The Dividend Disconnect *

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Abstract

We show that many individual investors, mutual funds and institutions trade as if dividends and capital gains are in separate mental accounts, and do not fully appreciate that dividends result in price decreases. Behavioral trading patterns (e.g. the disposition effect) are driven by price changes, not total returns. Investors treat dividends as a separate stable income stream, leading them to hold dividend-paying stocks longer and respond less to price changes. Demand for dividends is systematically higher in periods of low interest rates and poor market performance, leading to high valuations and lower future returns for dividend-paying stocks. Investors rarely reinvest dividends into the stocks from which they came, instead purchasing other stocks. This creates predictable marketwide price increases on days of large aggregate dividend payouts, concentrated in stocks not paying dividends.

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> "The humble dividend is reclaiming its rightful place as the arbiter of stock-market value... To investors desperate for income, the argument for buying equities is, well, duh. Who wouldn't want a higher income? Shares might swing around, but corporate managers go out of their way to preserve the dividend."
> - James MacKintosh, *The Wall Street Journal* May 9, 2016

At the heart of the dividend irrelevance result from Miller and Modigliani (1961) is the idea that money is fungible, implying that a value-maximizing investor should treat money equally regardless of its source. Because of this, academic finance typically assumes that an investor in a frictionless world will be indifferent between receiving $1 worth of dividends (with the price declining by $1) and selling a $1 worth of that position. Adding real-world frictions such as taxes and trading costs to the model can influence whether an investor prefers to receive a dividend or sell a given amount of stock. However, even with these frictions, investors are assumed to simply maximize the value of their position after subtracting costs, and otherwise treat the two sources of profits equally.

While the idea in Miller and Modigliani (1961) is intuitive when explicitly laid out, some of its implications (e.g. the price declining to offset dividend payment) may not be salient to many investors. Dividend irrelevance runs counter to intuitions from other areas of life, whereby harvesting the fruit from a tree is viewed as fundamentally different to harvesting the tree itself. One often reads statements like the quote with which we began, which may at first glance seem reasonable to a casual reader, but on reflection are difficult to reconcile with the Miller and Modigliani (1961) framework.

To value a stock for its income stream, like our initial quote claims, may speak to a sophisticated understanding of taxes and transaction costs, but the phrase "duh" does not immediately suggest such nuance. The last sentence of the quote implies that dividends are viewed as a safe hedge against the uncertain fluctuations in price, thereby ignoring that dividends come directly at the expense of the price level. We term this mistake the free dividends fallacy - unless the the tradeoff between price changes and dividends is salient, dividends are apt to appear as a desirable free source of income. We examine whether evidence of such a mistake is present in the trading and pricing of securities. We find that the disconnect between price changes and dividends appears to be of

considerable practical importance, affecting outcomes as varied as trading relating to gains and losses, prices of dividend-paying stocks, dividend reinvestment, and marketwide returns.

We hypothesize that investors utilize separate mental accounts (Thaler 1980, Thaler 1999, Frydman et al. 2015) for price changes and dividends, an idea first proposed by Shefrin and Statman (1984). This leads to a number of associated predictions. Firstly, because different mental accounts are tracked as separate non-fungible outcomes, investors are not likely to aggregate price changes and dividends when considering stock performance. Thus investors will trade differently in response to each of the two performance measures. Second, investors are likely to pay different levels of attention to each variable depending on how desirable the separated stream of payoffs is viewed as being. Because dividends are viewed as stable, small gains, they are apt to appear as a reliable source of free money, but one with relatively little chance for large gains. By contrast, price changes are volatile and offer the potential for both large gains and losses. As the relative desirability of small reliable gains versus large gains and losses changes over time (due to recent market returns and alternative sources of income), so will attention and trading to each of the two variables. Thirdly, because the two variables are in separate mental accounts, investors may treat them differently in terms of subsequent uses of the money. As a result, the proceeds from dividends and capital gains may be spent or reinvested in different ways.

We begin by examining whether investors exhibit different trading behavior in response to price changes and dividends. The greater volatility and frequency of price changes may make price changes more salient than dividends as a measure of how a stock is performing. Moreover, if investors suffer from the free dividends fallacy they will not correct for the impact of a dividend on the price level. In other words, if two stocks both have increased in price from \$5 to \$6, but one of them first rose to \$7 then paid \$1 of dividends, investors who only focus on price changes may treat the two stocks as having equivalent performance. To test this, we examine a number of trading behaviors based on past performance of stocks, and show that the trading is driven primarily by past price changes rather than past returns. These results hold strongly for individual investors, where mental accounting effects are expected to be strongest. For mutual funds and institutions, there is more

heterogeneity. However, among the 40% of mutual funds and 44% of institutions that display an overall disposition effect (and who thus appear to be using mental accounting more generally), the responses to dividends are similar to those of individual investors.

We examine the disposition effect (the tendency to sell winners more often than losers, as in Shefrin and Statman 1985), the rank effect (the tendency to sell extreme-ranked positions, as in Hartzmark 2015), and the rolled disposition effect (the tendency to sell a new position once its value exceeds the initial investment in a previously sold position, as in Frydman et al. 2015). The behavioral basis for these patterns means that that the economic content of dividends is less likely to explain the results.

We examine these effects, but decompose the drivers of performance into a price change component and a dividend component. For all of the studied patterns, there is significantly less selling response to the dividend component, and in a number of cases dividends do not appear to be part of the gain or loss evaluation at all. Perceptions of gains and losses seem to be largely driven by price changes, regardless of whether dividend payment has affected this price. When selling extreme-ranked positions, individual investors, mutual funds and institutions all increase their selling propensity in response to ranks of stocks based on price changes, but show no positive response to ranks that include dividends in the calculation. When computing the combined gain and loss on a reinvested position, individual investors (the data on which allow an examination of this question) do not appear to include dividends.

The fact that investors appear to give dividends less weight when calculating stock performance does not mean that dividends get ignored in the decision-making process. Rather, investors focusing on the dividend mental account, presumably for the perceived attractiveness of the income stream, are likely to pay less attention to the capital gains component of returns. Consistent with this, we show that investors (individuals, mutual funds and institutions) are less likely to sell stocks that pay more dividends, holding them for longer periods of time than other stocks. In addition, dividends make investors less sensitive to past price changes when selling stocks. This supports the prediction that investors do not view dividends and capital gains as equally important contributors to returns,

but focus on one variable or the other.

Next we turn to the marketwide implications of the prediction that the desirability of each of the two attributes of performance will shift according to how the separate payoffs are viewed at that time. We examine the abnormal return in the interim period after dividend announcement and before the ex-day to proxy for investors' demand for dividends. Hartzmark and Solomon (2013) show that these returns (which lacks dividend-related news, uncertainty, or tax consequences) are linked to price pressure from investors who want to receive the dividend payment itself. If investors are subject to the free dividends fallacy, viewing dividends as a source of income, they should place a higher value on that perceived income stream when other options for income are less attractive.

Perhaps the closest substitute for such an investment is bonds, suggesting that dividend demand will be high when interest rates are low as the periodic payments from bonds are less attractive. Consistent with this, we find that dividend demand is higher when the interest rate is low. In the cross-section, demand is higher for stocks whose dividends are more stable, and where dividends have increased in the recent past. In addition, the demand for dividends is lower when recent past market returns have been higher. In these times, the smaller predictable stream of payments from dividends is apt to appear less attractive compared with the large recent capital gains, even though both parts contribute to total returns.

We then turn to the third prediction, that viewing price changes and dividends in separate mental accounts may cause investors to use the proceeds from each differently. In particular, if investors view dividend payments as being separate from the value of their position, they may not reinvest dividends into the shares from which they came. This has been shown before for the case of individuals in Baker et al. (2007), who argued that dividends were financing consumption. We show that dividend reinvestment is also rare among more sophisticated groups of investors such as mutual funds and institutions, many of whom do not have an equivalent consumption motive. Using quarterly holdings, we examine how often dividend-paying holdings increase by approximately the number of shares that could be purchased with the dividend on the payment date (when reinvestment requires a non-trivial number of shares). We compare this to another benchmark for passive investing

- holding exactly the same number of shares in the subsequent quarter, and leaving the dividend in cash or investing it elsewhere. We show that dividend reinvestment is only about 2.3% as common as zero holdings changes for the case of mutual funds, and 9.6% as common for institutional investors. If revealed preference is to be believed, the low level of dividend reinvestment implies that these investors have a desire to marginally reduce their portfolio weights by the exact amount of the dividend starting on the ex-dividend date. It seems more likely that these sophisticated investors are either not directly tracking which dividends correspond to which stocks for reinvestment purposes, or do not care enough to maintain particular portfolio weights.

The reinvestment of dividends outside of the stocks from which they came has predictable effects upon market returns. Days with large dividend payouts in the market are associated with higher market returns that day - a one standard deviation increase in aggregate dividend payouts is associated with higher returns of 2.0 basis points (compared to a mean daily market return of 4 basis points). This price increase is consistent with the finding that uninformed shifts in demand can affect prices of individual stocks in the US (Shleifer 1986, Hartzmark and Solomon 2013) and the market as a whole in the case of Chile (Da et al. 2014). When the market is decomposed into stocks that paid a dividend that day and stocks that did not, we find that the price increase is more significant for firms that *did not* pay a dividend that day. This is consistent with the institutional and mutual fund results - the vast majority of dividends get reinvested outside the stock from which they were paid, leading to predictable price pressure in those stocks.

Our results are consistent with investors evaluating their portfolio performance in a more naive manner than academic finance has generally assumed. We provide direct evidence that investors do not treat dividends and capital gains in the same manner, consistent with investors considering them in separate mental accounts. This leads to each variable receiving a different levels of focus depending on context. A general disconnect between price changes and dividends, as our results suggest, would also explain why the popular discourse on dividends diverges so sharply from the academic literature. When US Airways called its frequent flier program "Dividend Miles," they presumably had in mind a definition of "paying dividends" similar to that of the Macmillan Dictionary - "to bring you a

lot of benefits."[1] It seems unlikely they were trying to convey messages like "tax-disadvantaged miles," "irrelevant miles" or "signaling miles." If investors do not accurately perceive the tradeoff between dividends and price changes, this stream of payments will seem like an unambiguously positive aspect of stocks. The fact that this apparent confusion exists even in the financial press is consistent with the market-wide impacts we document.

The disconnect between price changes and dividends arising from mental accounting also helps to unify a number of results that are puzzling under normal assumptions about returns. Baker et al. (2007) present evidence that individuals like to consume out of their dividends, consistent with the mental accounting distinctions between dividends and capital gains. Baker and Wurgler (2004b) argue for a catering theory whereby investors have a general demand for dividends due to psychological or institutional reasons, though the psychology behind this is not discussed at length. The free dividends fallacy not only explains psychologically why dividends may be desirable, but also why the shifting attractiveness of capital gains and dividends can generate time-varying demand for dividends which firms respond to (Baker and Wurgler 2004a). Valuing dividends purely as an income stream can also help to explain the observed preference that older investors have for dividends documented in Graham and Kumar (2006) and Becker et al. (2011), and the fact that investors do not perceive the risk-reward tradeoff inherent in the change in leverage associated with a dividend, as shown in Welch (2016). An overall demand for dividends is consistent with Hartzmark and Solomon (2013), who document abnormally positive returns during dividend months linked to price pressure from dividend-demanding investors. Harris et al. (2015) show that mutual funds have a tendency to "juice" their dividend yield by trading in and out of dividend-paying stocks to increase the fund's dividend yield at the expense of overall returns. These results all point to a generalized demand for dividends that is time-varying, but do not explain why dividends are desirable.[2]

The results suggest that the free dividends fallacy is costly to investors because of the systematic nature of the time-varying dividend demand. In addition to the direct costs and benefits associ-

[1] http://www.macmillandictionary.com/us/dictionary/american/pay-dividends

[2] In Section 1, we discuss other behavioral theories of dividends, such as Shefrin and Statman (1984) and Baker et al. (2016), and how they differ from the free dividend fallacy.

ated with dividend paying stocks (such as taxes, trading costs and reinvestments), if investors buy dividend-paying stocks when they are relatively over-priced due to a general demand for dividends, they will earn predictably lower returns. We estimate that investors buying dividend-paying stocks during times of high demand earn roughly 2-4% less per year in expectation. Thus an investor whose preferences for dividends cause him to shift into and out of dividend-paying stocks at the same time as other investors would lose a significant portion of the equity premium by doing so.

1 Framework

The null hypothesis of the paper is that investors seek to maximize the monetary value of a position, consistent with Miller and Modigliani (1961). Absent frictions, a rational investor is indifferent between receiving a dividend or selling the equivalent value of cash. The reason is that they can costlessly buy and sell positions to achieve a desired breakdown of cash to equity. Introducing frictions such as taxes or trading costs may make an investor prefer to achieve a given cash level through dividends or share sales. This simply requires adding costs into the calculation of value and does not mean the investor fails to appreciate that the dividend comes at the expense of the price level.

The alternative hypothesis we explore is that investors treat price changes and dividends in separate mental accounts (Thaler (1999) and Shefrin and Statman (1984)). We consider an implication of mental accounting not previously emphasized - if decisions about capital gains and dividends are made piecemeal, rather than combined together, then the two aspects of performance are likely to be considered separately, rather than combined into a single returns variable. At a broad level, this implies that investors will trade differently in response to the two aspects of performance, rather than evaluating stocks by their total return. We consider a number of additional specific predictions from mental accounting:

Prediction 1. The Free Dividends Fallacy: Separate Evaluation Leads to Neglect of the Tradeoff Between Price Changes and Dividends

If investors do not consider the two variables as part of a single evaluation, they will be less likely to appreciate that dividend payment results in a decrease in the price of the security. We describe in section 2 how the tradeoff may not be readily apparent to an investor who only pays attention periodically to his portfolio. To such an investor, if the reduction in price associated with dividends is not salient, then dividends are apt to appear as free. This will make dividends an unambiguously positive aspect of stocks, causing investors to be less likely to sell them (in order to receive the ongoing dividend payments).

Prediction 2. Capital Gains and Dividends Viewed as Separate Desirable Attributes of Stocks

While the dividend income stream is likely to appear as a relatively stable source of small gains, it will not offer the opportunity for large gains (or the risk of large losses) that price changes do. As a result, price changes are likely to receive greater attention as a measure of a stock's recent performance. In addition, if price changes and dividends are viewed as independent ways to profit from a stock, then investors in dividend-paying assets are likely to be less sensitive to the price change component, as they will perceive that they have already made a profit through the dividend component.

In addition, the relative attractiveness of dividends relative to capital gains is likely to vary over time according to how valuable the income stream appears. In particular, investors are likely to compare the income from stocks with the income they could receive on a fixed income asset like a bond. Thus, when interest rates are low, dividend paying stocks may be more attractive. In addition, the relative attractiveness of a small regular dividend stream to capital gains is likely to vary according to whether the price change component has been delivering large gains recently, which would make price changes seem relatively more valuable (consistent with extrapolative beliefs from Greenwood and Shleifer (2014)). Thus we also predict that the demand for dividends will be higher when market performance has been lower. If many investors systematically demand dividends for a similar reason this could impact the overall valuation of dividend paying stocks.

Prediction 3. Capital Gains and Dividends Spent Differently

If capital gains and dividends are evaluated in different mental accounts, then investors will

use the proceeds differently. This has been argued in Thaler and Johnson (1990) in terms of how much risk people take on with gains and losses and in Baker et al. (2007) when explaining why individuals consume out of dividends. More broadly, if dividends are considered to be cash flows that are separate from the "value" of a position, then investors may not be inclined to reinvest them into the stocks from which they came. If dividends are viewed as income to be spent, even if this is reinvested, it may be invested in a different manner or asset, rather than reinvested into the original stock as if it were just part of the same position value.

Comparison with other behavioral models

The idea that capital gains and dividends might be considered in separate mental accounts was first proposed by Shefrin and Statman (1984). In their model simply segregating the two parts into different mental accounts create a preference for dividends for a number of reasons. Dividends help investors solve self-control problems, prospect theory makes it preferable to split a gain or loss into multiple components, and consuming from dividends has lower regret possibilities than consuming from stock sales.

Importantly, these effects all operate regardless of whether or not investors understand that dividends come at the expense of price drops. Some of the Shefrin and Statman (1984) concepts (such as hedonic editing, where investors choose to sometimes segregate dividends and price changes, and sometimes combine them) suggest that investors have a concept of total returns, and evaluate the two components together when it produces more utility. In this regard, Shefrin and Statman (1984) investors are relatively more sophisticated, with heuristics regarding dividends being useful ways to circumvent other behavioral tendencies. By contrast, the free dividends fallacy is a more basic error, and one which does not seem to have been considered before - that investors simply do not understand that a tradeoff even exists between price changes and dividends.

While Shefrin and Statman (1984) present a number of compelling reasons why investors may like dividends, a number of our results are difficult to explain without the free dividend fallacy. Mutual funds and institutions do not consume out of dividends, making both self-control and consumption-based-regret unlikely as explanations of why dividends are not reinvested. In addition, it is not

clear why an investor who understands the tradeoff between price changes and dividends should desire dividends more when the interest rate or market returns are lower, whereas the free dividend fallacy suggests that these are traded off as alternative ways to make money off a stock. In addition, the prediction of hedonic editing is that for small capital losses, investors will integrate dividends and capital gains to a single variable that is treated as a gain. By contrast, our results regarding the disposition effect suggest that for stocks where adding the dividend would turn the stock into a gain, investors nonetheless trade as if they think of the stock as being at a loss.

A different behavioral model relating to dividends is presented in Baker et al. (2016). They present a signaling model, where investors are loss averse (as under a prospect theory value function) over dividend cuts. This leads managers to be reluctant to cut dividends. Their model mostly focuses on the predictions for managers, and finds support for their predictions. However their model of investor preferences are quite different, as in their setup investors care only about the dividend stream over multiple periods. Because price changes do no feature in investors' consideration in their model, it does not readily explain why demand for dividends changes with market price movements, or how investors evaluate price changes versus dividends for trading purposes.

Finally, it is worth noting that while we argue that such mental accounting is common, we are not arguing that it is true for all market participants. Clearly there are investors that recognize the tradeoff between prices and dividends and are trading based on total returns. Whether mental accounting is sufficiently widespread as to be evident in trading patterns and market prices is ultimately an empirical question.

2 Data Sources and Summary Statistics

Information about prices, returns, dividends and market-wide indices are all from CRSP. The individual trader data is the same as used in Barber and Odean (2000) and is processed for analysis as described in Hartzmark (2015) and Frydman et al. (2015). The sample includes trades from January 1991 through November 1996. Each observation is a position that could have been sold on

a day that an investor sells at least one position in their portfolio (a sell day). Positions purchased on a sell day that were not previously held are not considered possible to be sold because the data lacks time stamps to know when the purchase occurred in a day. Positions held before the beginning of the sample are dropped as the initial purchase price is unknown. Short positions are excluded from the analysis as are all positions that ever have a negative commission. Returns are calculated from the purchase price to the closing price the day before the sell day. All returns are calculated using the cumulative dividend received over a period, assuming no reinvestment.[3] If a position is purchased multiple times the value weighted average of the multiple purchase prices is used to calculate returns.

In Panel A, we present summary statistics for the individual investor sample. The data covers 54,176 accounts over 313,625 days that included the sale of an equity position. There were 1,506,274 equity positions in total held on those days, with the median investor holding 3 stocks on a day when he sells a position. Out of these positions, 696,138 were of stocks that paid a dividend while the investor was holding them. We describe the gain or loss status of these dividend-paying positions - 437,805 are gains regardless of whether the price change or the total return is used, 217,467 are losses regardless of whether the price change or the total return is used, and 40,866 are gains under a total return but losses under a price change measure.

Information about institutional holdings (13-F filings) and mutual funds holding (s12 filings) are taken from Thomson Reuters. Data cover 1980 to 2015 and the filters from Frazzini (2006) are utilized to remove observations that appear to be errors in the data. The reinvestment analysis simply looks at changes in holdings from one report date to the next and the sample is limited to reports that occur between 60 and 120 calendar days from each other to focus on quarterly reports. For the selling analysis the data is treated similar to the individual investor analysis where report dates are treated equivalently to a sell date. The value weighted price is used as the reference price if multiple purchases of a given position are made. If a given fund reports a holding on a given report day and does not report it in the subsequent filing the position is considered to be liquidated

[3]In untabulated results we find similar results with alternative assumptions of dividend reinvestment frequency.

(change of shares of -100%).

In Panel B, we present summary statistics for the mutual funds and institutions. We have 21,743 mutual funds with 279,018 report dates (over which we consider sales, which are a decrease in holding between consecutive report dates). This results in 24,570,258 holdings observations, of which 11,521,670 paid a dividend over the prior quarter. Similarly for institutions, we have observations for 6,761 institutions over 229,528 report dates, covering 57,040,527 holdings observations, of which 28,359,091 paid dividends over the prior quarter.

Because part of our tests involve the question of whether investors perceive dividends as resulting in price decreases (as opposed to merely being free income), we examine summary statistics about how apparent this tradeoff might be to an investor who was merely observing the two variables. It bears emphasizing that we are not claiming that investors never perceive such a tradeoff. Rather, we seek to examine whether an investor would find the tradeoff in price decreases so readily apparent that he would be forced to notice it in the course of casual observation.

Summary statistics of various measures of performance over various horizons are presented in Table 1 Panel C. Examining the daily correlation between return and dividend yield for individual stocks, conditional on a positive dividend yield, we see a positive correlation of about 0.09 (consistent with the ex-day price drop being somewhat less than the size of the dividend, leading to the positive ex-day returns documented in Elton and Gruber (1970)).

In many instances an investor observes price changes when viewing an individual stock's performance so the correlation between price change and dividend yield may be the more relevant number for a large number of investors. At the daily level, we see a robust negative correlation between daily price changes and dividend yields of -0.50 for individual stocks. The negative correlation is unsurprising as it is predicted by Miller and Modigliani (1961). However, it is noteworthy that even at the daily frequency this number is far away from -1 due to daily fluctuations in prices. Even though the price drops by roughly the value of the dividend, market movements and idiosyncratic price changes are a large portion of the daily stock return on dividend ex-dates.

The second and third columns move to the monthly and annual frequency. As the time increases

(to a level that is probably closer to what most investors use to evaluate their portfolio), the correlation between price changes and dividend yield moves closer to 0. The correlation in monthly returns is -0.103 and by the annual level this correlation is -0.067. The fact that this correlation moves towards zero as the horizon increases is also mechanical, as the price changes become more volatile over time, but still reflects what an investor would observe viewing price changes over the specified period. Correlations around -0.1 are sufficiently low that the tradeoff between price changes and dividends is not likely to be salient to a casual observer without access to large datasets. In other words, an investor suffering from the free dividends fallacy who only observed the prices of stocks periodically in his portfolio, would be unlikely to quickly be disabused of his mistake. This motivates the possibility that investors may fail to appreciate that dividends come at the expense of price changes.

3 Trading Behavior Based on Capital Gains and Dividends

If investors are not aggregating price changes and dividends into a single performance measure, then this maybe evident in their trading behavior. In particular, the literature has documented a number of patterns in how the propensity of investors to sell stocks is related to their past performance. In documenting these effects, performance was either measured using price changes or returns including dividends, and the role of dividends is examined mostly in terms of showing that similar results are ascertained using performance measures with or without dividends.[4]

However, this does not answer the question we are interested in - do investors actually respond to the dividend component, or just the price change component? In this section, we decompose the purported impact of returns into price changes and dividend yields, and find that investors respond mostly, and in some cases entirely, to the price change component. This is consistent with investors behaving as if a position's performance does not include the dividend component.

[4]For example, Odean (1998) does not include dividends in the calculation of returns as they are not relevant for the tax implications of selling a position. He notes that "The primary finding of the paper... is unaffected by the inclusion or exclusion of commissions or dividends."

3.1 Dividends and the Evaluation of Gains and Losses: The Disposition Effect

The disposition effect refers to the fact that investors are more likely to sell a position at a gain than at a loss (Shefrin and Statman 1985). The effect has been documented for a wide variety of assets - stocks (Odean 1998), executive stock options (Heath et al. 1999), real estate (Genesove and Mayer 2001), futures (Locke and Mann 2005), and online betting (Hartzmark and Solomon 2012).[5] It has also been documented for different levels of investor sophistication, including futures traders (Locke and Mann 2005), mutual fund managers (Frazzini 2006), and individual investors (in the US Odean (1998); Finland, Grinblatt and Keloharju (2001); China, Feng and Seasholes (2005)).

For many positions, either price changes or returns including dividends will yield the same category of gain or loss. However, some positions are at a gain when dividends are included, but at a loss without their inclusion. Do investors treat such positions as being at a gain or at a loss when evaluating whether to sell the position? This is equivalent to asking whether investors adjust for the mechanical decrease in shares price that results from dividend payments.

We examine three distinct cases of being at a gain or loss: a position that is at a loss regardless of whether dividends are included or not (which we term an "unambiguous loss"), a position that is at a gain when dividends are included but at a loss when they are excluded (a "gain only with dividends"), and a position that is at a gain regardless of whether dividends are included (an "unambiguous gain"). In our sample of individual investors 40,866 positions are in the ambiguous category of being at a gain only after dividends are included, compared to 437,805 unambiguous gain cases and 217,467 unambiguous loss cases.

In Table 2 we examine how the disposition effect varies across these three cases. Using the individual trader data we examine positions in an investor's portfolio on days when the investor sells a stock, and examine the propensity to sell each position in the portfolio. The dependent variable is a *Sell* dummy variable, equal to one if the position in question was sold that day. As dependent variables, we consider variables corresponding to the different categories of gains, to see

[5]The notable exception is delegated assets like mutual funds, where investors in mutual funds display a reverse disposition effect, as described in Chang et al. (2016). Those authors ascribe this difference to the role of delegation in helping investors resolve the cognitive dissonance of losing positions.

how their selling propensities compare with each other. In particular, we wish to know whether the category of gain only with dividends is traded as if it is a gain (as would be the case if investors are considering a standard returns variable that includes dividends), or traded as if it is a loss (as would be the case if investors only evaluated capital gains and ignored dividends). To test this, in Column 1 we include variables for the two categories under examination. First, unambiguous gains, represented by the *Unambiguous Gains* dummy variable, which equals one if the stock is at a gain using price changes alone. Second, *Gain Only With Dividends,* equal to one for the intermediate case where the stock is at a gain when dividends are included (as under a standard returns measure), but at a loss when dividends are excluded (as if investors only examine price changes). The omitted category is thus the unambiguous loss case.

The main variable of interest is *Gain Only With Dividends.* Regardless of whether investors are examining returns with dividends or just price changes the coefficient on *Unambiguous Gain* should be positive and significant, consistent with the disposition effect, as regardless of measure these positions are at a gain. If investors are examining returns including dividends, then the coefficient on *Gain Only With Dividends* should be positive, significant, and of a similar magnitude to *Unambiguous Gain.* This would indicate that such stocks are sold more than the unambiguous loss case and similar to the unambiguous gain case. By contrast, if investors are only examining price changes and are ignoring dividends for this calculation, then *Gain Only With Dividends* is not expected to be significantly positive, as stocks in this category are treated like the omitted category of losses. Further, the coefficient on *Gain Only With Dividends* will be significantly lower than the coefficient on *Unambiguous Gain*, as only the unambiguous gain stocks will be viewed as being at a gain for investors who are examining price changes.

In Column 1 of Table 2 the coefficient on *Unambiguous Gain* is 0.0789 with a t-statistic of 16.47 (with standard errors clustered by account and date). This means that investors are 7.8% more likely to sell unambiguous gains than the omitted category of unambiguous losses. The coefficient on *Gain Only With Dividends* is insignificant meaning that the gain only with dividends case is roughly as likely to be sold as the unambiguous loss case. The *Gain Only With Dividends* coefficient is also

significantly less than the coefficient on *Unambiguous Gain* (p-value less than 0.001) confirming that the gain only with dividends case is sold at a significantly lower rate than the unambiguous gain case. These results are consistent with investors evaluating gains and losses using price changes - stocks which are at a loss when dividends are excluded but at a gain when dividends are included are treated more like other losses than like other gains.

Column 2 adds a number of additional controls. We control for the level of returns, which has been known to effect selling propensities, as in Ben-David and Hirshleifer (2012) who document a V-shape in selling propensity as returns get higher or lower. We include a number of controls from that paper - price changes in the positive domain (*PriceChange*Gain*) and price changes in the negative domain (*PriceChange*Loss*), the square root of the holding period, the volatility over the previous year interacted with gain and loss, and holding period interacted with positive price changes and with negative price changes. In addition we include a portfolio size fixed effect and an account fixed effect to capture heterogeneity across investors.

With these additional controls in Column 2, investors are about 7.46% more likely to sell an unambiguous gain than an unambiguous loss, as seen in the coefficient on *Unambiguous Gain*, again highly significant. The coefficient on *Gain Only With Dividends* is positive and significant (0.00997, with a t-statistic of 3.58). This means that after controlling for all the additional permutations of return levels, holding periods and variances, the gain only with dividends case somewhat more likely to be sold than an unambiguous loss (by 1%). However this effect is still significantly smaller than the coefficient on *Unambiguous Gain*, meaning the gain only with dividends category is sold at a significantly lower rate than the unambiguous gains case.[6]

Given that individual investors appear to trade consistent with the free dividends fallacy, a natural question arises as to whether the same behavior is exhibited by more sophisticated investor groups. In particular, we examine the trading behavior of mutual funds and institutional investors based on their SEC filings of equity holdings. By examining the changes in holdings between two

[6]If the two categories are not distinguished, then an overall disposition effect is still evident regardless of whether gains are measured using price changes only or returns including dividends. This is consistent with the results above, since most observations are in the unambiguous gain category, and these get classified as a gain regardless of which variable is being used to evaluate gains.

consecutive reporting dates, we can get a measure of the net trades of the fund between these dates, and thus test a number of the same questions as for the individual trader data.

The investors in this data are likely more heterogeneous than the individual investors examined above and some are likely quite sophisticated. It would be surprising all of these investors exhibited the behavior documented for the individual investors, and some are likely to be appropriately judging positions based on their total return. In the internet appendix, we document that institutional investors display a reverse disposition effect of -0.8% and replicate the finding of Cici (2012) that mutual funds display a reverse disposition effect of -2.4%. While a reverse disposition effect could be driven by mental accounting for prices and dividends, it is also what would be predicted under most rational models where funds take taxable status and momentum into account (Odean (1998)). As such we are agnostic as to whether funds displaying such behavior are viewing positions in terms of total returns or not. We therefore focus our analysis on the 40% of funds and 44% of institutions that do exhibit a positive disposition effect as it is difficult to explain such an effect without some form of narrowly framing of gains and losses.

The fact that mutual funds display a reverse disposition effect of -2.4% stands in contrast to the positive disposition effect found elsewhere in the literature (e.g. Frazzini (2006) and An and Argyle (2015)). While tangential to the results of this paper, the literature has not explained the source of these conflicting findings which are based on the same data sources. While there are differences related to sample selection and methodology, in the appendix we document that the major difference appears to be the inclusion of positions that a mutual fund liquidates completely (i.e. positions not reported on a given date subsequent to a prior date when the position was held). Excluding these positions funds on average display a disposition effect of positive 3.5% while institutions display a disposition effect of 2.9%. Depending on the question being examined it may or not make sense to include such positions (e.g. Frazzini (2006) focuses on current holdings to examine the price impact of positions in a mutual fund's portfolio), but for basic calculations of the disposition effect liquidated positions should be included in the analysis.[7] Why it is that funds and institutions treat

[7]We thank Andrea Frazzini for helpful conversations related to his methodology and in replicating the base findings. These findings are reported in the internet appendix.

partial sales versus total liquidations separately is an open and interesting question in its own right which is beyond the scope of this paper.

We focus our analysis in this section on funds and institutions that exhibit a positive disposition effect as this subset of funds seems to generally act in accordance with the narrow framing of positions that we examine in our tests of trading behavior. To avoid any mechanical effects, for each fund and report date, we calculate the disposition effect displayed by that fund on all other report dates, excluding the current. This means that the sample split is not based on the behavior on a the given date that is examined.

Table 2 examines how these mutual funds and institutions treat positions that are at a gain only with dividends versus positions that are at an unambiguous gain. We repeat the analysis, regressing sell on a dummy variable equal to one if the position is at a gain only after the inclusion of dividends versus at a gain regardless of whether they are included. Without controls mutual funds are 4.9% more likely to sell an unambiguous gain while they are 1.7% more likely to sell a position at a gain only with dividends compared to a position that is at an unambiguous loss. Institutions are 3.2% more likely to sell a position at an unambiguous gain and 1.5% more likely to sell a position only with dividends compared to a loss. While not as stark as the result for individual investors trading on their own accounts, it appears that both mutual funds and institutional investors are more sensitive to gains that are ambiguous and treat positions at a gain only after including dividends differently from the unambiguous gains, more similarly to how they treat an unambiguous loss. In this respect, dividends are being given less weight in the calculation of gains of losses. This difference does not seem to be driven by return levels or fund specific behavior, as even after adding the additional controls, the gain with dividends category is still sold at a lower rate than unambiguous gains.

Taken as a whole, the table suggests investors view the gain or loss status of a positions based on their price changes. Investors display a strong tendency to sell stocks that are at a gain using only price changes (the unambiguous gains case). However, stocks that are at a gain when dividends are included, but at a loss if dividends are excluded, are sold at a rate more similar to other positions at a loss than other positions at a gain. This is consistent with the predictions of mental accounting.

Firstly, dividends and price changes are treated differently when evaluating a stock's performance. Secondly, price changes are the more attention-grabbing measure of shifts in a stock's performance. We find both results confirmed in the evaluation of the other trading patterns below.

3.2 Dividends and Ranks of Stock Performance: The Rank Effect

In addition to the previous literature documenting patterns trading based on the returns of each stock on its own, Hartzmark (2015) documents that investors engage in relative evaluation within their portfolio to judge performance. They exhibit the rank effect, whereby they are more likely to sell the best and worst performing positions in their portfolio based on combined return since the position was purchased. Like the disposition effect, this presents another way to gauge how investors are assessing the performance of positions in their portfolio. When deciding which are the best and worst-ranked stocks to sell, do investors include dividends in their evaluation of performance?

We examine this question in Table 3. Observations are again taken for all positions on days when the investor sells at least one stock, and the dependent variable is *Sell,* a dummy equal to one if the position in question was sold. As dependent variables, we include dummy variables for the best-ranked, second-best-ranked, worst-ranked and second-worst-ranked positions in the portfolio. We construct two versions of each of these variables - one set for rankings constructed based on price changes since purchase, and another for rankings based on return including dividends since purchase. For example, *Best (Price Only)* is equal to one if the position has the highest capital gain in the portfolio, and *Best (Including Dividends)* is equal to one if the position has the highest total return. The omitted category is thus middle ranked positions. By including both versions of the rank variables in the same regression, we can examine which ranking has a larger effect on selling propensities. We also add fixed effects for the total number of stocks in the portfolio, to control for mechanical effects based on correlations between portfolio size and selling propensity.

Column 1 of Table 3 includes only the rank variables. All of the four price change rank variables are associated with significantly higher selling probabilities, while the returns including dividends measures are generally smaller. For instance, the best-ranked position by price change is 14.6% more

likely to be sold (with a t-statistic of 23.72), compared with the best-ranked position by returns including dividends which is 0.7% more likely to be sold (with a t-statistic of 1.13).

These base effects may pick up the influence of other correlated variables. Investors may differ along a variety of dimensions, so in column 2 we add account fixed effects. Rank-based measures will also be correlated with the level of returns, as in Ben-David and Hirshleifer (2012). Thus we also include the same list of additional controls of price changes, holding period, portfolio size and volatility from Table 2. Adding these somewhat strengthens the results, with now all four price-change rank variables being positive and statistically significant, with effects ranging from 1.63% for the second-worst ranked to 13.8% for the best ranked. By contrast, return-based measures are all insignificant and small ranging from 0.7% to -0.4%.

Next we examine how the rank effect manifests itself for mutual funds and institutional investors investors and find similar results. Examining the fourth column (which includes the full set of controls), mutual funds show positive and significant responses to price-based ranks, but not to ranks that include dividends. Mutual fund are 7.1% more likely to sell their position with the best position sorted by price appreciation, while they are -3.3% less likely to sell the best position ranked by total returns. For worst-ranked stocks, the best price change position is 8.1% more likely to be sold, whereas the best return position has an insignificant measure of 0.6%. For second-best and second-worst the price based measure is positive and significant while the measure including dividends is not statistically different from zero. Examining institutional investors in column six, we find a similar result - price-based extreme ranks are significantly more likely to be sold, but ranks that include dividends show effects that are either zero or negative. Institutions are 4.3% more likely to sell their best ranked position based on price change, but -4.1% less likely to sell their best ranked position including dividends. Worst ranked positions based on price are 3.7% more likely to be sold while the worst ranked return measure is an insignificant 0.07% more likely to be sold. The priced based measure for second best and second worst are positive and significant while those measures including dividends are negative or insignificant. Again, it appears as if selling decisions based on ranks of past performance are made primarily using price-based measures, rather than

utilizing returns including dividends.

3.3 Gains and Losses Across Positions: The Rolled Disposition Effect

Another test of the role of dividends in performance measures is how investors account for profits considered across multiple positions. The typical assumption in many studies of investor behavior is that each position is considered as a separate mental account. However, Frydman et al. (2015) show that on days when investors sell a position and buys another position (reinvestment days), they appear to not close the mental account in the sold asset, but rather roll the account into the new position. As a result, when investors trade in the new position they evaluate whether they are at a gain or a loss relative to the amount initially invested in the old position (even though it is no longer in their portfolio). Consistent with this, Frydman et al. (2015) document the existence of a rolled disposition effect, whereby investors are more likely to sell a reinvested position when it is at a gain relative to the amount originally invested in the old position no longer in the portfolio. This provides another test of how dividends are evaluated - when evaluating the basis of rolled gains and losses, are dividends included in the calculation or not?

Table 4 examines the rolled disposition effect and finds that it is driven by the capital gains summed across the two positions, not the total return over the two positions. We consider only positions that were purchased on a reinvestment day where only one stock was purchased and one stock was sold. We take observations for these stocks on all future sell days. Given the lack of daily trading data for funds and institutions, this analysis is limited to the individual investor sample. The dependent variable is again a dummy for if the stock was sold that day. As the independent variable, we consider two versions of *Original Gain*. These are both dummy variables that equal one if the value of the position exceeds the amount initially invested in the old position. One version, labeled *Price Only*, calculates the cumulative value using only capital gains on both positions, ignoring any dividends. The other, labeled *Including Dividends*, calculates the current value including any dividends paid on both positions. The first two columns show that there are significantly positive effects for measures using both capital gains and returns, when only one or the other variable is

controlled for (although the effect without dividends of a 3.96% increase is more than double the effect with dividends of 1.68%).

Column 3 includes both measures together and finds that the dividend-excluding measure has a positive and significant effect of 3.8%, while the dividend-including measure is an insignificant 0.7%. Columns 4 and 5 add further controls for being at a gain or loss on the current position (both with and without dividends) as well as the additional controls for performance of the current position. In all specifications, the point estimate on *Original Gain (Price Only)* is between 0.021 and 0.030, meaning that investors display a strong rolled disposition effect across reinvested positions using prices to calculate combined value. However, the *Original Gain (Including Dividends)* coefficient is either zero or negative once the price-based measure is controlled for, implying that dividends are not being included in the calculation of combined gains and losses across positions.

3.4 Dividends and the Reaction to Price Changes

The above analysis suggests that trading based on past performance is typically based on price appreciation alone. It is important to note that this does not mean that dividends do not have a role in trading decisions, but only that they do not get considered in the same category of performance as price changes. Dividend payment may still be considered as part of the trading decisions if investors view dividend-paying assets as a perpetual stream of payments. Indeed, the premise of the prior argument is that investors are not clearly appreciating how price changes and dividends are related to each other. If investors do not fully internalize the fact that more dividend payments mean larger price decreases, then dividend payment may make stocks appear more desirable and be less likely to be sold. This is part of the free dividends fallacy - dividend payment is a positive attribute of stocks, which should increase their willingness to hold the stock.

We test this possibility in Table 5. As before, the dependent variable is a dummy variable for whether a given stock got sold. The main independent variables is *Dividend Yield in Prior Year*, the total amount of dividends paid over the prior 12 months divided by the previous day's price. Additional controls include account fixed effects and the returns controls from Ben-David

and Hirshleifer (2012). In Panel A, regardless of the specification, and for all classes of investors (individual investors as a group, as well as mutual funds and insitutions that display a disposition effect overall), the propensity to sell a stock decreases with the level of the dividend yield. This result holds even relative to the investor's own average turnover level among all stocks in his portfolio. This is consistent with individuals viewing dividend streams as a source of income that represents a distinct and independent aspect of performance from from price appreciation.

If investors are more likely to evaluate the performance of dividend-paying stocks based on their dividend yield, then this may imply a lower sensitivity to the price change component. This is the second component - because price changes and dividends are likely to be a separate desirable ways to make money on a stock, investors may care less about price changes for a dividend-paying stock (as they perceive that have already made gains on the dividend component). In Table 5 Panel B, we examine this in terms of the overall propensity to sell gains (measured using price changes). The dependent variable is again a *Sell* dummy, while the independent variables are a *Gain* dummy, an *Received Dividend* dummy, and the interaction between the two. The main variable of interest is the *Gain*Received Dividend* interaction. This is large and significantly negative. In column 1, the base *Gain* coefficient of 0.109 means that non-dividend-paying stocks have a disposition effect of 10.9%. Meanwhile, the *Gain*AnyDividend* coefficient is -0.0693, with a t-statistic of -17.81. This means that dividend-paying stocks have a disposition effect of 0.109 - 0.0694 = 3.96%, a large reduction. Adding in account fixed effects and the BDH controls reduces the *Gain*Received* coefficient to -0.0423, but the effect is still large and highly statistically significant - when evaluating dividend-paying stocks, investors pay less attention to whether the stock is at a gain or a loss using price change measures.[8]

Finally we explore the extent to which mutual funds and institutions respond less to the price changes of dividend-paying stocks. Mutual funds display a disposition effect 1.7% lower for dividend paying positions, roughly 40% less than the base rate of 4.4% in this sample for non-dividend paying

[8]One potential concern with the individual investor analysis up to this point is a tax-related explanation. In untabulated results we have replicated all of the tables using individual investor data for the subsample of tax exempt accounts and find materially similar results.

positions. Institutions display a disposition effect that is -0.9% lower than non-dividend paying positions, roughly 30% of the 2.8% probability of sale for non-dividend paying positions in this sample.

We can also examine the relationship between dividends and the response of selling to price changes non-parametrically over levels of capital gains. In particular, we examine the impact of dividends on the V-shaped propensity to sell in Ben-David and Hirshleifer (2012) (which up to this point we have been mostly considering as a control variable). Those authors argue that the propensity of investors to sell at each level of gains and losses follows a V-shape, with both large gains and large losses more likely to be sold. If the focus on dividends implies a relative underweighting of price changes, then we would expect the V-shape to be muted in both directions for dividend-paying stocks. In other words, an investor should be less likely to sell a position with a large capital gain and a position with a large capital loss if those positions pay dividends.

Figure 1 shows a local linear plot for selling propensities of individual investors based on being at a gain or loss (measured using capital gains), split according to whether or not the position paid a dividend. The two noteworthy aspects of this graph are that dividend-paying positions are less likely to be sold and that the slope of the line is lower in absolute value in both the positive and negative domain for dividend-paying positions. This is consistent with investors being less likely to evaluate performance based on price appreciation for dividend-paying positions. In other words, not only do investors fail to add dividends to capital gains when evaluating stock performance, but dividends actually appear to result in less attention being paid to capital gains.

Overall, the results from this section indicate that while the free dividends fallacy is not universal, it appears to be present in a significant fraction of mutual funds and institutions, and is not limited merely in individual investors. While mutual funds and institutional investors are a less homogeneous group, for the significant fraction that exhibit the disposition effect, and thus who seem more likely to be using mental accounting, their responses to price changes and dividends are similar to those of individual investors. As with any analysis of such data, it is impossible to know for sure whether the behavior is driven by the preferences of mutual fund managers or by how they

perceive their public disclosures will be interpreted. Regardless of the specific underlying cause of the behavior, these investors are exhibiting similar patterns to that of the individual investors trading on their own accounts. This suggests that such behavior is ubiquitous across a large number of different types of investors and time periods.

4 Dividends as an Income Stream

The results above are consistent with investors viewing price changes and dividends in separate mental accounts. If investors are paying more attention to the dividend mental account, they will not fully realize that dividends come at the expense of the price level. If so, they may suffer from the free dividends fallacy and view a dividend as an income stream independent of the price level of a stock. Similarly, the demand for dividends is likely to shift over time, as investors compare dividends to price changes, and to other sources of income. Because there is a significant common component to both price changes and the income generated by fixed income assets, we hypothesize that investors are likely to change their desire for dividends in a systematic manner, which could impact how dividend-paying stocks are valued by the market.

To proxy for the relative demand for dividend-paying stocks we focus on the interim return variable from Hartzmark and Solomon (2013). Hartzmark and Solomon (2013) show that price pressure from investors who want to receive a dividend payment leads to predictable returns after a dividend is announced and before the ex-day. We call the cumulative characteristic adjusted returns over this period the interim period return. In this period there is no information about the dividend (as the announcement has already been made), no uncertainty about the payment (since paying the dividend is now a legal obligation for the firm), and no dividend-specific tax consequences (since an investor who sells before the ex-day never receives the dividend, making the tax consequences over this period equivalent to holding any non-dividend-paying stock for the same length of time). The returns represent a time-series increase relative to other periods, and reverse in the period after the ex-day, so they are not capturing the fact that dividend-paying firms are more risky overall.

Further, as discussed in Hartzmark and Solomon (2013), it is very difficult to link this return to an explanation based on changing exposure to systematic risk factors. As a result, the average positive abnormal returns over this period are most consistent with price pressure from investors wanting to receive the dividend.

For robustness, we also examine the time variation in the book-to-market of stocks based on their dividend yield (similar to Baker and Wurgler (2004b) and Baker and Wurgler (2004b)). Baker and Wurgler (2004a) demonstrate that firms are more likely to issue dividends when the book-to-market ratio of dividend paying stocks is higher. Our paper focuses on the demand side of this equation, why investors have time-varying demand for dividends, while Baker and Wurgler (2004a) focus on the supply, why firms issue dividends in response to shifts in this demand. The book-to-market ratio of stocks has a number of possible interpretations other than that of mispricing, such as those related to growth and risk among others. Thus we consider the measure as secondary to the interim return results which represents a more direct measure of demand for dividends.

If our interim return measure is capturing investor demand for dividends it should also help to explain when firms decide to issue dividends. If more investors want to receive a dividend-paying stock this interim period return will be larger. As validation that the interim return measure is also capturing dividend demand, we examine the propensity of firms to initiate dividends based on average interim returns among dividend-paying stocks over the previous year. In Table 6 we regress a dummy variable equal to one if a firm issues a dividend in a given year, limiting the sample to firms that did not issue a dividend the previous year. In column 1 we regress this dummy variable on the average interim returns variable and find a positive and highly significant coefficient. This suggests that the interim period return is capturing dividend demand and firms are responding to it. In column 2 we examine the average book-to-market ratio of dividend paying firms divided by that of non-dividend paying firms as of December in the previous year.[9] The negative and significant coefficient replicates the finding of Baker and Wurgler (2004a) that firms are more likely to issue dividends when dividend paying firms have relatively higher valuations. Finally in Column

[9]Other versions of the book-to-market ratio gap, such as the difference between dividend-paying and non-dividend-paying firms or the log of the ratio, produce substantially similar results.

3 we include both variables and find strong relationships between both proxies for dividend demand and subsequent dividend initiations. This suggests that both variables are meaningful in capturing dividend demand, so we examine both in subsequent analysis.

We begin this analysis of the determinants of the overall demand for dividends by examining the time-series behavior of the interim period returns with a focus on two notable periods. Figure 2 graphs the interim period returns over time using a local linear plot. The first notable aspect of this plot is the finding of Hartzmark and Solomon (2013) that these returns are generally quite positive. The one major exception to this occurs in the green shaded area. This area is from January 1995 through the end of April 2000, which coincides with the tech boom. Anecdotally, during this period investors were highly focused on price appreciation rather than dividends. This is the one period where these interim returns were systematically negative. The blue shaded period represents the recent period with extremely low interest rates. The shaded area represents the period from January 2009 through the end of our sample in June 2016 when the federal funds rate was below 0.50. As the quote at the beginning of the paper suggest, investors suffering from the free dividend fallacy will desire dividend-paying stocks when interest rates are so low. As a further example, dividend-paying products were so popular over this period that some of the larger dividend-focused funds closed themselves to new investors.[10] This period has been notable in the large positive interim returns, consistent with investors focusing on dividends.

We test this intuition more formally in Table 7 examining how the demand for dividends varies with the interest rate and recent market performance. If investors are suffering from the free dividends fallacy they will value a dividend stream as payouts, similar to that of a bond. Thus the interest rate represents perhaps the best substitute to such an investor. When the interest rate is high, income-seeking investors will be happy investing in bonds, while when the interest rate is low they may be more prone to hold a dividend-paying stock for its stream of dividend payments. This idea is related to the finding in Baker and Wurgler (2012) that certain stocks have bond-like

[10]"Famously low bond yields have encouraged a stampede into stock funds that invest in dividend-rich companies. Vanguard Group closed its $31 billion Vanguard Dividend Growth Fund (VDIGX) to new assets after the fund doubled in size over three years." -John Coumarianos, The Wall Street Journal September 5, 2016

characteristics which cause them to covary with bond market factors. Second, when recent market performance has been high, investors may focus more on the price appreciation mental account as this appears relatively more attractive. Similarly, in periods of low or negative recent price changes, investors may turn to the perceived stability and relatively higher income stream offered by dividend-paying stocks. Thus we predict that dividend demand should be negatively correlated with both the interest rate and recent market performance.[11]

In Panel A we regress the interim return around the dividend ex-date on our measures of dividend demand. We also control for the level of the dividend yield and the number of days in the interim period, as Hartzmark and Solomon (2013) show these are related to the level of price pressure during the interim period. Regressing the interim return on the interest rate we find a coefficient of -4.088 with a t-statistic of -3.40. A one standard deviation decrease in the daily interest rate leads to an interim period return 5 basis points higher (relative to a mean interim return of 16 basis points). Regressing the interim return on the market return over the prior month we find a coefficient of -0.0196 with a t-statistic of -5.92. A one standard deviation decrease in the market return leads to an increase in the interim return of roughly 8 basis points. In column 3 we include both measures and find similar coefficients, suggesting that these two sources represent distinct motivations for attention being placed on the dividend or price change mental account.

In Panel B we examine how the book-to-market ratio varies with the interest rate and market returns, according to whether or not the stock paid dividends. We examine a monthly panel of all stocks where the dependent variable is a given stock's book-to-market ratio. We regress this variable on our two variables that proxy for shifts in dividend demand (the risk free rate, and the past year's market returns), a dummy variable equal to one if the stock paid a dividend over the previous year and an interaction of the two.

The coefficient of interest is the interaction between dividend payment and the measures of

[11] In related work, Jiang and Sun (2016) find a similar result that the prices of dividend-paying stocks increase more than other stocks when interest rates fall. They relate this to the duration of cash flows of dividend-paying stocks. In our current setting, by focusing on the relatively short return window during the interim period, we are able to focus more specifically on the demand for dividends themselves, over and above the general properties of dividend-paying firms.

dividend demand. This represents the distinct reaction of dividend-paying stocks to the driver of dividend demand, relative to the variable's effects on non-dividend-paying stocks. Intuitively, this is the panel analogue of Baker and Wurgler (2004b) who examine the average book-to-market ratio of dividend-paying stocks relative to the average of non-dividend-paying stocks. In Column 1 we utilize the interest rate as our proxy of dividend demand and find a positive and significant coefficient on the interaction term. This is consistent with times of low interest rates being times of high dividend demand, leading to relatively higher prices for dividend-paying stocks (as measured by book-to-market ratio). In Column 2 we examine the market return over the prior year and again find a positive and significant coefficient. This is consistent with times of high recent price appreciation being times with lower demand for dividends, leading to dividend-paying stocks having relatively lower valuations compared with other stocks.

Next we turn to the price impact of two other aspects of dividends - dividend increases and dividend reliability. To the extent that investors are likely to prefer stable dividend payment (making the stock seem more like a substitute for bonds), demand should be higher when the company has kept its dividends at a level at least equal to past payments. Secondly, because dividends have the potential to increase with earnings (unlike fixed bond payments), demand may also increase when dividends have increased by larger amounts.

In Table 8 we examine how the interim period return varies with both of these characteristics. To measure the increase in dividend payments, we use *Dividend Change Amount* equal to the difference in dividend payment from the current quarter minus the previous quarter. In column 1 the interim period return is regressed on the *Dividend Change Amount* variable along with the dividend yield and days in interim period. The coefficient is a highly significant 0.0313. This indicates that for every penny of additional dividends the interim period return increases by 3 basis points. One may worry that this is simply capturing some sort of time-varying level of the interim return, so in Column 2 we add a year by quarter fixed effect. The coefficient is materially similar, suggesting the regression is not capturing time-variation in the interim return, but rather the impact of the change in dividends. To examine stability we examine a dummy variable *No Div. Cut in Prior Year* which

is equal to one if in the current quarter and the three quarters prior the dividend paid was greater than or equal to that of the previous quarter. Column 3 adds this variable to the regression and Column 4 adds year by quarter fixed effects. The coefficients imply that consistently paying at least the same dividend amount over the prior year is associated with a higher interim period return by 12-13 basis points. In Columns 5 and 6 we include both variables and again find similar results. This suggests that these characteristics are not proxying for each other, and each independently impacts the interim returns.

It is worth considering whether these results may be driven by explanations other than demand for dividends. Market-to-Book ratios have a number of interpretations other than over- and under-valuation, including risk, growth opportunities, and others. For this reason, we consider them as mostly supportive of the interim returns results, which are more difficult to explain. The returns in this period are high only for a short period between announcement and ex-day, and are abnormally high not only relative to size/book-to-market/momentum matched portfolios, but also are high relative to other dividend paying stock not currently in a dividend payment period. In addition, this period has no news, and no direct tax consequences relative to holding non-dividend-paying shares (since if the share is sold before the ex-day, the investor does not receive the dividend). Thus the interim returns measure is difficult to reconcile with explanations other than those related to a time-varying demand for dividends.

It is possible that the price rise over this period represents tax-free investors trying to arbitrage the high pre-tax returns on the ex-dividend day. However, two facts are worth noting in this respect. Firstly, it is difficult to explain both the positive interim returns and the positive ex-day returns using simple rational models of tax costs. In particular, the Elton and Gruber (1970) explanation for the positive ex-day return is that the marginal investor pays dividend taxes, and thus requires a positive pre-tax return in order to be indifferent between holding over the ex-day or selling. However, the tax argument for the positive returns in the interim period implies that the marginal investor one or two days earlier is a tax-free institution who is pushing up the price through their purchases to take advantage of the ex-day. Moreover, it is not clear why either version should

predict negative returns immediately after the ex-day (Hartzmark and Solomon (2013)), which is more consistent with reversals following price pressure. Finally, an explanation based on tax-free institutions buying in the interim period would predict that the interim returns should be higher when the ex-day returns are also higher. In untabulated results, the correlation between these two returns is -0.05, and in a regression context the ex-day returns have a negative explanatory power over interim returns, not a positive explanation as taxes would predict. This suggests that even modified tax arbitrage explanations are unlikely to drive the results we find.

The free dividend fallacy has a number of costs to investors. The most direct cost is the tax effect of receiving dividends versus selling the equivalent number of shares. For taxable investors, dividends will generally have tax consequences, whereas selling shares only results in capital gains tax if the position was sold at a gain, in which case only the capital gains portion of the sale is taxed. As a result, dividends are likely to be worse on average for tax purposes. If an investor has a need for a certain amount of money, receiving it in the form of a dividend lets them benefit by avoiding trading costs associated with selling shares. Alternatively, if an investor would have kept the value of a dividend in their portfolio without the dividend, but do not reinvest it when they receive the dividend, they lose out on the future expected returns.

While these are the direct costs, the previous analysis suggests an indirect cost that may be considerable. Specifically, demand for dividends by investors is not randomly distributed, but instead investors systematically demand dividends at the same time. To the extent that book-to-market ratio of dividend-paying stocks decreases in times of high dividend demand, and this book-to-market ratio can be interpreted as a stock being relatively over- or under-priced, the analysis suggests that in periods of high dividend demand, dividend stocks are likely to pay lower returns in the future. To understand the magnitude of this cost we conduct a simple, back-of-the-envelope calculation. Our predictor of future mispricing is the average book-to-market ratio of dividend-paying firms in a given month, divided by the average of non-dividend-paying firms.[12] Our measure of future returns is the average cumulative return over the next 12 months of dividend-paying

[12]We focus on book-to-market because of its widespread use in predictability regressions. In untabulated results we find slightly larger estimates of total costs using average interim returns over the prior year.

firms minus the same average for non-dividend-paying firms. We regress this return gap on the difference in book-to-market ratios between dividend-paying and non-dividend-paying firms. We find a coefficient of 0.225 with a t-statistic of 2.16 (with Newey West standard errors with a 12 month lag). The interpretation is that the difference in book-to-market ratio of dividend-paying stocks to non-dividend-paying stocks predicts the future return gap between these two types of firms. In other words, when dividend-paying firms are relatively highly valued compared to other firms, they also have relatively lower future returns.

Because dividend demand drives up these valuations of dividend-paying firms, investors who buy such firms due to a demand for dividends are likely to receive on average lower future returns. During the recent period of low interest rates this ratio of book-to-market has dropped by slightly more than 0.1, and as the tech boom ended this ratio decreased by more than 0.2. Using our regression estimate, we find that a decrease of 0.1 is associated with expected returns of 2.3% lower over the next twelve months and 0.2 is associated with expected returns about 4.6% lower. The exact impact on an individual's expected returns on their portfolio will depend on how actively they shift from dividend to non-dividend-paying stocks over time, but the simple back-of-the-envelope calculation suggests that the costs of buying dividend-paying stocks when dividend demand is especially high could lead to lower expected returns of roughly 2-4% over the next year, a substantial fraction of the equity premium itself.

5 Reinvestment of Dividends by Institutions and Mutual Funds

5.1 Frequency of Dividend Reinvestment

We next examine the prediction of mental accounting relating to what they do with such dividends once they have received them. A key part of the dividend irrelevance theorem of Miller and Modigliani (1961) is the idea of dividend reinvestment - an investor who receives a dividend from a share and would prefer to maintain the size of his existing portfolio weight can simply reinvest the dividend. In the case of individual investors, Baker et al. (2007) show that individual investors

rarely reinvest dividends, and appear to consume out of dividend income. One possible explanation for such behavior is based on theories of dividend clienteles, such as Graham and Kumar (2006). In this view, some investors have reasons such as trading or time costs to not want to regularly sell small amounts of stock, and use dividends as a way to generate a stream of cash flows for consumption at a lower cost. This seems likely to be part of the explanation, especially for individual investors. However, a lack of dividend reinvestment may occur for psychological reasons, if investors treat the dividend payments as belonging to a separate mental account to be used elsewhere. This is an idea consistent with the mental accounting literature - when investors view money as being in separate accounts, they are likely to spend the money from each account in different ways (such as in the house money phenomenon of Thaler and Johnson (1990)). Reinvesting dividends outside of the stocks that paid them would be consistent with the general disconnect between dividends and price changes that we show in evaluating performance.[13]

To test this possibility, we examine the dividend reinvestment policies of investors for whom individual consumption motives seem less likely, namely mutual funds and institutions. In the case of mutual funds, there is no obvious consumption motive, as funds are legally required to distribute all dividends and capital gains they receive to the fund's investors by the end of the year (known as the "pass-through rule") in order to avoid paying corporate income taxes. However, the timing of the fund's dividends rarely affects the immediate short-term decision to reinvest, as many funds pay out their received dividends in a single amount, often towards the end of the year. As a result, any dividends received during the year are simply part of the fund value until the fund makes its own dividend payment, and hence they can either be reinvested or left in cash. The fund's choice of whether to reinvest dividends or not is thus more linked to investment policies, rather than consumption. Institutional investors will have different tax arrangements, but many of them also lack an equivalent of a consumption motive. Some, such as charities, may be constrained by the terms of their charters to not spend the principal in their endowment, but many institutional

[13] It is true that investors as a whole cannot increase their exposure to the stock without the firm issuing more shares. However, if some investors desire to increase their exposure and push up the price, other investors may be expected to sell in response to the lower expected returns. We examine whether mutual funds or institutions are on net increasing their exposure during such periods.

investors are large financial firms who (like mutual funds) similarly lack consumption needs.

To test the level of dividend reinvestment, we examine the changes in quarterly holdings for mutual funds and institutions. There are several possible benchmarks by which to evaluate how much funds reinvest dividends. Given tradings costs and frictions, investors may not always reinvest exactly the amount of the dividend, or may wait some days (at which point the price of the share, and the amount of shares that the dividend can purchase, may have changed). However, one easy comparison is the frequency with which an investor holds exactly the same number of shares from one quarter to the next. Funds that hold exactly the same number of shares, when the stock in question has paid dividends, are either holding the payment as cash or reinvesting it elsewhere. If dividend reinvestment is reasonably common, then dividend-paying holdings should be less likely to have exactly the same number of shares held from one quarter to the next, relative to non-dividend-paying holdings.

We examine this question in Figure 3. This show the changes in shares from last quarter (the prior report) for positions that received dividends over that time period (the left figure) and positions that did not (the right figure), done both for mutual funds (Panel A) and institutions (Panel B). The green and red bars represent the fraction of positions with exactly zero change in shares, and each blue bar represents the fraction of positions with the indicated number of shares, binned in 50 share change increments.

Several aspects of this picture are noteworthy. First, both mutual funds and institutions are much more likely to hold exactly the same number of shares next quarter in a dividend-paying stock than they are to hold a small amount of shares more (as under reinvestment). Zero reinvestment is a very common outcome for both types of investors, as shown by the left figure in both panels. Second, a comparison of the left and right figures in each panel indicates that the likelihood of holding exactly the same number of shares next quarter is very similar regardless of whether the stock paid a dividend that quarter. For mutual funds, the fraction of dividend-paying holdings where the fund holds exactly the same number of shares next quarter is 31.7%, compared to non-dividend-paying holdings where the fraction is 32.2%, with the difference being insignificant. For

institutions, the exact number of shares fraction is 18.2% for dividend-paying holdings, versus 19.0% for non-dividend-paying holdings. The presence of a dividend does not make a large difference in the likelihood that a fund changes the number of shares it holds, consistent with dividend reinvestment being rare.

Another plausible baseline against which to test dividend reinvestment is how often investors' holdings change by the amount corresponding to full dividend reinvestment. We test this hypothesis in Figure 4. To avoid any issues related to round lots or trading costs of small amounts we limit the sample to dividends where reinvestment involves at least 100 shares. Further we examine only positions where there was a change in shares between reports (thus excluding the large zero investment bars in Figure 3.). If investors are reinvesting dividends, then if they *do* change the amount of shares they hold, their position should be more likely to increase by the amount of shares corresponding to dividend reinvestment, rather than some other number of shares. To test this, we plot the difference between the actual change in shares for the investor, and the change in shares that would occur if they reinvested all of their dividends back into the stock at the price available on the payment date. A fund that engages in full reinvestment should have a difference of zero. Examining the figure, we see that exact reinvestment (within 100 shares of the number implied by full reinvestment) occurs at a very similar rate to other nearby amounts of share changes. The number of trades motivated by exact reinvestment does not seem large compared to the number of trades of other sizes. Another way of putting this is that if the fund *does* change their holdings in a dividend-paying asset, they are not particularly likely to change them by an amount corresponding to dividend reinvestment.

It is possible that these actions represent a deliberate choice by funds to change their portfolio weights for reasons other than dividend payment. However, the high prevalence of zero share changes would imply that, under this alternative interpretation, many investors have an explicit desire to reduce their portfolio weight by exactly the amount of the dividend payment, on exactly the dividend ex-date. This seems somewhat implausible.

Table 9 uses regression analysis to examine similar questions about dividend reinvestment rates.

Panel A examines mutual fund holdings, while Panel B examines institutional holdings. In columns 1 and 2, we examine the likelihood of an investor (mutual fund or institution) holding the exact same number of shares in the subsequent quarter, as a function of whether the holding paid dividends or not. The dependent variable is *Same Shares*, a dummy variable that equals one if the number of shares in the following quarter is exactly the same as the number in the current quarter. The main independent variable is *Dividend Paying Holding,* a dummy variable that equals one if the stock paid a dividend between the current quarter and the following quarter.

In Panel A (the mutual fund sample), the coefficient on *Dividend Paying Holding* is -0.00483, and statistically insignificant. In other words, the presence of a dividend does not change the likelihood that a fund alters their holdings in a stock. When fund fixed effects are added in column 2, the coefficient increases to 0.00309, with an insignificant t-statistic of 1.37 (when clustered by fund and quarter). If there were widespread dividend reinvestment we would have expected a significantly negative coefficient (as funds would be more likely to change their holdings when the stock paid a dividend), not the insignificant coefficients with inconsistent signs.

In column 3 and 4, we examine the likelihood of the fund increasing its position as a function of whether the share paid dividends. The dependent variable is now a dummy variable that equals one if the fund increased its holdings from one quarter to the next (regardless of how much the holding went up). The univariate coefficient on *Dividend Paying Holding* is 0.0179, which decreases to 0.0135 with the addition of fund fixed effects (with t-statistics of 6.44 and 6.71 respectively). This indicates that funds are significantly more likely to increase their holdings of dividend-paying stocks relative to other stocks. However, the magnitude of this increase is still relatively small - the intercept of 0.304 means that funds have a 30.4% chance of increasing their holdings of a non-dividend-paying stock, versus a 32.0% (0.304 + 0.0179 = 0.3299) of increasing their holdings of a dividend-paying stock.

Finally, in column 5 we examine the likelihood of exact dividend reinvestment. We limit the sample to dividend-paying holdings where the amount of the dividend would have allowed the fund to purchase at least 100 shares at the closing price on the payment date (to ensure that lack of

reinvestment is not driven by odd-lot issues or transaction costs making reinvestment prohibitive). We compute the proportion of holdings corresponding to exact-reinvestment - cases where there is an increase in holdings and the number of shares purchased is within 100 shares of the exact reinvestment amount. This proportion is 0.00719, meaning that mutual funds exactly reinvest dividends in only 0.719% of instances for dividend-paying holdings.

In Panel B, we examine the same questions for institutions, and find that they are somewhat more likely than mutual funds to reinvest their dividends, but that dividend reinvestment is still relatively uncommon. In columns 1 and 2, the likelihood of holding exactly the same number of shares is somewhat lower for dividend-paying holdings. The univariate coefficient on *Dividend Paying Holding* is -0.00781 (with a t-statistic of -2.76), which increases with the addition of investor fixed effects to -0.0235, with a t-statistic of -12.01. Given the constant of 0.190, this means that institutions have 19.0% chance of holding the same number of shares for dividend-paying stocks, and a (univariate) 18.2% chance of the exact same holdings for dividend-paying stocks. In columns 3 and 4, the likelihood of increasing the number of shares held for dividend-paying stocks is similar to the mutual fund case - a univariate coefficient on *Dividend Paying Holding* of 0.0222, increasing to 0.0330 with investor fixed effects (both highly significant), relative to a univariate constant of 0.338. Finally, the probability of exact dividend-reinvestment for institutions is 1.17%.

Taken together, these results indicate that dividend reinvestment is relatively uncommon among both mutual funds and institutions. To put these numbers in perspective, suppose that an investor is going to effectively leave their holding essentially unchanged over a quarter, either by just reinvesting the dividend on the payment date or by leaving their holding unchanged and doing something else with the dividend. By comparing the "reinvestment within 100 shares" rate (0.00719) to the exact same number of shares fraction (from column 1, 0.315-0.00483= 0.3102), a mutual fund is 43.1 times more likely to leave their holdings unchanged than they are to just reinvest the dividend. For institutions, the corresponding rates are 0.0117 for reinvestment within 100 shares versus 0.1822 for the exact same number of shares. Thus an institution is 15.6 times more likely to leave their holdings unchanged than they are to just reinvest the dividend.

5.2 Market Impact of Dividend Reinvestment

As noted in section 5.1, mutual funds and institutional investors rarely reinvest dividends into the stocks from which they came. If this is the case, when these investors receive dividend payments they must either increase their cash balances or reinvest them elsewhere. Importantly, because dividend payment occurs at the same time for all holders of a given stock, this may cause predictable price pressure. If most dividend reinvestment is occurring outside the stocks that paid dividends, then we predict that it is in these non-paying stocks where price pressure should be concentrated. Recall that dividend payment dates and amounts are known in advance, so any price pressure is predictable and tradable.

To test this, we first examine how daily market returns are related to the amount of dividends paid out that day. As an independent variable, we calculate a daily dividend payout yield, as the total dollar value of dividends that had a payment date that day, divided by the sum of market capitalizations on the previous day. We then test whether this explains variation in CRSP market returns, either value-weighted (Panel A) or equal-weighted (Panel B).

We present these results in Table 10. In columns 1 and 2, the dependent variable is the market returns, and higher daily dividend payouts positively predict daily market returns. The coefficient on daily dividend yield is 64.92, with a t-statistic of 2.90. In column 2, we add year by month fixed effects, to ensure that we are not picking up something about the overall economic conditions when dividends are higher, and the effect becomes slightly stronger. In terms of magnitude, a one standard deviation increase in dividend payment (0.0003084) is associated with higher market returns by 2.0 basis points (.0003084 * 64.92 = 0.020). This compares with a mean daily market return of 4 basis points, so the effect is economically large.

In columns 3-6, we test whether, within the market portfolio, these price increases are concentrated among firms that actually paid a dividend that day, or those that did not. We split the overall market return into dividend payers (columns 3 and 4) and non-payers (columns 5 and 6), and repeat the same analysis. For the firms that actually paid a dividend that day, column 3 shows

a smaller coefficient of 39.62 and a statistically insignificant effect, while adding fixed effects results in a marginally significant (t-statistic of 1.72) coefficient of 61.64.[14]

By contrast, when we examine the effect of dividend payment solely on the returns of firms that didn't pay a dividend, in columns 5 and 6, the results are similar to the overall effect on market returns, but larger in both magnitude and significance. The univariate coefficient is 73.59 (with a t-statistic of 3.28), increasing to 78.53 (with a t-statistic of 3.38) once year by month fixed effects are added. The significant effects for non-dividend-payers are what would be expected given the dividend-payer results, as that the two subgroups must add up to the total market.

In Panel B, the results are similar and somewhat larger for equal-weighted portfolios of returns. This is consistent with the finding in Hartzmark and Solomon (2013) that price-pressure effects are larger for smaller market capitalization companies which may have less liquidity. The results in Table 10 further confirm that the way investors account for dividends has effects on market prices. Mutual funds and institutions, who make up large fractions of total ownership, tend to reinvest dividends when they are received, but do so mostly outside of the stock that paid the dividends. This creates predictable price pressure when dividend payments are larger, but mostly among stocks without a payment.

6 Conclusion

The idea that a value maximizing investor is indifferent between receiving value through capital gains or dividends is an economically sensible one - by combining the capital gains yield and dividend yield on a stock into a single returns variable, an investor can measure the total profit he receives on a position. Nonetheless, the wedge between normative theories of how to account for investment profits (which provide sound measures of overall economic performance for an investor), and positive theories of mental accounting (which describe how investors actually think of their positions) may

[14]The positive and significant constant coefficient is consistent with the finding of positive returns on the payment date found in Berkman and Koch (2016). Berkman and Koch (2016) find the results are driven by dividend reinvestment plans and notes that these plans have caps on the amount that can be reinvested which effectively excludes many, if not most, mutual funds and institutions.

be considerable. In this paper, we document that investors behave as if they track capital gains and dividends as separate and largely independent variables. Their behavior does not suggest that these two components are conceived of as part of a single combined source of money, and this t has important marketwide consequences.

This disconnect between dividends and price changes shows up in a number of ways. When considering whether to sell assets, the performance of stocks is mostly considered in terms of price changes, not returns. Dividend-paying stocks are sold less frequently, and the propensity to sell depends less on price changes. These results hold not only for individual investors, but also for the significant fraction of mutual funds and institutions who overall display behavior consistent with mental accounting. Demand for dividend-paying assets increases when interest rates are low and when recent market returns are low, suggesting that investors value these stocks as an income stream, and compare them to income streams on bonds and the potential for price increases. When even sophisticated investors receive a dividend, they rarely reinvest it back into the asset from which it came. Rather, they reinvest it in other stocks, leading to predictable price pressure from aggregate dividend payments. These findings are best understood as showing that investors view price changes and dividends in separate mental accounts.

Absent considerations of taxes and transaction costs, dividends are merely another source of profit along with capital gains, and one which will mechanically reduce the price of the stock. However, popular discourse often discusses them as if they are a cost-free stream of income, largely independent of capital gains. Many investors and commentators, if pushed, will readily admit than any given dividend will result in a price drop. However, they will then make puzzling statements such as claiming that the reliability of dividend payments provides a good hedge against the possibility of uncertain fluctuations in prices, or that a high dividend yield is valuable when bond yields are low. A better understanding of the relationship between dividends and price changes would help investors appropriately characterize their profits on each position. How best to teach investors about the proper role of dividends in finance remains an open and interesting question.

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Figure 1

V-Shape in Selling Propensity Based on Dividend Payment

This graph shows a local linear plot of the propensity to sell positions based on their percentage price change. Four groups are estimated separately, being at a loss with no dividend income, being at a gain with no dividend income, being at a loss and receiving dividend income, and being at a gain and receiving dividend income (with gains and losses being calculated based on price changes only). The gray area indicates the 90 percent confidence interval.

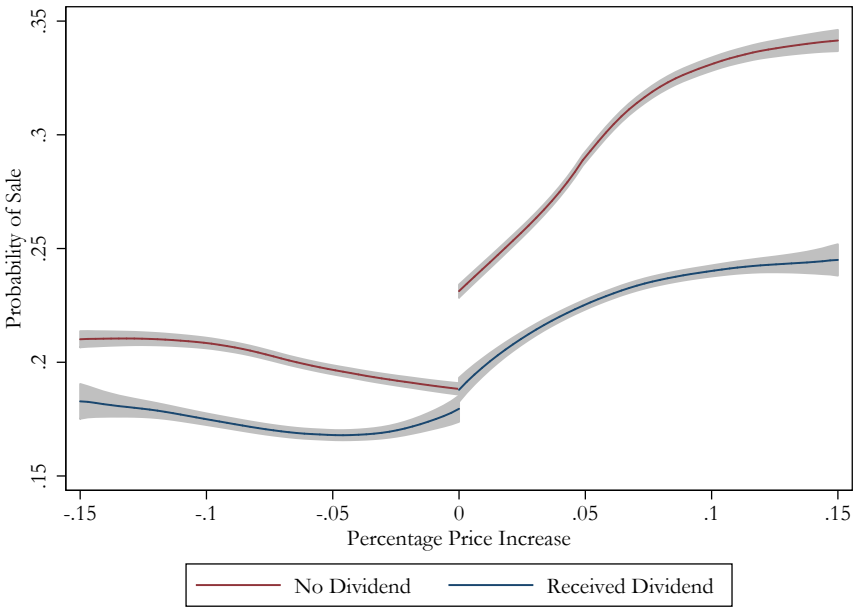


Figure 2
Dividend Interim Returns over Time

This graph shows a local linear plot of the interim period return (the cumulative characteristic adjusted return after a dividend announcement and before the ex-date) over time. The green shaded area coincides roughly with the tech boom from January 1995 through April 2000. The blue shaded area represents low interest rates beginning in from January 2009 through June 2016 where the federal funds rate was below 0.50. The gray area indicates the 90 percent confidence interval.

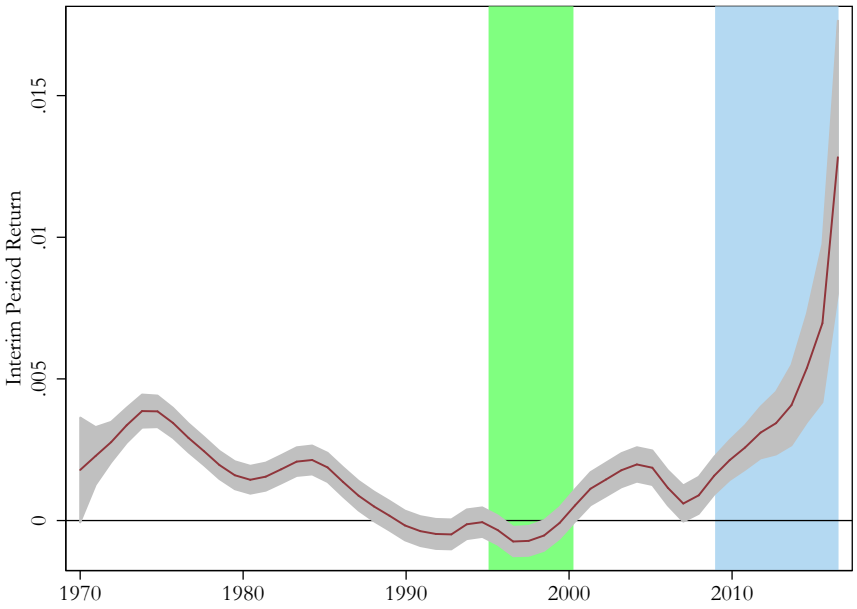
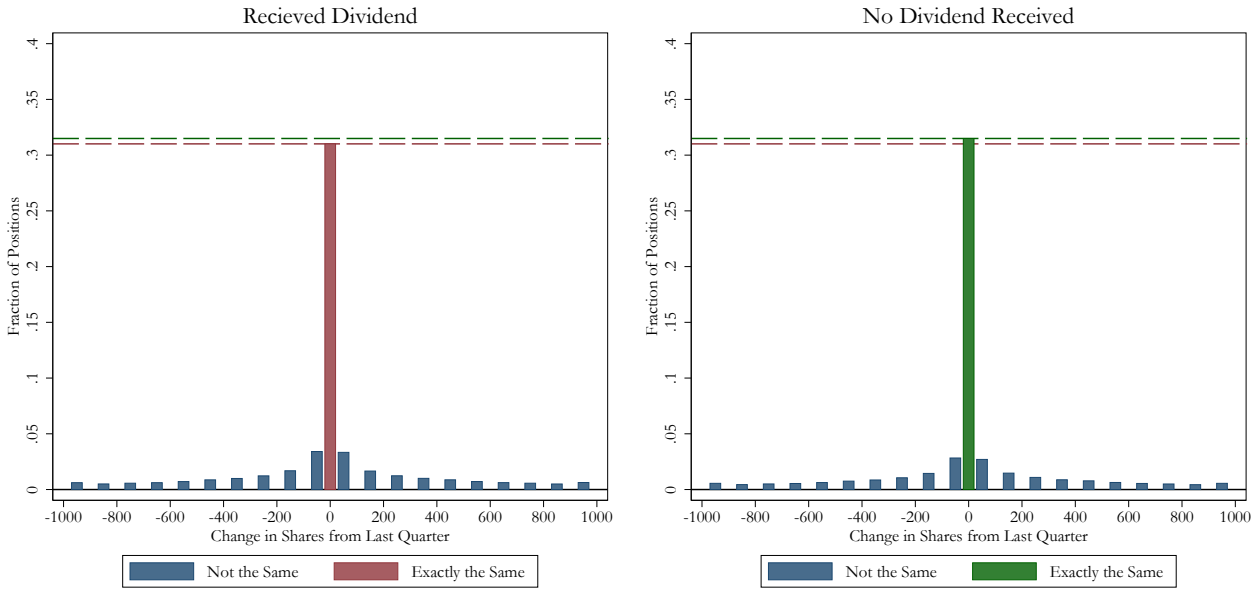


Figure 3

Changes in Holdings for Dividend-Paying and Non-Dividend-Paying Stocks

This graph shows the distribution of the change in number of shares of a given fund holding from one report date to the next, for holdings that paid a dividend between the two report days (left graph) and those that did not (right graph). Panel A examines holdings changes for mutual funds, and Panel B examines holdings changes for institutions. The maroon and green bars represents the number of holdings with the exact same number of positions from quarter to quarter. The blue bars represent changes in number of position in 100s. Bars are centered at x and to the right of the maroon bar contain changes from $(x - 50,\ x + 50]$ and to the left $[x - 50,\ x + 50)$.

Panel A: Mutual Funds



Panel B: Institutional Investors

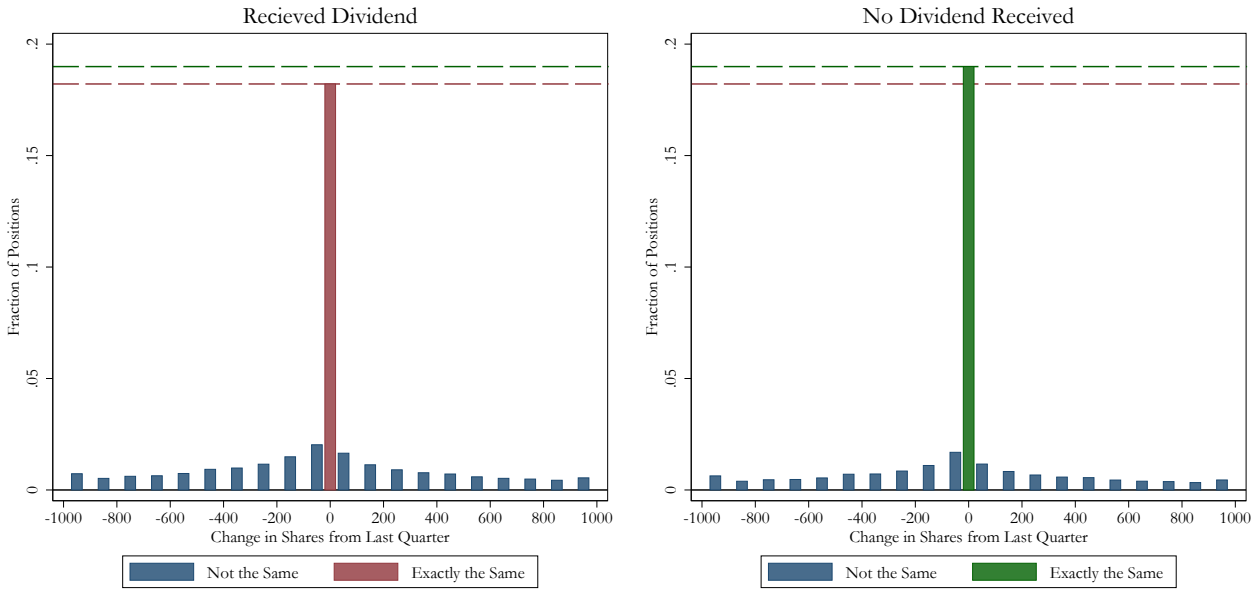
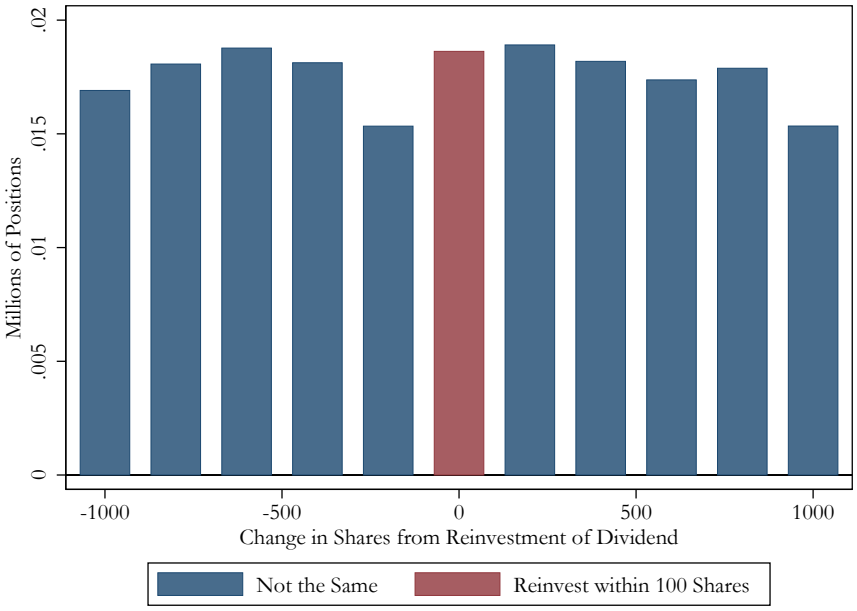


Figure 4

Difference Between Actual Change in Mutual Fund and Institutional Holdings and Amount Corresponding to Full Reinvestment of Dividends

This graph examines the amount by which changes in mutual fund and institutional holdings differ from the amount corresponding to dividend reinvestment, given that the investor made some change in holdings. For holdings that paid a dividend during the quarter, we compute the actual change in holdings minus the change in holdings that would occur if the dividend were immediately reinvested into the stock on the payment day. As a result, a fund that exactly reinvests the dividend will show a difference of zero. The figure plots the distribution of this difference for all dividend-paying fund holdings where the amount to be reinvested was at least 100 shares. The maroon bar represents a difference between -99 and +100 (i.e. the fund invested within 100 shares of the amount of the dividend). The blue bars are difference amounts binned into units of 100 shares. We exclude observations where the fund made no change in shares. Only funds with a difference of report days between 60 and 100 calendar days are included. Panel A examines mutual funds while Panel B examines the holdings of institutional investors.

Panel A: Mutual Funds



Panel B: Institutional Investors

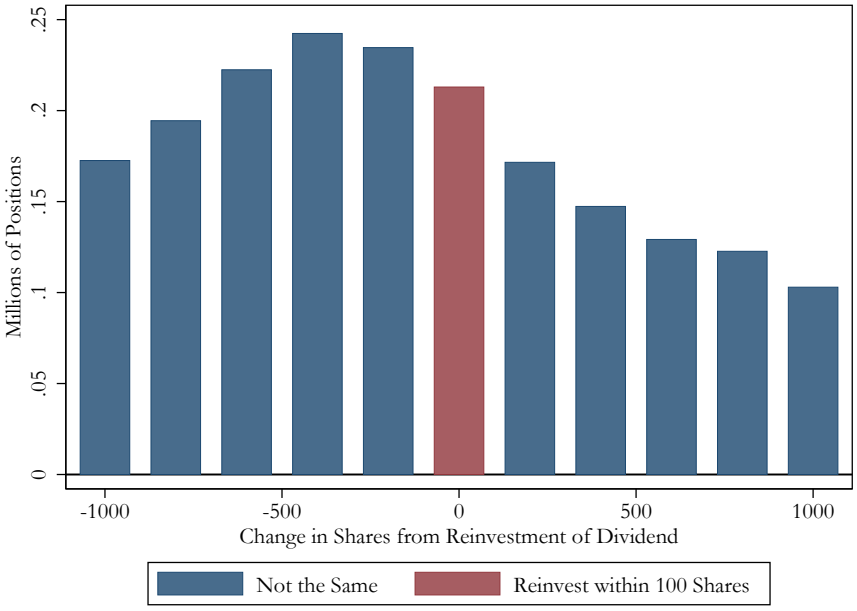


Table 1
Summary Statistics

Panel A shows summary statistics for the individual investor data which covers January 1991 to November 1996. Panel B shows summary statistics for mutual funds and institutional investors covering 1980 through 2015. Panel C explores the returns of stocks, their percentage price changes and their dividend yield at the daily, monthly and annual horizon. The first three rows show the mean value of each. The next three rows show correlations, and the final two row shows the total number of observations and the total number of observations with a positive dividend yield.

Panel A: Individual Investor Summary Statistics

	Obs	Mean	SD	Min	25th Pctile	Median	75th Pctile	Max
Accounts	54,176							
Sell Days	313,625							
Observations	1,506,274							
Portfolio Size	313,625	4.803	7.577	1	2	3	6	358
Dividend Paying Obs.	696,138							
Unambiguous Gain	437,805							
Gain Only with Dividends	40,866							
Unambiguous Loss	217,467							

Panel B: Mutual Fund and Institutional Investors Statistics

	Mutual Funds	Institutional Investors
Filing Entities	21,743	6,761
Report Days	279,018	229,528
Observations	24,570,258	57,040,527
Dividend in Current Quarter	11,521,670	28,359,091

Panel C: Returns by Dividend Yield

	Daily	Monthly	Annual
Return	0.0008	0.0113	0.1601
Percentage Price Change	0.0007	0.0094	0.134
Dividend Yield	0.0001	0.0019	0.0242
Corr(Ret, Div Yield)	0.0061	0.0171	-0.0097
Corr(Ret, Div Yield|Div Yield>0)	0.0925	0.0664	-0.0263
Corr(Price Change, Div Yield|Div Yield>0)	-0.5039	-0.1031	-0.067
Total Observations	87,124,042	3,752,363	287,540
Observations with Div Yield>0	744,409	658,238	155,561

Table 2
The Disposition Effect With and Without Dividends

This table explores the propensity of individual investors, mutual funds and institutional investors to sell positions when they are at a gain, measured using either price changes or returns including dividends. The dependent variable is *Sell*, a dummy variable for whether a particular share was sold that day (for individuals) or between the two reporting dates (for funds and institutions), given that some sale occurred. The two main independent variables are *Unambiguous Gain*, a dummy variable that equals one for any share at a gain relative to purchase price, computed using only the capital gain and excluding dividends, and *Gain Only With Dividends*, a dummy variable for a share at a gain relative to purchase price if dividends are included but at a loss when dividends are not included. All regressions include a *Received Dividend* dummy that equals one if the share has received any dividends since being purchased. *Additional Controls* include a portfolio size fixed effect, *Gain*, *Gain*(% Price Change)*, *Loss*(% Price Change)*, *Gain*(% Price Change)*(√Holding Days)*, *Loss*(% Price Change)*(√Holding Days)*, *√Holding Days*, *Gain*Variance*, and *Loss*Variance,* where *Gain* and *Loss* are defined based on % price change. p-values for the test of *Unambiguous Gain=Gain Only With Dividends* are reported after the regression values. Individual investor data covers January 1991 to November 1996. Fund and institutional data covers 1980 to 2015 and only funds and institutions displaying a positive disposition effect (excluding the current day) are included. Standard errors are clustered by account/fund and date, and t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Individual Investor		Mutual Fund		Institutional Investor	
	(1)	(2)	(3)	(4)	(5)	(6)
Unambiguous Gain	0.0789***	0.0746***	0.0488***	0.0395***	0.0321***	0.0252***
	(16.47)	(20.63)	(9.38)	(10.81)	(7.06)	(8.97)
Gain Only With Dividends	0.00549	0.00997***	0.0173***	0.0246***	0.0151***	0.0146***
	(1.41)	(3.58)	(4.03)	(10.35)	(4.18)	(6.09)
p: Unambiguous=With Dividends	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Account FE	No	Yes	No	Yes	No	Yes
Additional Controls	No	Yes	No	Yes	No	Yes
R^2	0.0115	0.238	0.00332	0.164	0.00124	0.0703
Observations	1506274	1506274	10767599	10767599	16664828	16664828

Table 3
The Rank Effect With and Without Dividends

This table explores how the the tendency of individual investors, mutual funds and institutional investors to sell stocks varies with the ranking of performance within the portfolio, measured using returns including dividends and price changes. The dependent variable is *Sell*, a dummy variable for whether a particular share was sold that day (for individuals) or between the two reporting dates (for funds and institutions), given that some sale occurred. *Best*, *Worst*, *2nd Best* and *2nd Worst* are dummy variables for the ranking of stocks within the investor's portfolio based on total performance. *(Including Dividends)* ranks based on returns including dividends, while *(Price Only)* ranks based only on the capital gain. An investor must hold at least 5 stocks on a sell day to be included in the analysis. *Additional Controls* are listed in Table 2, and Account FE indicates a fixed effect for each account. All regressions include a *Received Dividend* dummy variable. Standard errors are clustered by account/fund and date and t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Individual Investor		Mutual Fund		Institutional Investor	
	(1)	(2)	(3)	(4)	(5)	(6)
Best (Price Only)	0.146***	0.138***	0.0546***	0.0716***	0.0630***	0.0434***
	(23.72)	(24.62)	(8.35)	(10.24)	(9.58)	(4.67)
Best (Including Dividends)	0.00739	0.00746	0.0121	-0.0331***	0.0386***	-0.0414***
	(1.13)	(1.37)	(1.48)	(-4.05)	(5.95)	(-4.72)
Worst (Price Only)	0.0526***	0.0306***	0.105***	0.0805***	0.0606***	0.0368***
	(9.74)	(6.21)	(18.54)	(11.99)	(9.37)	(5.40)
Worst (Including Dividends)	0.0318***	-0.00462	-0.0126***	0.00607	-0.0276***	0.000740
	(6.25)	(-0.97)	(-2.73)	(1.11)	(-5.13)	(0.12)
2nd Best (Price Only)	0.0818***	0.0307***	0.0471***	0.0524***	0.0591***	0.0373***
	(17.88)	(8.77)	(13.13)	(13.20)	(14.27)	(6.61)
2nd Best (Including Dividends)	0.0247***	-0.00490	0.0198***	-0.00573	0.0369***	-0.0130***
	(5.45)	(-1.41)	(4.47)	(-1.24)	(9.06)	(-2.68)
2nd Worst (Price Only)	0.0234***	0.0163***	0.0529***	0.0394***	0.0327***	0.0207***
	(6.87)	(5.57)	(14.33)	(9.38)	(7.91)	(4.84)
2nd Worst (Including Dividends)	0.0272***	0.00289	-0.00835**	0.00132	-0.0164***	0.00201
	(8.02)	(1.01)	(-2.43)	(0.32)	(-4.42)	(0.47)
Account FE	No	Yes	Yes	Yes	Yes	Yes
Additional Controls	No	Yes	No	Yes	No	Yes
R^2	0.0262	0.296	0.129	0.164	0.0618	0.0701
Observations	1058711	1506274	10767599	10767599	16664828	16664828

Table 4
The Rolled Disposition Effect With and Without Dividends

This table examines the propensity of individual investors to sell positions purchased as part of a reinvestment episode, according to whether the combined position is at a gain or a loss (with or without dividends included). Stocks are included as observations if they were purchased on the same day that another stock was sold (a reinvestment day). For these stocks, we take all days on which some position was sold and use as a dependent variable *Sell*, a dummy variable for whether the particular share was sold that day. The main independent variables are *Original Gain*, either including or excluding dividends. These are dummy variables that equal one if the new asset (purchased on a reinvestment day) has a value that exceed the amount initially invested into the old asset (which got sold on the reinvestment day) - in other words, whether the combined reinvested position is at a gain or a loss. *Including Dividends* adds the dividends paid on both the old and the new stock to compute whether the combined position is at a gain or a loss. *Gain* (either with or without dividends) is a dummy variable that equals one if the new asset is at a gain just relative to its own purchase price, as a single stock investment. *Additional Controls* are listed in Table 2 and all regressions include a *Received Dividend* dummy variable. Standard errors are clustered by account and date and t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Original Gain (Price Only)	0.0396***		0.0378***	0.0296***	0.0210***
	(5.90)		(5.59)	(4.47)	(5.41)
Original Gain (Including Dividends)		0.0168***	0.00682	-0.0220***	-0.0108**
		(3.01)	(1.23)	(-3.64)	(-2.34)
Gain (Price Only)				0.105***	0.0621***
				(8.36)	(5.80)
Gain (Including Dividends)				-0.0424***	-0.00331
				(-3.56)	(-0.33)
Constant	0.217***	0.229***	0.214***	0.192***	0.239***
	(22.51)	(24.06)	(21.37)	(25.50)	(23.75)
Additional Controls	No	No	No	No	Yes
R^2	0.00220	0.000418	0.00226	0.00686	0.116
Observations	91812	91812	91812	91812	91136

Table 5
The Holding Period and Price Sensitivity of Dividend-Paying Stocks

This table examines whether individual investors, mutual funds and institutional investors are more or less likely to sell stocks that pay dividends, and whether dividends are associated with less selling reaction to price changes. The dependent variable is *Sell*, a dummy variable for whether a particular share was sold that day (for individuals) or between the two reporting dates (for funds and institutions), given that some sale occurred. *Dividend in Prior Year* is a dummy variable if the stock paid a dividend in the prior 12 months. *Dividend Yield in Prior Year* is a stock's dividend yield over the prior 12 months. *Gain* is a dummy variable equal to one if the stock is at a gain using only price appreciation. *Received Dividend* is a dummy that equals one if the share has received any dividends since being purchased. *Additional Controls* are listed in Table 2. Standard errors are clustered by account/fund and date. t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Selling Based on Dividends

	Individual Investor		Mutual Fund		Institutional Investor	
	(1)	(2)	(3)	(4)	(5)	(6)
Dividend Yield in Prior Year	-0.237***	-0.275***	-0.370***	-0.260***	-0.308***	-0.295***
	(-5.93)	(-10.93)	(-7.87)	(-5.80)	(-7.78)	(-6.52)
Dividend in Prior Year	-0.0287***	-0.0101***	0.0165***	-0.0126***	0.0112***	0.00174
	(-6.73)	(-6.62)	(2.93)	(-5.10)	(2.77)	(0.62)
Account FE	No	Yes	No	Yes	No	Yes
Additional Controls	No	Yes	No	Yes	No	Yes
R^2	0.00197	0.289	0.000447	0.164	0.000351	0.0704
Observations	1480398	1480398	23076600	10671905	39313861	16462766

Panel B: Disposition Effect Based on Dividends

	Individual Investor		Mutual Fund		Institutional Investor	
	(1)	(2)	(3)	(4)	(5)	(6)
Gain	0.109***	0.0834***	0.0555***	0.0443***	0.0386***	0.0281***
	(20.22)	(21.67)	(10.45)	(12.26)	(7.75)	(9.02)
Gain*Received Divided	-0.0693***	-0.0367***	-0.0136***	-0.0165***	-0.0125***	-0.00883***
	(-17.81)	(-12.56)	(-3.58)	(-6.14)	(-4.11)	(-3.38)
Account FE	No	Yes	No	Yes	No	Yes
Additional Controls	No	Yes	No	Yes	No	Yes
R^2	0.0131	0.289	0.00333	0.164	0.00125	0.0703
Observations	1506274	1506274	10767599	10767599	16664828	16664828

Table 6
Dividend Initiation and Time-Varying Dividend Demand

This table examines how the propensity of firms to initiate dividend payment varies with proxies of dividend demand. The sample has one observation per firm per year and is limited to firms that did not issue a dividend in year $y-1$. The dependent variable is a variable equal to one if a firm decides to issue a dividend in year y. The independent variable is the average interim return for all dividend paying firms in year $y-1$ and the average book-to-market of dividend paying firms divided by non-dividend paying firms as of December in year $y-1$. Data covers 1964 to 2016. Standard errors are clustered by firm and year. t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Interim Return	4.666***		4.503***
	(10.37)		(11.29)
Book-to-market (Div vs. No Div.)		-0.0455**	-0.0417**
		(-2.32)	(-2.34)
Constant	0.0284***	0.0809***	0.0713***
	(57.31)	(3.73)	(3.70)
R^2	0.00394	0.00275	0.00626
Observations	121024	121584	121024

Table 7
The Market Impact of Time-Varying Dividend Demand

This table examines how pricing variables of dividend-paying stocks vary with the nominal risk-free interest rate and past market returns. Panel A presents regressions with the interim return, the characteristic adjusted cumulative return from one day after a dividend announcement to one day before the ex-date, as the dependent variable. This is regressed on the interest rate, the market return over the prior month (trading days t-20 to t-40), the stock's dividend yield over the previous year and the number of days between the ex-date and the announcement date. Each observation represents the interim return for an individual dividend payment for a given stock. In Panel B, monthly observations of the book-to-market ratio is regressed on the interest rate, the market return over the prior year (months m-1 to m-13), a dummy variable equal to one if the stock paid a dividend over the prior 12 months (*Div. Payer*). Data covers January 1964 to June 2016. Standard errors are clustered by firm and date. t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Interim Returns Surrounding Dividends

	(1)	(2)	(3)
Interest Rate	-4.088***		-4.121***
	(-3.40)		(-3.44)
Market Return		-0.0196***	-0.0196***
		(-5.92)	(-5.93)
Dividend Yield	0.393***	0.369***	0.392***
	(15.76)	(15.83)	(15.76)
Days in Interim Period	-0.000140***	-0.000139***	-0.000140***
	(-8.74)	(-8.67)	(-8.76)
R^2	0.00207	0.00220	0.00226
Observations	283654	283654	283654

Panel B: Book-to-Market of Dividend vs. Non-Dividend Paying Firms

	(1)	(2)	(3)
Interest Rate x Div. Payer	26.37***		25.38***
	(8.72)		(8.08)
Market Return x Div. Payer		0.115***	0.0889**
		(2.61)	(2.15)
Interest Rate	18.74***		19.52***
	(4.93)		(4.85)
Market Return		-0.0110	-0.0587
		(-0.17)	(-0.86)
Div. Payer	-0.0511***	0.0600***	-0.0590***
	(-3.45)	(5.40)	(-3.95)
R^2	0.0194	0.00314	0.0195
Observations	2397595	2397595	2397595

Table 8
The Market Impact of Dividend Stability and Increases

This table examines how the interim return (the characteristic adjusted cumulative return from one day after a dividend announcement to one day before the ex-date) varies with changes in the dividend paid and stability of the dividend paid. *Dividend Change Amount* is the difference in quarterly dividend from the current quarter minus the amount paid in the prior quarter. *No Div. Cut in Prior Year* is a dummy variable equal to one if in the current quarter and the three quarters preceding it the dividend change amount is zero or positive. Columns 2, 4 and 6 include a year by quarter fixed effect. Each observation represents an individual dividend payment for a given stock. Data covers January 1964 to June 2016. Standard errors are clustered by firm and date. *t*-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Dividend Change Amount	0.0313***		0.0318***	0.0313***
	(9.18)		(9.43)	(9.31)
No Div. Cut in Prior Year		0.00126***	0.00139***	0.00130***
		(3.46)	(3.80)	(3.55)
Days in Interim Period	-0.000130***	-0.000133***	-0.000131***	-0.000131***
	(-6.86)	(-6.98)	(-6.87)	(-6.87)
Dividend Yield	0.0294	0.0231	0.0338	-0.0129
	(1.00)	(0.78)	(1.16)	(-0.39)
Quarter FE	No	No	No	Yes
R^2	0.000871	0.000528	0.000934	0.00607
Observations	283539	283464	283464	283464

Table 9
Dividend Reinvestment Among Mutual Funds and Institutions

This table examines the propensity of mutual funds (Panel A) and Institutional Investors (Panel B) to reinvest dividends. In the first two columns a dummy variable equal to one if there is no change in shares between the current and previous report is regressed on a dummy variable for whether the holding paid a dividend over that time period. In the third and fourth columns the left hand side variable is equal to one if there is an increase in shares. In column five the sample is limited to observations where reinvesting a dividend would require buying at least 100 shares and the constant displays the mean value of a dummy variable equal to one if the investor reinvests within 100 shares of what would be necessary for exact reinvestment. Columns 2 and 4 include fund fixed effects. Standard errors are clustered by fund and quarter, and t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Mutual Funds

	Same Shares		Increase Shares		Change Shares
	(1)	(2)	(3)	(4)	(5)
Dividend Paying Holding	-0.00483	0.00309	0.0179***	0.0135***	
	(-1.00)	(1.37)	(6.44)	(6.71)	
Constant	0.315***	0.311***	0.304***	0.306***	0.00719***
	(35.58)	(129.63)	(54.21)	(86.03)	(19.27)
Fund FE	No	Yes	No	Yes	No
R^2	0.0000271	0.254	0.000373	0.119	0
Observations	24570258	24570258	24570258	24570258	5410720

Panel B: Institutional Investors

	Same Shares		Increase Shares		Change Shares
	(1)	(2)	(3)	(4)	(5)
Dividend Paying Holding	-0.00781***	-0.0235***	0.0222***	0.0330***	
	(-2.76)	(-12.01)	(11.46)	(19.25)	
Constant	0.190***	0.198***	0.338***	0.332***	0.0117***
	(31.37)	(84.75)	(69.60)	(201.83)	(31.06)
Manager FE	No	Yes	No	Yes	No
R^2	0.000101	0.122	0.000542	0.0426	0
Observations	57040527	57040527	57040527	57040527	18255322

Table 10
Market Returns Based On Aggregate Dividend Payments

This table explores how the market return varies with the market dividend yield (measured using dividend payment dates). The returns in Panel A are value weighted and the returns in Panel B are equal weighted. The dependent variable is the return to the CRSP index (in columns 1-2) the average returns to dividend paying stocks (in columns 3-4) and the average returns to non-dividend paying stocks (in columns 5-6). The main independent variable is the daily dividend payout yield, measured as the total amount of dividends paid out that day, divided by the total market capitalization at the end of the previous day. t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Value-Weighted Returns

	Market		Dividend Payers		Non-Dividend Payers	
	(1)	(2)	(3)	(4)	(5)	(6)
Dividend Yield	64.92***	71.06***	39.62	61.64*	73.59***	78.53***
	(2.90)	(3.06)	(1.17)	(1.72)	(3.28)	(3.38)
Constant	0.0327***	0.0320***	0.0861***	0.0830***	0.0347***	0.0341***
	(4.41)	(4.30)	(7.08)	(6.79)	(4.68)	(4.58)
Year Month FE	No	Yes	No	Yes	No	Yes
R^2	0.000354	0.0497	0.0000676	0.0630	0.000453	0.0499
Observations	23784	23784	20236	20236	23784	23784

Panel B: Equal-Weighted Returns

	Market		Dividend Payers		Non-Dividend Payers	
	(1)	(2)	(3)	(4)	(5)	(6)
Dividend Yield	95.86***	99.17***	27.02	73.40**	98.43***	101.9***
	(4.34)	(4.41)	(0.91)	(2.36)	(4.44)	(4.51)
Constant	0.0721***	0.0717***	0.116***	0.109***	0.0715***	0.0711***
	(9.85)	(9.96)	(10.84)	(10.24)	(9.74)	(9.84)
Year Month FE	No	Yes	No	Yes	No	Yes
R^2	0.000790	0.0864	0.0000410	0.0755	0.000829	0.0863
Observations	23784	23784	20236	20236	23784	23784