrealized loss samples. Unrealized gain (loss) observations are observations where $CGO > 0$ ($CGO \leq 0$). All variables are defined in Appendix A. All variable means are significantly different between the unrealized gain and unrealized loss samples at the 1% level based on (two-tailed) Satterthwaite *t*-statistics for groups with unequal variances.

Table 3
Simple Pearson Correlations Among Key Measures

	***AVOL* Measures**										
	TOTAL TRADES	***BUYER INITIATED TRADES***	***SELLER INITIATED TRADES***	***CGO***	***ABS_UE***	***SIZE***	***DISPER-SION***	***ABS_RET***	***MKT TURN***	***PRICE***	***AVG TURN***
$AVOL_{BUYER\text{-}INITIATED\ TRADES}$	0.951										
$AVOL_{SELLER\text{-}INITIATED\ TRADES}$	0.944	0.816									
CGO	0.097	0.091	0.098								
ABS_UE	0.016	0.008 [x]	0.020	-0.383							
SIZE	0.008[x]	0.007 [x]	0.025	0.206	-0.186						
DISPERSION	-0.052	-0.054	-0.048	-0.381	0.431	-0.278					
ABS_RETURN	0.417	0.400	0.388	-0.175	0.119	-0.117	0.070				
MKT_TURN	0.305	0.272	0.325	-0.036	0.041	0.166	0.055	0.117			
PRICE	0.090	0.084	0.095	0.443	-0.313	0.627	-0.477	-0.148	0.027		
AVG_TURN	0.187	0.158	0.212	0.021	-0.019	0.674	-0.023	0.052	0.631	0.272	
MOMENTUM	0.222	0.213	0.219	0.402	-0.137	0.084	-0.204	-0.031	0.022	0.249	0.033

This table presents simple Pearson correlations among key variables in the sample. All variables are defined in Appendix A. All correlations except those noted with [x] are statistically significant at the 1% level (two-tailed).

Table 4
Ordinary Least Squares Regression Coefficient Estimates (*t*-statistics) for Tests of the Relation Between Capital Gains Overhang and Abnormal Trading Volume Around Quarterly Earnings Announcements from 1993 to 2007

		Panel A		Panel B				Panel C	
		(1)		(2)		(3)		(4)	
	Pred. Sign	*TOTAL TRADES*		*BUYER-INITIATED TRADES*		*SELLER-INITIATED TRADES*		*TOTAL TRADES*	
Constant		1.296	***	1.350	***	1.350	***	1.293	***
		(3.52)		(4.27)		(3.25)		(3.50)	
CGO_DUMMY	(?)	0.068	***	0.058	***	0.074	***	0.069	***
		(4.12)		(3.26)		(4.78)		(4.22)	
ABS_UE	(+)	0.008	***	0.005	**	0.012	***	0.008	***
		(4.39)		(2.43)		(5.13)		(4.24)	
SIZE	(-)	-0.048	***	-0.039	***	-0.051	***	-0.048	***
		(-5.12)		(-4.10)		(-5.50)		(-5.05)	
DISPERSION	(+)	-0.006		-0.006		-0.005		-0.006	
		(-1.24)		(-1.35)		(-1.03)		(-1.23)	
ABS_RETURN	(+)	3.787	***	3.948	***	3.627	***	3.779	***
		(12.69)		(11.94)		(13.98)		(12.69)	
MKT_TURN	(+)	0.313	***	0.322	***	0.338	***	0.313	***
		(3.49)		(4.10)		(3.39)		(3.48)	
PRICE	(+)	0.098	***	0.094	***	0.100	***	0.097	***
		(7.18)		(7.20)		(6.91)		(7.18)	
AVG_TURN	(+)	0.022		0.011		0.030	**	0.022	
		(1.64)		(0.80)		(2.15)		(1.63)	
MOMENTUM	(+)	0.197	***	0.210	***	0.199	***	0.197	***
		(8.25)		(7.58)		(8.82)		(8.30)	
DECEMBER								0.145	***
								(3.08)	
*CGO_DUMMY * DECEMBER*	(-)							-0.103	***
								(-2.89)	
Observations		55,245		55,245		55,245		55,245	
Adjusted R^2		31.2%		29.2%		32.9%		32.9%	
F-Statistic						22.09	***	0.606	

This table reports various specifications of the OLS regression outlined in equation (4). *T*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. Panel A presents the results from estimating equation (4) with $AVOL_{TOTAL\ TRADES}$ as the dependent measure. Panel B presents the results from estimating equation (4) with $AVOL_{BUYER\text{-}INITIATED\ TRADES}$ and $AVOL_{SELLER\text{-}INITIATED\ TRADES}$ as the dependent measures in columns (2) and (3), respectively. The F-Statistic reported in Panel B reports the results of a Wald test testing the equality of the coefficients *CGO_DUMMY* across models (2) and (3), based on the results of (untabulated) multivariate multiple regression analysis. Panel C presents the results from estimating equation (4) with $AVOL_{TOTAL\ TRADES}$ as the dependent measure, adding an interaction between *CGO_DUMMY* and *DECEMBER*. The F-Statistic reported in Panel C reports the results of a Wald test of the hypothesis that the coefficients (*CGO_DUMMY* + *CGO_DUMMY*DECEMBER*) = 0. All variables are defined in Appendix A. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively.

Table 5
Ordinary Least Squares Regression Coefficient Estimates (*t*-statistics) for Tests of the Impact of Capital Gains Overhang on the Relation Between Earnings Information and Abnormal Trading Volume Around Quarterly Earnings Announcements from 1993 to 2007

$$AVOL_{TOTAL\_TRADES} = \alpha_0 + \alpha_1 CGO\_DUMMY_{it} + \alpha_2 ABS\_UE_{it} + \alpha_3 CGO\_DUMMY_{it} * ABS\_UE_{it} + \alpha_4 ABS\_RETURN_{it} + \alpha_5 CGO\_DUMMY_{it} * ABS\_RETURN_{it} + \sum_k \alpha_k CONTROLS_{ikt} + \varepsilon_{it} \quad (5)$$

	Pred. Sign	(1) All Obs.		(2) Good News ($UE > 0$)		(3) Bad News ($UE < 0$)	
Constant		1.284	***	1.331	***	1.320	***
		(3.49)		(3.59)		(3.56)	
CGO_DUMMY	(+)	0.060	***	0.013		0.008	
		(3.66)		(0.57)		(0.35)	
ABS_UE	(+)	0.004	**	0.009	***	0.006	***
		(2.54)		(4.77)		(3.16)	
*CGO_DUMMY*ABS_UE*	(+)	0.026	***			0.022	***
		(3.66)				(3.01)	
ABS_RETURN	(+)	3.786	***	3.136	***	3.149	***
		(12.70)		(10.30)		(10.29)	
*CGO_DUMMY*ABS_RETURN*	(+)			1.174	***	1.149	***
				(4.38)		(4.28)	
CONTROLS		Included		Included		Included	
Observations		55,245		55,245		55,245	
Adjusted R^2		31.6%		31.2%		31.5%	

This table reports various specifications of the OLS regression outlined in equation (5). *CONTROLS* is a vector of control variables that includes the same control variables specified in equation (4): *SIZE*, *DISPERSION*, *MKT_TURN*, *PRICE*, *AVG_TURN*, and *MOMENTUM*. *T*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. All variables are defined in Appendix A. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively.

Table 6
Ordinary Least Squares Regression Coefficient Estimates (*t*-statistics) for Tests of the Impact of Capital Gains Overhang on Abnormal Returns Around Quarterly Earnings Announcements from 1993 to 2007

$$CAR_{(-1,+1)} = \beta_0 + \beta_1 CGO\_DUMMY_{it} + \beta_1 UE_{it} + \beta_2 NONLINEAR_{it} + \beta_3 LOSS_{it} + \beta_4 ROA_{it} + \beta_5 DISPERSION_{it} + \beta_6 PRICE_{it} + \beta_7 AVG\_TURN_{it} + \varepsilon_{it} \quad (6)$$

	Pred. Sign	(1) All Obs.		(2) Good News ($UE > 0$)		(3) Bad News ($UE < 0$)	
Constant		0.007	**	-0.020	***	0.025	***
		(2.04)		(-3.12)		(5.28)	
CGO_DUMMY	(-)	-0.007	***	-0.012	***	-0.005	**
		(-5.07)		(-8.86)		(-2.19)	
UE	(+)	0.023	***	0.047	***	0.010	***
		(11.44)		(7.53)		(6.91)	
NONLINEAR	(-)	-0.002	***	-0.013	***	-0.001	***
		(-9.01)		(-6.96)		(-5.33)	
LOSS	(-)	-0.004	**	-0.006	***	-0.004	**
		(-2.33)		(-2.84)		(-2.21)	
DISPERSION	(-)	-0.000		-0.006	***	0.004	***
		(-0.71)		(-7.15)		(6.51)	
ROA	(+)	0.067	***	0.053	*	0.006	
		(3.25)		(1.94)		(0.17)	
PRICE	(-)	-0.001		-0.003	***	0.004	***
		(-0.68)		(-3.09)		(2.98)	
AVG_TURN	(-)	-0.000		0.001		-0.002	***
		(-0.39)		(1.63)		(-4.90)	
Observations		55,245		29,838		18,364	
Adjusted R^2		3.1%		2.5%		1.1%	

This table reports various specifications of the OLS regression outlined in equation (6). *T*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. All variables are defined in Appendix A. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively.