Do dividend flows affect stock returns?*

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Abstract

We examine price impacts from dividend flows. Event study estimates show that stocks experience abnormal returns on the dividend distribution day. Results also show a spillover effect to non-dividend-paying stocks that are likely to be part of the same benchmark portfolio as the dividend-paying stocks. Regression results indicate that the effect is dependent on the ownership share by professional investors. The temporary nature of the effect on returns is in line with the literature's demand-driven price pressure hypothesis.

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I Introduction

A large body of literature finds that stock prices are positively correlated with flows to investors. One type of flow is distributions of dividends. In this paper, we analyze how dividend distributions impact stock prices. To this end, we analyze a portfolio consisting of stocks from two distinct categories. For each trading date, we distinguish between a subportfolio consisting of dividend payers and a subportfolio consisting of non-dividend-payers. Our empirical results show a clear, positive relation between the dividend distributions and the returns on the dividend-paying stocks. The results also indicate that there is a positive relationship between the distributions and the returns on the non-dividend-paying stocks.

Four dates are important in the dividend payment process (see Figure I). At the declaration date, the dividend-paying company announces the ex-dividend-, record-, and payment date. The size of the dividend and all other relevant information is also made public. Thus, no new information regarding the dividend payment is made available to the market after the declaration date. All holders of the company's stock prior to the ex-dividend date are entitled to the dividend payment. After the ex-dividend date, buyers of the stock do not have the right to receive the dividend. The record date is usually two trading days after the ex-dividend date. All holders of the stock on record will receive the dividend. The record date is set so that the company can get on record all investors that held the stock one day prior to the ex-dividend date. Finally, the dividend is transferred to investors on the payment date. The payment date is usually two to four weeks after the ex-dividend date. Some companies offer investors to participate in dividend reinvestment plans. If an investor participates in such a plan, dividends are automatically reinvested in the stock of the dividend-paying company.

[INSERT FIGURE I HERE]

Most mutual funds and institutional investors measure their portfolio's return against a benchmark index and have upper bounds on tracking errors. When an index constituent goes ex-dividend, the index provider typically "reinvests" the dividend in all the index constituents according to their market capitalization. Unless investors have cash in their portfolio, they cannot do similarly until they receive the dividends on the distribution day. This time gap between the change in the index on the ex-day and the distribution date poses a problem for portfolio managers with a tight tracking error as their exposure to the portfolio they are benchmarked to becomes too low. They therefore have an incentive to reinvest the dividends as early as possible. They also have an incentive to invest in such a way that they obtain the right exposure to their benchmark, that is, to invest broadly in the constituents.

In a frictionless market, with equally well-informed investors, unexpected changes in asset prices are a result of new information. Edelen and Warner (2001) find that flows to investors and stock returns are thus positively correlated. That flows contain new information is a common problem when analyzing price impacts. With new information, it is difficult to disentangle any demand effect on prices from the effect of new information. Surprisingly little attention has been devoted to distributions of dividends, which certainly add to flows to investors. A particular feature of analyzing dividend distributions is that they are not associated with any new information. The announcement of the size of the dividend payment is made weeks in advance of the distribution date. When the investors receive the dividends, to observe the size and the timing of the payment is just a confirmation of what they already know. If they reinvest the dividends, the demand for stocks increases. Any (abnormal) price impacts around dividend distributions are therefore likely to be driven by changes in demand. Two hypotheses regarding non-information-related supply and demand shocks for stocks dominate the literature (see e.g., Scholes 1972). The price pressure hypothesis postulates that supply or demand shocks that are not related to new information temporarily drive prices away from their fundamental value. Because there is no new information driving the shocks, the prices will revert to their fundamental value over subsequent days. In contrast, the substitution hypothesis postulates that a demand shock leads to a permanent effect on prices. Kraus and Stoll (1972) find that positive block trading (purchasing) by institutions leads to a permanent price increase in stock prices, while negative block trading (selling) leads to a temporary price decrease. However, a possible problem of using block trading to test these two hypotheses that has been discussed in the literature is that it can be associated with new information. The price effect of dividend payments is well suited to test the two opposing hypotheses. Both postulate a price increase as a result of increasing demand, but a price reversal – prices going back to their pre-distribution level – is only consistent with the price pressure hypothesis. Our empirical results are in line with the price pressure hypothesis. Interestingly, the price effect from reinvesting the dividends does not seem to be related to the stocks' level of liquidity.

The price impact literature primarily focuses on changes in net holdings, i.e., flows to investors to address price impact effects in stocks. Several papers find that flows to investors are correlated with stock returns (Warther 1995; Lou 2012; Coval and Stafford 2007). These results are related to the literature that documents how stocks that are included in an index receive a price premium (see e.g., Shleifer 1986). This inclusion effect is present for both the S&P 500 index (Wurgler 2011; Goetzmann and Massa 2003) and the Nikkei 225 index (Greenwood and Sosner 2007). Basak and Pavlova (2013) present a theoretical model that explains how institutional investors tilt their portfolio towards index stocks, and Gompers and Metrick (2001) find that institutions' demand accounts for price increases in stocks. Another strand of the literature, which is related to the price impact literature, is the comovement literature. This literature states that correlated demand by investors creates comovement in prices for index constituents (Barberis, Schleifer, and Wurgler 2005). In a recent paper, Chen, Singal, and Whitelaw (2016) take a different stand on this issue and claim that comovement is simply a manifestation of the momentum effect documented by Jagadeesh and Titman (1993).

Ogden (1994) finds that, for stocks where investors participate in reinvestment plans, returns on the distribution date and the following trading days are higher than normal. These results are futher confirmed in a recent paper by Berkman and Koch (2017). They find the price effect to be higher for higher dividend yields. Our paper is related to these two papers, but we have a different focus in our analysis. We analyze whether changes in stock returns are related to ownership by institutions and/or mutual funds, that is, professional investors. Furthermore, we also relate the ownership by professional investors to the spill-over effect to the returns on the index constituents that are non-dividend-payers. Our results indicate that the higher the ownership by professional investors, the lower the return on the distribution day for the dividend payers and the higher the return for the non-dividend-payers. This observation indicates that professional investors do reinvest dividends and they invest broadly in the index members. We also find some evidence suggesting that investors try to reinvest dividends before the actual distribution date.

II Hypothesis

Mutual funds measure the performance of their stock portfolio relative to a predetermined benchmark of stocks, e.g., the S&P 500 index or some other relevant benchmark (see e.g., Ang (2014) for a discussion of benchmarks). Portfolio managers' mandates oftentimes include a maximum tracking error that is measured as the portfolio's performance relative to the benchmark. For actively managed funds this tracking error is less tight, while for index-linked mutual funds, it is very tight. Dividend distributions can pose a challenge to funds with tight tracking errors.

By way of an example, consider an index that is based on three stocks, each with a value of 100. The index value is 300 (the sum of the value of the three stocks). One of the stocks declares a dividend of 50. On the ex-day, the stock price falls to 50. The index provider reinvests the dividend of 50 in the three stocks according to their relative value: 10 in the dividend-paying stock and 20 in each of the other two stocks. The index value is still 300 $((50+10)+(100+20)+(100+20))$. An index tracking fund has invested 100 in each of the three stocks. On the ex-day, the fund's investments consist of the three stocks with value 50, 100, and 100. In addition, it also has a claim on the future dividend payment of 50. The relative weights of the assets in the stock portfolio are the same as in the benchmark index, but the claim on the dividend payment causes the portfolio's beta towards the index to be only 0.8333 $((300-50)/300)$, not 1 (ignoring discounting of the future dividend payment). In general, one effect of dividend payments is to lower mutual funds' market beta. The effect of this lower beta is a higher tracking error. To reduce the tracking error, the funds should reinvest the dividends as early as possible. Also, they can lower the tracking error by reinvesting the dividends broadly in the index members, not only in the stocks of the dividend-paying company.

We hypothesize that reinvesting dividends leads to price pressure in the dividend-paying stocks. Based on the discussion above, we further hypothesize that reinvestment also leads to price pressure in the non-dividend-paying stocks. In addition, we hypothesize that reinvestment leads to increased trading activity.

In contrast to mutual funds and institutional investors, retail investors typically invest on their own account, do not track indices, and are not concerned with tracking errors. Retail investors therefore have fewer constraints on where and when they can reinvest the dividend payments. As they are non-professional investors, it can take some time before they can reinvest the dividends. Many retail investors may use the dividends to support spending and will not reinvest them at all. We hypothesize that there is a positive relationship between the degree of professional ownership and returns on the benchmark constituents at the distribution date.

Companies pay dividends about four times per year. Because a dividend payment contains no new information that investors can use to change their assessment of the company value and because dividends are paid quite often, any price impacts from reinvesting should be temporary. We therefore hypothesize that price impacts from reinvestment of dividends will be short lived and prices will revert back to their "fundamental value".

III Data and methodology

We study whether the distribution of dividends affects stock prices. Further, we like to relate any price effect to the amount of professional ownership. To this end, we construct an agnostic stock portfolio, a "Benchmark 500 Index". For each stock, we construct a variable for ownership share by mutual funds (os_{MF}), i.e., the fraction of a company's shares that are owned by mutual funds. At every year end we pick the 500 stocks with the highest ownership share. We find the ownership shares by searching the Thomson Reuters database on mutual funds' year-end holdings from 1999 through 2012. Funds not based in the US are excluded. We use the ownership shares by mutual funds with a balanced investment objective code, resulting in a total of 188 mutual funds (using other mutual funds gives relatively small changes in the composition of the agnostic portfolio). Among the holdings of these funds, we only include common stocks traded on the NYSE or AMEX. We also exclude stock holdings where either the CUSIP, ticker, industry code, price, or shares outstanding are missing. In practice, different mutual funds have different benchmarks. Our approach is therefore an agnostic way of defining stocks that are part of a benchmark used by mutual funds. From Thomson Reuters we also find the share of institutional ownership for the same stocks. Mutual funds' ownership is not part of the institutional ownership data. Finally, we download daily security data for the agnostic benchmark portfolio from the Center for Research in Security Prices (CRSP) database from January 2000 through September 2013. We exclude stocks where either the stock's price, the payment date, or the dividend amount is missing for any day during the sample period.

In Table 1 we present some statistical facts about the ownership data in the agnostic portfolio for the different years in our sample. We also report the portfolio's total number of dividend payments in the different years. The column max(os_{II}) shows the ownership share by institutional investors in the stock with the highest share. Institutional ownership exceeds 100% for some stocks. Obviously, institutions cannot own more than 100% of any stock. Two likely reasons can explain this excess ownership: First, different reporting dates by institutions might cause some ownership shares to exceed 100%. Second, lending of stocks can cause problems regarding reported ownership. If one investor lends stocks to another investor, and both claim ownership of the stock when they report their holdings, ownership may exceed 100%. For some years the total mean ownership share (mean(os_{MF})+mean(os_{II})) exceeds 100%. However, in cases where reported ownership by institutions and mutual funds exceeds 100%, their ownership must be very high. Therefore, we do not consider excess ownership to be of much concern.[1] The total number of dividend payments is fairly stable across the different years.

[INSERT TABLE 1 HERE]

For every trading day in our sample, we calculate the dividend yield on the benchmark portfolio. We define the dividend yield as the total dividend distributions of portfolio members on a given day, divided by the portfolio's market capitalization. Next, we sort all trading days in descending order based on the portfolio's dividend yield. In total, our sample contains 2,887 distribution days within a period of 3,436 trading days. Since a majority of the trading days (84%) have some type of distribution, we focus on the sub-sample consisting of the 5%

[1] Excluding observations with excessive ownership does not significantly alter estimated results.

of trading days with the highest dividend yield. This sub-sample consists of days where the portfolio experiences large dividend payments. Dividend payments of this magnitude occur on average almost once every month (10.34 times every year). Thus, these distributions are not rare events. To check for robustness, we enlarge the sub-sample by increasing the cut-off value from 5% to 10%.

Further, we divide the portfolio members into three categories, dividend payers, non-dividend-payers, and excluded stocks. For each day in the sample, all stocks that distribute dividends of at least 0.25% of the equity value to their owners on that particular day[2] and that do not pay dividends on the previous five days or the following 55 days are considered to be dividend payers. Stocks that do not distribute any cash on that day or the previous five days or the following 55 days are considered non-dividend-payers. Thus, a stock belonging to the dividend payer category on one day can belong to the non-dividend-payer category on another day. Stocks that distribute dividends of between zero and 0.25% of the firm value are among the excluded stocks (for that particular day). The same also applies to stocks paying dividends on the previous five days and the following 55 days. Table 2 shows descriptive statistics for the portfolios of dividend payers, non-dividend-payers, and the excluded stocks. Panel A is for the 5% of the trading days with the highest dividend yield, while Panel B is for the days with the 95% lowest dividend yield. The sample we analyze contains 1,996 dividend payments and 55,957 observations of non-dividend-payments.

[INSERT TABLE 2 HERE]

[2] This cut-off value is similar to that used by Ogden (1994).

Some companies offer dividend reinvestment plans (DRIPs). We have obtained lists from The American Association of Individual Investors (AAII) for the years 1998-2008 containing tickers of firms that offer DRIPs. There is large variation in the number of DRIPs firms accross the different years in our sample. According to Mukherjee, Baker, and Hingorani (2002), only 31 firms discontinued their DRIPs program during the time period 1983-1992. The lists we have obtained are clearly not exhaustive for each individual year (the lists vary between 20 and 1,118 tickers). Also Berkman and Koch (2017) question the reliability of the AAII data for the sample period we have data for (as a consequence, they only use data for the period 2008-2012 in their analysis). However, it is likely that the union of the tickers in the different years covers a large fraction of the companies in our sample that offer DRIPs. We make the assumption that once a firm has been listed by AAII as a DRIPs firm, it continues to be a DRIPs firm throughout the rest of our sample period.

We use standardized abnormal returns as our performance measure. To estimate these returns, we use the mean adjusted returns model presented in Brown and Warner (1980). For a given stock, this return is the raw return minus an estimate of the mean return, standardized by the estimated standard deviation of the stock's return. We use post-payment returns on the stocks to estimate mean returns and standard deviations. We avoid using returns before the payment date since both the declaration date and the ex-dividend date precede it. In addition, we avoid using the days immediately following the dividend payment period to reduce potential problems regarding short-term price reversals. Therefore, we estimate the first and second moments of returns from $t = 6$ to $t = 55$.[3] For stock i

[3]The estimation period is set somewhat arbitrary. Robustness checks using different estimation periods provide similar results.

at time t, we calculate the performance measure as

$$a_{i,t} = \frac{r_{i,t} - \overline{r}_i}{\hat{\sigma}(r_i)},$$

where r is raw logarithmic returns, $\overline{r}$ is estimated mean returns in the estimation period, and $\hat{\sigma}(r)$ is the estimated standard deviation of returns in the estimation period. To evaluate the significance level of this estimated performance measure in the event study, we use a parametric t-test with crude dependence adjustment (t_{CDA}) and a non-parametric rank test (t_{Rank}). In the rank test we rank abnormal returns from $t = -5$ to $t = 55$. The parametric test is described by Brown and Warner (1980) and the non-parametric test is described by Corrado and Zivney (1992).

In event study analysis, market-based models are often used to estimate expected returns. However, we analyze the effect from dividend payments on a wide range of stock returns. These stocks constitute a significant part of the total market. Hence, for our analysis, a market-based model is unsuitable for estimating normal returns.

IV Analysis

The results in this section show that the dividend payments are associated with positive standardized abnormal returns. We also present empirical evidence indicating that trading volume increases around dividend payments, but price effects are not caused by lack of liquidity.

An event study of dividend payments

In Table 3 we present empirical results for the event study. The table shows the performance measure ($\bar{a}_t$) with accompanying t-values for trading days $t = -5$ to $t = 5$, where $t = 0$ is the payment day. For the dividend payers, we see a highly significant standardized abnormal return on day $t = 0$. This return is also positive and significant at day $t = 1$. For the non-dividend-payers, the highest observations of our performance measure are on days $t = 0$ and $t = 1$, but it is only at $t = 1$ that it is statistically different from zero. The results in Table 3 indicate that dividends are reinvested in the dividend-paying stocks at the distribution day and the following day ($t = 0$ and $t = 1$). The results also indicate that dividends are reinvested in the stocks of the non-dividend-paying companies.[4] These observations are in line with our hypotheses: investors reinvest the dividends when they receive them and do so broadly. That the return-effect for the non-dividend-payers is small and hard to detect statistically is not surprising. The dividend payments from relatively few companies are to be reinvested in several companies, resulting in a small amount to be invested in each company's stocks.

[INSERT TABLE 3 HERE]

Looking at the cumulative standardized abnormal returns around the dividend payment ($t = -3$ to $t = 3$), we see that these returns are significantly positive for the dividend payers. The corresponding cumulative returns over the period $t = 0$

[4] A rational response to a dividend payment for a diversified investor is to reinvest the dividends so that he continues to be diversified. The observation that dividends are reinvested also in the stocks of the non-dividend-paying companies is interesting because it is consistent with investors acting rationally on the reinvestment of dividend payments.

to $t = 3$ are significantly positive for both dividend payers and non-dividend-payers. These results further support the hypothesis that dividends are reinvested close to the distribution date and not only in the stocks of the dividend-paying companies.

Other benchmark portfolios

As a robustness check for the above agnostic portfolio, we also conduct event-time analysis for the dividend payments on other stock portfolios. First, we increase the cut-off value from the 5% of the trading days with the highest dividend yield to the days with the 10% highest dividend yield. Second, we redo the event-time analysis by using the stocks in the S&P 500 index, which is often used as a benchmark for asset managers. For the S&P 500 index we use both the 5%- and the 10% cut-off value. Third, we do the same analysis on the stocks in the Nordic VINX index (excluding Icelandic companies). When we increase the the cut-off value from 5% to 10%, we can both analyze more days with relatively high dividend yields and check our results for robustness to the 5% cut-off value. While the S&P 500 index has many of the same constituents as our agnostic portfolio, the Nordic VINX represents a whole new sample of stocks. Thus, analyzing these different portfolios increases our study's internal and external validity.

For all portfolios we do the same restrictions concerning the dividend yield as we do for the agnostic benchmark portfolio, requiring companies to distribute at least 0.25% of the market capitalization to count as a dividend payer. The companies in the Nordic region on average pay dividends less frequently than companies listed on the NYSE and AMEX. Therefore, we focus on the top 25% of the trading days with the highest dividend yields for the Nordic region. For the S&P 500 index we use observations from January 2000 through September 2013, while for the Nordic index we use observations between 1 November 2006 and 6 October 2014.

We present the event study estimates for the agnostic portfolio with a 10% cut-off value in Table 4. There is still clear evidence of abnormal returns for the dividend payers on the distribution day. Interestingly, this evidence is now also present for the non-dividend-payers.

[INSERT TABLE 4 HERE]

We present the event study estimates for the S&P 500 in Table 5 and in Table 6. The estimated results are consistent with our hypothesis, with a positive and statistically significant performance measure at trading day $t = 0$ for the dividend payers. By evaluating the performance measure at the individual days around the distribution date, we find little evidence of a spillover effect to the non-dividend-payers. However, looking at the cumulative standardized abnormal returns, there is also some evidence of spillover to the non-dividend-payers. When we increase the cut-off value to 10%, the performance measure for the dividend payers is still statistically significant. With this cut-off value, we also find stronger evidence of a spillover to the non-dividend-payers.

[INSERT TABLE 5 HERE]

[INSERT TABLE 6 HERE]

In Table 7 we report the estimated results for the portfolio of Nordic stocks. For this portfolio as well, there is clear evidence of reinvestments of dividends at $t = 0$, but only for the dividend payers. This effect disappears when we look at the cumulative returns, but it is present for the non-dividend-payers over the periods $t = -3$ to $t = 3$ and $t = -3$ to $t = 0$.

[INSERT TABLE 7 HERE]

The estimated results for these control portfolios indicate that the main finding (positive performance measure at $t = 0$) for the agnostic portfolio is robust to both the portfolio construction and to the stock market selection. The results clearly indicate that there are investors that are concerned with reinvesting dividends once they are received. The results for the non-dividend-payers are not as clear as for the dividend payers. However, the event-study estimates indicate that there are investors who reinvest the dividends in non-dividend-payers. This observation is consistent with investors trying to reinvest to track a broader stock index. We also note that there is clear evidence of price pressure on trading day $t = -3$, i.e., a statistically significant and positive performance measure. We comment on this observation later.

An event study of trading volume

When investors reinvest dividends, it is reasonable to expect trading volume to be higher than normal. An increase in demand-driven trading volume typically leads to positive returns and is consistent with the findings in the previous subsection. To analyze the relationship between dividend payments and trading volume, we follow the approach by Campbell and Wasley (1996). We calculate a trading volume measure as

$$V_{i,t} = \ln\left(\frac{n_{i,t} * 100}{S_{i,t}}\right),$$

where $n_{i,t}$ is the number of stocks traded at day t for company i, $S_{i,t}$ is the number of shares outstanding at day t for company i, and $\ln(\cdot)$ is the operator for the natural logarithm. In Table 8, we report the average of the trading-volume measure with the corresponding t-values.

[INSERT TABLE 8 HERE]

We note that, as hypothesized, there is a significantly higher trading volume for the dividend payers on the distribution date. This observation indicates that the reinvestment of dividends leads to demand pressure. There is also some, albeit weaker, evidence of demand pressure for the non-payers. Somewhat surprising, there is also higher than normal trading volume on the day before the dividend distribution ($t = -1$) for both the payers and for the non-payers. From Table 3 we see that the standardized abnormal returns have negative, but not significant, estimates for both types of stocks on day $t = -1$.

We expect the demand-effect on returns to be larger for illiquid stocks than for liquid stocks. To investigate the effect of liquidity, we calculate an illiquidity measure for each stock and for each year similar to Amihud (2002). We only calculate the illiquidity measure for the dividend payers. Next, we sort the stocks into five portfolios based on their liquidity level. We further sort each of these five portfolios into five new portfolios based on the dividend yield. This sorting gives 25 portfolios. We report abnormal returns on the portfolios in Table 9, where we estimate abnormal returns using a constant mean return model. We estimate the mean return per year, per security.

[INSERT TABLE 9 HERE]

Based on the sorted portfolios in Table 9, there appears to be no systematic relationship between the abnormal returns on the distribution day and the level of liquidity. Neither does there seem to be any relationship between the size of the dividend yield and the abnormal returns. One explanation for this finding could be that investors take liquidity into account when reinvesting dividends. For instance, when an illiquid stock pays a high dividend, investors may not fully reinvest in the stock at the payment date. The dividend may be invested in other stocks and/or on other dates. Another possible explanation (suggested by the referee), is that DRIPs may offer retail investors the opportunity to reinvest without a fee or with lower transaction costs, and this phenomenon could diminish the importance of liquidity with regard to price pressure on the dividend payment date.

Price reversal

Are the price effects from reinvesting the dividends that we have documented temporary or permanent? To address this question, we analyze the dividend payers in the agnostic portfolio. We order all stocks based on their performance measure at trading day $t = 0$. Next, we split this ordered list of stocks into two sets, one containing the top 50% performers and one set containing the bottom performers. We use these two sets of stocks to construct a zero-cost portfolio with a long position in the top 50% performing stocks on trading day $t = 0$ and a short position in the remaining bottom 50% performing stocks on trading day $t = 0$. The best-performing stocks are likely those that have experienced the largest price impact, while the short position acts as a benchmark in the period following the dividend distribution. We plot the cumulative raw returns on this zero-cost portfolio in Figure II. In Table 10 we present some of the point estimates from Figure II with the corresponding t-values.

[INSERT FIGURE II HERE]

[INSERT TABLE 10 HERE]

In an informationally efficient market, we expect a price reversal to happen quickly. From Figure II and Table 10 it appears that there is price reversal for the zero-cost portfolio, but it is somewhat slow (20-30 days). This price reversal is also documented in Berkman and Koch (2017) and in Yadav (2017). Combining the results so far, they indicate that distributions of dividends are associated with temporary price pressure. The results are consistent with the aforementioned price-pressure hypothesis.

Ownership and returns

We run pooled OLS regressions to identify whether abnormal returns on trading day $t = 0$ are correlated with ownership shares by institutional investors and mutual funds. To distinguish between dividend payers and non-dividend-payers, we run regressions on the abnormal returns of these two groups separately, where we estimate abnormal returns using a constant mean return model. We estimate the mean return per year, per security. We include explanatory variables to control for known market anomalies.

In our regressions, we let the left-hand side variable be abnormal stock returns on the distribution day. Let JAN be a dummy variable for the month of January. We include this variable and the interaction term $JAN * mc$ to account for the January effect discussed by Keim (1983). The variable mc is a time-series of the market capitalization of the companies. The variable $dy'_{i,t} = dy_{i,t} - \overline{dy}_{i,t}$ is each individual dividend-paying stock's demeaned dividend yield at trading day $t = 0$.[5] We use this variable when we analyze the stock returns of the dividend payers. By construction, stocks in the non-dividend-payers category do not pay dividends at trading day $t = 0$. Because these stocks do not pay dividends at this trading day, but may potentially experience an increase in demand because of reinvestments of dividends paid by other companies, we use the demeaned dividend yield on the entire portfolio ($dy'_{p,t} = dy_{p,t} - \overline{dy}_{p,t}$) as an explanatory variable for the returns on these stocks. Further, we use the variable PRO' to account for the combined ownership share by mutual funds and institutional investors. This variable is also demeaned. We use the dummy variable $DRIP$ for the dividend payers that are recognized on the lists from AAII as DRIPs firms.

A high ownership share by institutions and mutual funds should not in itself lead to higher returns, but should only be relevant to explain those in connection with flows to investors (i.e., dividend yield). Therefore, we interact the variable for professional ownership with the dividend-yield variable $dy'_{i,t}$ for the dividend-paying stocks. For the non-dividend-payers, we interact the ownership variable with the dividend-yield variable on the whole portfolio ($dy'_{p,t}$).

[5] We demean some of the variables so that it will be easier to interpret the estimated coefficients for the interaction terms.

In the cross-sectional regressions for the dividend payers, we estimate the pooled regression

$$\begin{aligned} r_{i,t} - \bar{r}_i =& \beta_0 + \beta_1 JAN + \beta_2 mc_{i,t} + \beta_3 JAN * mc_{i,t} + \beta_4 dy'_{i,t} + \beta_5 DRIP_i \\ &+ \beta_6 * PRO'_{i,t} + \beta_7 * PRO'_{i,t} * dy'_{i,t} + \epsilon_{i,t}, \end{aligned} \tag{1}$$

and for the non-dividend-payers

$$\begin{aligned} r_{i,t} - \bar{r}_i =& \beta_0 + \beta_1 JAN + \beta_2 mc_{i,t} + \beta_3 JAN * mc_{i,t} + \beta_4 dy'_{p,t} \\ &+ \beta_5 * PRO'_{i,t} + \beta_6 * PRO'_{i,t} * dy'_{p,t} + \epsilon_{i,t}. \end{aligned} \tag{2}$$

The estimation results from these regressions are presented in Table 11.

[INSERT TABLE 11 HERE]

In the first column in Table 11 we omit the ownership variable. The estimated results show no significant correlation between dividend yield and abnormal returns for the dividend payers. From column (2) we see indications of a negative relationship when we include the ownership variables. The positive coefficient estimate for the variable PRO' indicates that there is a positive relationship between professional ownership and the returns when the dividend yield-variable is zero, i.e., at its mean value, but the result is not statistically significant. The coefficient-estimate for the interaction term $PRO' * dy'_i$ is negative, which means that higher than average levels of professional ownership and yields reduce the slope between the level of professional ownership and returns. With high dividend yields and high professional ownership, we expect more of the dividends to be reinvested broadly, also in the non-dividend-payers. Therefore, this observation does not contradict our hypothesis and should be seen in relation to the positive coefficient estimate for the corresponding interaction term for the non-dividend-payers.

Looking at column (3) for the non-dividend-payers, we see a clear positive relationship between the stock returns and the dividend yield on the entire portfolio. This observation is in line with our hypothesis: A higher dividend yield on the total portfolio means that there is more money that needs to be reinvested, leading to price pressure and thereby higher (abnormal) stock returns. From column (4) we see that this positive relationship is unaffected by the inclusion of the ownership variables. The coefficient estimate for the variable PRO' is negative, meaning that the slope between the level of stock returns and the fraction of professional ownership is negative when the dividend yield on the total portfolio is at its mean level. This observation is not in line with our hypothesis as we expect professional investors to invest more broadly than retail investors. However, the coefficient estimate for the interaction term $PRO' * dy'_p$ is positive. The economic interpretation of this coefficient estimate is that high professional ownership and high dividend yields positively affect the slope between them and the abnormal returns and can shift the slope into positive territory. This observation is therefore partly in line with our hypothesis. Another interpretation, which also is in line with our hypothesis, is that for a given (above average) level of professional ownership, higher dividend yields are associated with higher abnormal returns. Higher yields mean more money to be reinvested and the high fraction of professional ownership means that the dividends are reinvested broadly on the distribution day.

Given the results in Berkman and Koch (2017), it is surprising that the coefficient estimate for the $DRIP$ variable is insignificant. To further explore the effect of DRIPs plans, we split our sample into two subsamples – one where the dividend payers offer DRIPs plans and one where the dividend payers do not offer DRIPs plans. The estimation results for the first subsample are reported in Table 12. There are mainly two parameter estimates that distinguish the two subsamples: the parameters for $PRO' * dy'_i$ and $PRO' * dy'_p$. The first estimate is negative and shows that when the firms offer a DRIPs plan, a combination of a high ownership share by professional investors and a high dividend yield is associated with a lower slope between the variables PRO' and dy'_i and abnormal returns for the dividend payers. The second estimate is positive and shows that a combination of a high professional ownership share and a high dividend yield is associated with a positive shift in the slope between the variables PRO' and dy'_p and abnormal returns for the non-dividend-payers. The corresponding parameter estimates for the non-DRIPs firms are (with robust standard errors in parenthesis) -2.311 (1.841) and 2.709 (5.124). The differences in these parameter estimates indicate that professional investors take the existence of DRIPs plans into account when they decide how to reinvest dividends (many professional investors are not allowed to participate in DRIPs). The results further indicate that the price pressure in the stocks of DRIPs firms, as documented in Berkman and Koch (2017), may cause professional investors to reinvest more of the dividends in non-dividend-payers.

[INSERT TABLE 12 HERE]

3-day settlement period

To reduce the tracking error, portfolio managers would prefer to reinvest the dividends at the ex-day when the index provider "reinvests" the dividends. As the dividends are not yet available to the investors, reinvesting at the ex-day is impossible. The settlement period for stock purchases is three trading days.[6] In principle, the consequence of this settlement period is that investors can reinvest dividends at trading day $t = -3$ to match settlement of the purchased stock(s) with the arrival of the dividend at day $t = 0$. Looking back to the performance measure for $t = -3$ reported in Table 3, we see some weak evidence of abnormal returns for the dividend payers. The corresponding value of the performance measure reported in Table 5 for the S&P 500 is significant at the 1%-level for the dividend payers. This observation indicates that there is price pressure three days preceding the dividend distribution. However, we do not find that the trading volume is significantly higher on trading day $t = -3$, c.f., Table 8. Also Berkman and Koch (2017) and Yadav (2017) find evidence of price pressure on trading day $t = -3$. Yadav (2017) uses intra-day trading data of stocks around the dividend payment dates and find clear evidence of increased buying pressure also on trading day $t = -3$. He further finds the buying pressure to be positively related to the dividend yield.

From Table 7 we observe that the performance measure is highly significant at trading day $t = -3$ for the non-dividend-payers in the Nordic portfolio. We know that many of the Nordic companies pay dividends only once a year. One possible explanation for this observation can therefore be that the dividends are so large that they must be reinvested in the non-dividend-payers. If dividends in

[6]For an informative discussion of the three-day settlement period, see Yadav (2017).

fact are reinvested at trading day $t = -3$ and in the non-dividend-payers, then this behavior is consistent with a large fraction of professional ownership and tight tracking errors. However, we do not have ownership data for the Nordic portfolio to back our speculations.

We rerun the same regressions as in Subsection *Ownership and returns*, but now with the abnormal returns on trading day $t = -3$ as the left-hand side variables. Table 13 presents the estimated results.

[INSERT TABLE 13 HERE]

From column (1) in Table 13 we see that the dividend yield and the stock returns on the dividend payers are positively related. This observation is in line with our hypothesis. The coefficient estimate increases in value when we in column (2) include the ownership variables. The coefficient estimate for the variable PRO' is not statistically different from zero. The estimated coefficient for the interaction term $PRO' * dy_i'$ is positive, but not statistically significant.

In columns (3) and (4) we report the corresponding estimation results for the non-dividend payers. The coefficient estimate for the variable PRO' is weakly significant, but has the same sign as we hypothesize. The estimates for the other variables we are interested in here (dy_p' and $PRO' * dy_p'$) are negative, insignificant and not in line with our hypothesis. We will therefore not comment them any further.

To further shed light on how the reinvestment process and professional ownership are related, we estimate regressions (1) and (2) for days $t = -5$ to $t = 5$. We report coefficient estimates for the variables dy_i', PRO', $dy_i' * PRO'$ for the time $t = 0$ dividend payers and the estimates for the variables dy'_p, PRO', and $dy'_p * PRO'$ in Figure III.

[INSERT FIGURE III HERE]

For the three panels to the left, we see a spike at trading day zero for the professional ownership coefficient. In contrast, the coefficient for the interaction term and dividend yield shows a drop. When dividend yield is at its average (demeaned variable at zero), professional ownership affects returns positively at the distribution date (middle panel). However, as the dividend yield increases, the effect on returns decreases in ownership, as if professionals avoid reinvesting at the distribution date when dividend yields are high (bottom left panel). When professional ownership is at its average (demeaned variable at zero), dividend yield affects returns positively three days prior to the distribution date and negatively on the distribution date (top left panel). This effect is strengthened as professional ownership increases (bottom left panel). Seen together, these results suggest that retail investors reinvest dividends into the stocks of the dividend payers at the distribution date, while professional investors try to front run by investing three days prior to the distribution date.

The three panels to the right show the corresponding coefficient sizes for the subportfolio consisting of non-dividend payers. The bottom panel shows that coefficients for the interaction term is positive for all days before the distribution date except trading day $t = -3$. For the non-dividend payers, we see a similar pattern in the bottom two panels on trading day $t = -3$ to that of the dividend payers on the distribution date. When dividend yield is at its average, professional ownership positively affects returns three days prior to the distribution date. However, as dividend yields increase, the effect from professional ownership is larger on all days except trading day $t = -3$. This result suggests that professionals reinvest dividends into non-payers at the beginning of the settlement period, but smooth reinvestments when dividend yields are sufficiently high.

Clustering

Some securities may experience coinciding events during a specific month or year, obscuring our estimation results. The effect from the event can also be different for different months or years. To account for such clustering effects, we run the event time analysis for individual years and for individual months. We only perform this robustness check for stocks categorized as dividend payers. Table 14 reports estimated results for the event study on individual years, while Table 15 reports estimated results for the event study on individual months.

This splitting of the sample gives significantly fewer observations for each year and for each month. The consequence of fewer observations is apparent in Tables 14 and 15. Fewer of the estimated values of the performance measures are statistically different from zero. However, there are still significant estimates for $t = 0$ in both Table 14 and in Table 15. Thus, even with this few observations, there is still some evidence of standardized abnormal returns on the distribution day that are statistically different from zero. The results do not indicate that there is any clustering, neither in the different years in our sample nor in the different months.

[INSERT TABLE 14 HERE]

[INSERT TABLE 15 HERE]

V Conclusions

Our starting point in this paper has been to reconfirm the results presented by Ogden (1994), that dividend flows and consequent reinvestments affect stock returns for the dividend-paying company. We have extended the analysis and confirm that there also is a spillover effect to other stocks that do not pay dividends. We claim that this spillover effect is a result of investors reinvesting dividends into broad benchmark portfolios. The trading volume is higher on the payment day for both dividend payers and non-dividend-payers. Furthermore, we find that these effects are dependent on the degree to which stocks are owned by what we define as professional owners. Our results suggest that investors to a large extent try to reinvest dividends three days prior to their distribution. The effects that dividend flows have on returns appear to be temporary. Thus, we provide evidence toward a temporary demand-driven price pressure, referred to as the price pressure hypothesis in the literature.

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TABLE 1. Descriptive Statistics for Agnostic Benchmark Portfolio.

Year	min(os_{MF})	mean(os_{MF})	max(os_{MF})	min(os_{II})	mean(os_{II})	max(os_{II})	No. of div. payments
2000	0.01	0.19	0.51	0.00	0.64	2.05	974
2001	0.01	0.22	0.56	0.01	0.63	1.48	888
2002	0.01	0.16	0.46	0.00	0.61	1.57	913
2003	0.01	0.20	0.49	0.00	0.69	1.47	1000
2004	0.02	0.20	0.51	0.03	0.66	1.37	1074
2005	0.00	0.18	0.48	0.00	0.74	1.65	1116
2006	0.01	0.20	0.60	0.00	0.77	1.70	1101
2007	0.01	0.23	0.50	0.11	0.79	1.58	1052
2008	0.02	0.25	0.64	0.10	0.80	1.56	1137
2009	0.00	0.24	0.65	0.00	0.77	1.89	1032
2010	0.00	0.25	0.69	0.00	0.73	1.53	995
2011	0.01	0.28	0.67	0.04	0.77	1.74	1135
2012	0.00	0.29	0.52	0.09	0.76	1.25	1192
2013	0.01	0.27	0.53	0.05	0.76	3.64	995

Note: The table shows descriptive statistics for an agnostic benchmark portfolio. The descriptive statistics include ownership share by mutual funds (os_{MF}), ownership share by institutional investors (os_{II}), and the number of dividend payments made for each year in the sample period. The min($\cdot$) and max($\cdot$) show the ownership share for the stock in the portfolio for a given year that has the lowest and highest share, respectively.

TABLE 2. Summary Statistics for Ownership, Payments, and Dividend Yields.

Panel A	$\overline{os}_{MF}$	$\overline{os}_{II}$	Payments	$\overline{dy}_p$	$\overline{dy}_i$	Unique stocks
Payers	0.21	0.67	1,996	0.06	0.80	324
Non-payers	0.23	0.74	0	0.06	0.00	1,484
Excluded	0.24	0.78	316	0.06	0.16	98
Panel B						
Payers	0.22	0.71	9,606	0.01	0.75	823
Non-payers	0.23	0.73	0	0.01	0.00	1,494
Excluded	0.24	0.78	2,674	0.01	0.15	324

Note: The table shows average ownership share by mutual funds ($\overline{os}_{MF}$), average ownership share by institutional investors ($\overline{os}_{II}$), number of dividend payments, average portfolio dividend yield ($\overline{dy}_p$), average stock yield ($\overline{dy}_i$) and number of unique stocks for portfolios of dividend payers, non-dividend-payers and excluded stocks within the benchmark portfolio. Panel A shows statistics for the 5% of trading days with the highest portfolio yield, while Panel B is for the days with the 95% lowest portfolio yield. The sample period is from January 2000 through September 2013.

TABLE 3. Standardized Abnormal Returns for Agnostic Portfolio.

	Dividend payers			non-dividend-payers		
Trading day(s)	$\bar{a}_t$	t_{CDA}	t_{Rank}	$\bar{a}_t$	t_{CDA}	t_{Rank}
-5	0.02	0.39	0.17	0.05	0.97	0.52
-4	0.02	0.37	0.46	0.05	0.90	0.53
-3	0.09	1.47	1.68*	0.02	0.40	0.09
-2	0.04	0.71	1.21	0.04	0.82	0.66
-1	-0.09	-1.49	-1.03	-0.08	-1.49	-1.20
0	0.17	2.72***	2.59***	0.08	1.54	1.17
1	0.13	2.08**	1.84*	0.10	2.00**	1.54
2	0.08	1.22	1.44	0.05	1.03	0.95
3	-0.02	-0.26	-0.22	0.01	0.22	0.14
4	0.06	1.05	1.14	0.05	0.96	0.78
5	0.01	0.18	0.61	0.03	0.62	0.55
-3 - $+3$	0.40	2.02**	2.84***	0.22	1.48	1.26
-3 - 0	0.21	1.42	2.23**	0.06	0.55	0.36
0 - $+3$	0.36	2.39**	2.82***	0.24	2.08**	1.90*
n	1,653			45,569		

Note: This table reports average standardized abnormal return ($\bar{a}_t$) on equally weighted portfolios formed over a subsample of stocks on the NYSE and AMEX for 11 trading days. The sample period is from January 2000 through September 2013. The subsample consists of the 5% of trading days with the highest dividend yield. The payment date is trading day 0. Standardized abnormal return is calculated by subtracting the average return for trading days 6 through 55 from the raw portfolio returns. These differences are standardized by the estimated standard deviation of returns for trading days 6 through 55. t-values for the parametric CDA t-test are estimated using a method described by Brown and Warner (1980). t-values for the non-parametric rank test are estimated using a method described by Corrado and Zivney (1992).

*** Significant at the 1%-level.

** Significant at the 5%-level.

* Significant at the 10%-level.

TABLE 4. Standardized Abnormal Returns for Agnostic Portfolio (10% cut-off).

	Dividend payers			non-dividend-payers		
Trading day(s)	$\bar{a}_t$	t_{CDA}	t_{Rank}	$\bar{a}_t$	t_{CDA}	t_{Rank}
-5	-0.01	-0.23	-0.13	0.00	-0.12	0.02
-4	-0.05	-1.10	-0.43	-0.02	-0.71	-0.47
-3	0.11	2.54**	2.80***	0.05	1.56	1.20
-2	0.02	0.54	1.11	0.03	0.90	0.84
-1	0.00	-0.02	0.46	-0.03	-1.07	-0.54
0	0.13	3.05***	2.80***	0.07	2.31**	1.75*
1	0.04	0.85	1.00	0.05	1.50	1.10
2	-0.03	-0.59	0.01	0.01	0.33	0.36
3	0.00	-0.06	0.23	0.04	1.14	1.01
4	-0.02	-0.37	-0.02	0.00	-0.05	-0.03
5	-0.04	-0.88	-0.10	0.00	-0.12	0.19
-3 - $+3$	0.27	2.05**	3.18***	0.22	2.21**	2.16**
-3 - 0	0.26	2.63***	3.58***	0.12	1.62	1.62
0 - $+3$	0.14	1.40	2.02**	0.17	2.31**	2.10**
n	2,617			90,223		

Note: This table reports average standardized abnormal return ($\bar{a}_t$) on equally weighted portfolios formed over a subsample of stocks on the NYSE and AMEX for 11 trading days. The sample period is from January 2000 through September 2013. The subsample consists of the 10% of trading days with the highest dividend yield. The payment date is trading day 0. Standardized abnormal return is calculated by subtracting the average return for trading days 6 through 55 from the raw portfolio returns. These differences are standardized by the estimated standard deviation of returns for trading days 6 through 55. t-values for the parametric CDA t-test are estimated using a method described by Brown and Warner (1980). t-values for the non-parametric rank test are estimated using a method described by Corrado and Zivney (1992).
*** Significant at the 1%-level.
** Significant at the 5%-level.
* Significant at the 10%-level.

TABLE 5. Standardized Abnormal Returns for S&P 500 Portfolio.

	Dividend payers			non-dividend-payers		
Trading day(s)	$\bar{a}_t$	t_{CDA}	t_{Rank}	$\bar{a}_t$	t_{CDA}	t_{Rank}
-5	-0.02	-0.32	-0.48	-0.02	-0.37	-0.19
-4	-0.02	-0.35	0.28	0.00	-0.06	0.24
-3	0.15	2.63***	3.01***	0.05	1.03	1.60
-2	-0.04	-0.63	-0.06	-0.05	-0.94	-0.34
-1	-0.04	-0.61	-0.33	-0.06	-1.17	-0.65
0	0.13	2.27**	2.27**	0.02	0.29	0.87
1	0.07	1.21	1.58	0.07	1.39	1.58
2	0.02	0.31	0.71	0.08	1.58	1.74*
3	-0.02	-0.27	-0.11	0.02	0.46	0.64
4	0.00	-0.03	0.38	0.04	0.78	1.04
5	-0.08	-1.45	-0.86	-0.01	-0.14	0.26
−3 - +3	0.27	1.51	2.67***	0.13	0.92	2.05**
−3 - 0	0.20	1.49	2.44**	-0.04	-0.36	0.74
0 - +3	0.20	1.43	2.23**	0.19	1.72*	2.41**
n	2,385			57,525		

Note: This table reports average standardized abnormal return ($\bar{a}_t$) on equally weighted portfolios formed over constituents of the S&P 500 index for 11 trading days. The sample period is from January 2000 through September 2013. The subsample consists of the 5% of trading days with the highest dividend yield. The payment date is trading day 0. Standardized abnormal return is calculated by subtracting the average return for trading days 6 through 55 from the raw portfolio returns. These differences are standardized by the estimated standard deviation of returns for trading days 6 through 55. t-values for the parametric CDA t-test are estimated using a method described by Brown and Warner (1980). t-values for the non-parametric rank test are estimated using a method described by Corrado and Zivney (1992).

*** Significant at the 1%-level.

** Significant at the 5%-level.

* Significant at the 10%-level.

TABLE 6. Standardized Abnormal Returns for S&P 500 Portfolio (10% cut-off).

	Dividend payers			non-dividend-payers		
Trading day(s)	$\bar{a}_t$	t_{CDA}	t_{Rank}	$\bar{a}_t$	t_{CDA}	t_{Rank}
-5	-0.01	-0.31	-0.18	0.00	0.16	0.68
-4	-0.03	-0.68	-0.09	-0.02	-0.50	-0.04
-3	0.11	2.63***	2.85***	0.03	1.06	1.50
-2	0.01	0.33	0.88	0.03	0.86	1.23
-1	-0.03	-0.61	-0.05	-0.04	-1.17	-0.25
0	0.13	3.10***	2.96***	0.02	0.70	1.16
1	0.08	1.84*	1.86*	0.06	2.03**	1.74*
2	0.01	0.24	0.81	0.02	0.61	1.05
3	0.02	0.56	0.67	0.06	2.14**	1.99**
4	-0.02	-0.57	-0.02	0.03	0.91	1.05
5	-0.04	-0.96	-0.48	0.03	0.97	1.23
-3 - $+3$	0.33	2.65***	3.77***	0.18	2.18**	3.18***
-3 - 0	0.22	2.36**	3.32***	0.04	0.67	1.82*
0 - $+3$	0.24	2.49**	3.15***	0.16	2.53**	2.97***
n	4,260			114,751		

Note: This table reports average standardized abnormal return ($\bar{a}_t$) on equally weighted portfolios formed over constituents of the S&P 500 index for 11 trading days. The sample period is from January 2000 through September 2013. The sub-sample consists of the 10% of trading days with the highest dividend yield. The payment date is trading day 0. Standardized abnormal return is calculated by subtracting the average return for trading days 6 through 55 from the raw portfolio returns. These differences are standardized by the estimated standard deviation of returns for trading days 6 through 55. t-values for the parametric CDA t-test are estimated using a method described by Brown and Warner (1980). t-values for the non-parametric rank test are estimated using a method described by Corrado and Zivney (1992).

*** Significant at the 1%-level.

** Significant at the 5%-level.

* Significant at the 10%-level.

TABLE 7. Standardized Abnormal Returns for Nordic VINX portfolio.

	Dividend payers			non-dividend-payers		
Trading day(s)	$\bar{a}_t$	t_{CDA}	t_{Rank}	$\bar{a}_t$	t_{CDA}	t_{Rank}
-5	0.12	1.12	0.75	0.05	0.95	1.21
-4	0.06	0.63	1.17	-0.02	-0.45	0.18
-3	0.03	0.29	0.45	0.11	2.27**	2.22**
-2	0.10	1.01	0.26	0.04	0.84	1.28
-1	-0.20	-1.94*	-1.94*	-0.04	-0.86	-0.13
0	0.26	2.57**	2.09**	0.06	1.13	1.16
1	-0.02	-0.17	0.65	-0.03	-0.62	0.10
2	0.01	0.06	0.24	0.01	0.11	0.81
3	-0.20	-1.98**	-0.30	-0.04	-0.87	-0.06
4	-0.01	-0.11	0.26	-0.02	-0.44	-0.02
5	-0.10	-0.94	-1.44	-0.12	-2.50**	-1.57
-3 - $+3$	-0.02	-0.04	0.55	0.11	0.74	2.04**
-3 - 0	0.19	0.70	0.43	0.17	1.66*	2.26**
0 - $+3$	0.05	0.18	1.34	0.00	-0.12	1.01
n	107			12,761		

Note: This table reports average standardized abnormal return ($\bar{a}_t$) on equally weighted portfolios formed over constituents of the Nordic VINX index (excluding Iceland) for 11 trading days. The sample period is from 1 November 2000 to 6 October 2014. The payment date is trading day 0. Standardized abnormal return is calculated by subtracting the average return for trading days 6 through 55 from the raw portfolio returns. These differences are standardized by the estimated standard deviation of returns for trading days 6 through 55. t-values for the parametric CDA t-test are estimated using a method described by Brown and Warner (1980). t-values for the non-parametric rank test are estimated using a method described by Corrado and Zivney (1992).
*** Significant at the 1%-level.
** Significant at the 5%-level.
* Significant at the 10%-level.

TABLE 8. Average Value of Trading Volume Measure.

	Dividend payers		non-dividend-payers	
Trading day(s)	$\overline{V}_t$	t_{Rank}	$\overline{V}_t$	t_{Rank}
-5	0.01	0.99	0.02	1.17
-4	0.01	1.22	0.03	1.24
-3	0.02	1.59	0.03	1.39
-2	-0.01	0.56	0.01	0.57
-1	0.05	2.30**	0.06	2.45**
0	0.06	2.64***	0.04	1.86*
1	0.02	1.16	0.04	1.57
2	-0.02	-0.01	0.03	1.15
3	0.01	0.76	0.04	1.51
4	0.04	1.36	0.05	1.99**
5	0.01	0.49	0.02	0.73
n	1,721		46,405	

Note: This table reports the average value of the trading volume measure ($\overline{V}_t$) on equally weighted portfolios formed over a sub-sample of stocks on the NYSE and AMEX for 11 trading days. The sample period is from January 2000 through September 2013. The dividend payment date is trading day 0. The t-values for the non-parametric rank test are estimated using a method described by Corrado and Zivney (1992).
*** Significant at the 1%-level.
** Significant at the 5%-level.
* Significant at the 10%-level.

TABLE 9. Abnormal Returns: Dividend Size and Liquidity.

dy_i -quintile	$AMIHUD$-quintile very illiquid	2	3	4	very liquid
high	-0.19	-0.08	0.01	0.47	0.19
2	0.46	0.24	-0.16	0.36	0.46
3	0.09	-0.17	0.70	0.26	0.16
4	0.32	0.07	0.41	0.30	0.22
low	0.38	0.03	0.51	0.34	0.08

Note: This table shows average daily abnormal returns at the dividend distribution date for 25 different portfolios. Row-quintiles are based on dividend size. Column-quintiles are based on liquidity. The sample period is from January 2000 through September 2013.

TABLE 10. Cumulative Returns on Zero-cost Portfolio.

Days after portfolio formation	4	8	12	20	30	40	50
Cumulative portfolio performance	0.06	-0.41	-1.02	-1.97	-2.21	-2.20	-2.55
t-values	0.15	-0.72	-1.44	-2.15**	-1.97**	-1.70*	-1.76*

Note: This table reports cumulative raw returns at different trading days following the formation of a zero-cost portfolio. The sample period is from January 2000 through September 2013. The zero-cost portfolio consists of a long position in the top 50% stocks ordered by standardized abnormal returns on trading day $t = 0$ and a short position in the bottom 50% stocks ordered by standardized abnormal returns on trading day $t = 0$. Cumulative returns are estimated from and include $t = 1$.
*** Significant at the 1%-level.
** Significant at the 5%-level.
* Significant at the 10%-level.

TABLE 11. Regression Analysis ($t = 0$).

$\mathbf{t = 0}$	Dividend payers		non-dividend-payers	
	(1)	(2)	(3)	(4)
JAN	0.019*	0.020*	0.011	0.011
	(0.011)	(0.011)	(0.009)	(0.008)
mc	0.002	-0.001	0.005	0.002
	(0.007)	(0.007)	(0.006)	(0.005)
$JAN * mc$	-0.031	-0.032	-0.037	-0.038
	(0.036)	(0.037)	(0.040)	(0.038)
dy'_i	-0.335	-0.691^{*}		
	(0.304)	(0.398)		
dy'_p			18.158***	18.086***
			(6.561)	(5.691)
$DRIP$	0.002	0.001		
	(0.002)	(0.002)		
PRO'		0.016		-0.006^{**}
		(0.010)		(0.003)
$PRO' * dy'_i$		-3.155^{**}		
		(1.500)		
$PRO' * dy'_p$				8.310*
				(4.993)

TABLE 11 Continued.

t = 0	Dividend payers		non-dividend-payers	
	(1)	(2)	(3)	(4)
Constant	0.003	0.005*	−0.009***	−0.009***
	(0.003)	(0.002)	(0.003)	(0.003)
Observations	2,000	2,000	59,594	59,594
R^2	0.010	0.026	0.013	0.014
Adjusted R^2	0.007	0.023	0.013	0.014

Note: This table reports results from a regression analysis for stock returns' response to the ownership share by professional investors on the distribution date of dividends ($t = 0$). The sample period is from January 2000 through September 2013, while the DRIPs data is for the years 1998 through 2008. The coefficients are estimated using a pooled OLS approach. The January effect is controlled for by the variable JAN and the interaction term $JAN{*}mc$, where mc is the market capitalization of the stock. Other control variables include dividend repurchasing programs ($DRIP$), $dy'_{i,t}$ is the demeaned dividend yield for the individual stocks, while $dy'_{p,t}$ is the demeaned dividend yield for the portfolio. PRO' is the demeaned ownership share in the stocks by mutual funds and institutional investors. Both dividend variables and the variable for professional ownership are demeaned to ensure that zero-values exist. All standard errors are adjusted for heteroskedasticity and autocorrelation using a Bertlett kernel with an automatic bandwith selection procedure (Newey and West 1987, 1994).

*** Significant at the 1%-level.

** Significant at the 5%-level.

* Significant at the 10%-level.

TABLE 12. Regression Analysis for Payers with DRIPs Plans ($t = 0$).

$\mathbf{t = 0}$	Dividend payers		non-dividend-payers	
	(1)	(2)	(3)	(4)
JAN	0.014	0.014	0.008	0.007
	(0.011)	(0.012)	(0.009)	(0.008)
mc	0.005	0.009	0.004	0.003
	(0.008)	(0.009)	(0.006)	(0.005)
$JAN * mc$	-0.010	-0.010	-0.006	-0.012
	(0.036)	(0.038)	(0.035)	(0.033)
dy'_i	-0.264	-0.779^{*}		
	(0.337)	(0.457)		
dy'_p			19.959^{**}	20.342^{***}
			(8.631)	(7.543)
PRO'		0.026^{*}		-0.014^{***}
		(0.014)		(0.005)
$PRO' * dy'_i$		-3.993^{**}		
		(1.840)		
$PRO' * dy'_p$				26.951^{***}
				(8.721)
$Constant$	0.005^{**}	0.007^{***}	-0.009^{**}	-0.009^{**}
	(0.002)	(0.003)	(0.004)	(0.004)

TABLE 12 Continued.

$\mathbf{t = 0}$	Dividend payers		non-dividend-payers	
	(1)	(2)	(3)	(4)
Observations	1,157	1,157	21,446	21,446
R^2	0.006	0.026	0.015	0.017
Adjusted R^2	0.003	0.021	0.015	0.017

Note: This table reports results from a regression analysis for stock returns' response to the ownership share by professional investors on the distribution date of dividends ($t = 0$). All dividend payers offer DRIPs plans. The sample period is from January 2000 through September 2013, while the DRIPs data is for the years 1998 through 2008. The coefficients are estimated using a pooled OLS approach. The January effect is controlled for by the variable JAN and the interaction term $JAN * mc$, where mc is the market capitalization of the stock. $dy'_{i,t}$ is the demeaned dividend yield for the individual stocks, while $dy'_{p,t}$ is the demeaned dividend yield for the portfolio. PRO' is the demeaned ownership share in the stocks by mutual funds and institutional investors. Both dividend variables and the variable for professional ownership are demeaned to ensure that zero-values exist. All standard errors are adjusted for heteroskedasticity and autocorrelation using a Bertlett kernel with an automatic bandwith selection procedure (Newey and West 1987, 1994).

*** Significant at the 1%-level.

** Significant at the 5%-level.

* Significant at the 10%-level.

TABLE 13. Regression Analysis ($t = -3$).

$\mathbf{t = -3}$	Dividend payers		non-dividend-payers	
	(1)	(2)	(3)	(4)
JAN	-0.007	-0.006	-0.008^{***}	-0.008^{***}
	(0.005)	(0.005)	(0.002)	(0.002)
mc	-0.015^{**}	-0.012	-0.005	0.0003
	(0.007)	(0.008)	(0.006)	(0.006)
$JAN * mc$	0.039	0.040	0.031^{**}	0.029^{*}
	(0.035)	(0.037)	(0.015)	(0.015)
dy'_i	0.479^{**}	0.627^{***}		
	(0.208)	(0.242)		
dy'_p			-9.394^{*}	-9.620^{**}
			(4.810)	(4.511)
$DRIP$	0.001	0.001		
	(0.002)	(0.002)		
PRO'		-0.006		0.007^{*}
		(0.008)		(0.004)
$PRO' * dy'_i$		1.704		
		(1.041)		
$PRO' * dy'_p$				-6.731
				(6.135)

TABLE 13 Continued.

$\mathbf{t = -3}$	Dividend payers		non-dividend-payers	
	(1)	(2)	(3)	(4)
Constant	-0.002	-0.003	0.006**	0.006**
	(0.002)	(0.008)	(0.003)	(0.003)
Observations	1,371	1,371	42,566	42,566
R^2	0.014	0.022	0.008	0.009
Adjusted R^2	0.010	0.017	0.008	0.009

Note: This table reports results from a regression analysis for stock returns' response to the ownership share by professional investors on the distribution date of dividends ($t = -3$). The sample period is from January 2000 through September 2013, while the DRIPs data is for the years 1998 through 2008. The coefficients are estimated using a pooled OLS approach. The January effect is controlled for by the variable JAN and the interaction term $JAN{*}mc$, where mc is the market capitalization of the stock. Other control variables include dividend repurchasing programs ($DRIP$), dy'_i is the demeaned dividend yield for the individual stocks, while dy'_p is the demeaned dividend yield for the portfolio. PRO' is the demeaned ownership share in the stocks by mutual funds and institutional investors. Both dividend variables and the variable for professional ownership are demeaned to ensure that zero-values exist. All standard errors are adjusted for heteroskedasticity and autocorrelation using a Bertlett kernel with an automatic bandwith selection procedure (Newey and West 1987, 1994).

*** Significant at the 1%-level.

** Significant at the 5%-level.

* Significant at the 10%-level.

TABLE 14. Average Standardized Abnormal Returns in Different Years.

	2000		2001		2002		2003		2004		2005		2006		2000-2006	
Trading day(s)	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$
-3	0.18	0.92	0.05	0.14	-0.03	-0.11	-0.06	-0.27	**0.63**	2.19	0.27	0.96	**-0.56**	-2.36	0.06	0.63
-2	-0.05	-0.27	0.21	0.56	0.27	1.01	0.10	0.41	-0.22	-0.77	0.34	1.21	0.06	0.25	0.09	0.91
-1	-0.01	-0.07	-0.32	-0.85	0.19	0.69	-0.38	-1.60	-0.33	-1.16	0.07	0.26	-0.25	-1.04	-0.16	-1.53
0	**0.43**	2.19	0.55	1.50	0.19	0.70	0.30	1.26	0.28	0.98	0.34	1.22	-0.16	-0.66	**0.26**	2.52
1	0.33	1.71	-0.25	-0.69	-0.15	-0.57	0.38	1.63	-0.51	-1.79	0.27	0.97	0.07	0.31	0.08	0.77
2	0.21	1.08	0.17	0.46	-0.36	-1.33	-0.18	-0.77	0.56	1.93	0.11	0.41	0.13	0.54	0.06	0.60
3	-0.06	-0.29	0.00	0.01	-0.21	-0.78	0.03	0.14	-0.09	-0.32	0.05	0.19	0.35	1.45	0.01	0.13
n	68		30		69		123		74		80		69		513	
	2007		2008		2009		2010		2011		2012		2013		2007-2013	
Trading day(s)	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$
-3	-0.15	-0.70	0.43	1.63	-0.24	-0.96	0.11	0.38	0.03	0.15	**0.62**	2.48	0.00	0.01	0.10	1.02
-2	0.26	1.22	-0.20	-0.76	-0.01	-0.05	0.11	0.38	-0.12	-0.57	0.04	0.17	0.51	1.74	0.05	0.50
-1	-0.17	-0.77	0.00	-0.01	-0.06	-0.23	-0.18	-0.64	-0.25	-1.21	0.18	0.73	0.33	1.13	-0.05	-0.56
0	-0.06	-0.26	-0.38	-1.43	0.41	1.67	**0.97**	3.44	**-0.55**	-2.62	-0.35	-1.38	0.08	0.26	0.05	0.55
1	0.07	0.31	0.51	1.93	0.34	1.38	0.36	1.28	-0.13	-0.64	-0.09	-0.35	-0.37	-1.25	0.14	1.41
2	0.08	0.39	-0.05	-0.19	-0.06	-0.22	0.01	0.05	0.18	0.86	0.23	0.92	0.12	0.40	0.06	0.67
3	0.45	**2.10**	-0.31	-1.18	-0.21	-0.86	-0.42	-1.48	-0.30	-1.44	**0.57**	2.26	**0.61**	2.06	-0.04	-0.43
n	97		130		165		162		169		105		91		917	

Note: This table reports average standardized abnormal return on equally weighted portfolios formed over a subsample of stocks on the NYSE and AMEX for 7 trading days. The sample period is from January 2000 through September 2013. The payment date is trading day 0. Standardized abnormal return is calculated by subtracting the average return for trading days 6 through 55 from the raw portfolio returns. These differences are standardized by the estimated standard deviation of returns for trading days 6 through 55. t-values for the parametric CDA t-test are estimated using a method described by Brown and Warner (1980). Values in bold indicate significance at minimum the 5%-level.

TABLE 15. Average Standardized Abnormal Returns in Different Months.

	JAN		FEB		MAR		APR		MAY		JUN		JAN-JUN	
Trading day(s)	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$
-3	-0.39	-0.52	0.22	1.06	-0.39	-1.86	-0.20	-0.41	0.00	-0.01	0.19	1.08	0.02	0.23
-2	1.12	1.49	-0.26	-1.24	-0.01	-0.05	-0.53	-1.11	0.12	0.52	-0.04	-0.21	-0.04	-0.39
-1	0.43	0.57	0.09	0.42	-0.30	-1.43	-0.24	-0.50	-0.04	-0.16	0.12	0.65	0.00	-0.01
0	0.76	1.02	**0.68**	3.26	**-0.55**	-2.63	0.35	0.74	0.14	0.59	0.11	0.64	0.09	0.86
1	0.25	0.33	-0.14	-0.69	0.02	0.11	**1.03**	2.17	0.28	1.20	-0.05	-0.30	0.07	0.66
2	0.13	0.18	-0.26	-1.23	**0.48**	2.27	-0.43	-0.89	-0.02	-0.09	0.12	0.67	0.09	0.87
3	-0.84	-1.12	-0.18	-0.87	-0.21	-0.99	-0.13	-0.26	-0.17	-0.72	0.09	0.48	-0.07	-0.67
n	16		83		130		42		93		332		696	

	JUL		AUG		SEP		OCT		NOV		DEC		JUL-DEC	
Trading day(s)	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$	$\bar{a}_t$	$CDA(t)$
-3	0.66	1.57	0.25	1.31	-0.06	-0.31	-0.48	-0.93	0.20	0.94	0.25	1.05	0.15	1.36
-2	0.28	0.66	0.19	1.02	0.26	1.38	0.48	0.94	0.31	1.50	-0.15	-0.64	0.16	1.52
-1	-0.08	-0.19	-0.11	-0.60	-0.26	-1.40	-0.51	-0.98	-0.28	-1.35	-0.03	-0.12	-0.18	-1.64
0	0.40	0.97	0.12	0.63	0.22	1.19	**1.28**	2.47	-0.14	-0.65	0.09	0.37	0.16	1.51
1	0.33	0.79	-0.13	-0.71	0.31	1.65	0.18	0.35	0.03	0.12	0.25	1.02	0.16	1.49
2	-0.30	-0.72	0.00	-0.01	0.21	1.13	0.42	0.81	0.11	0.52	-0.17	-0.72	0.04	0.35
3	0.74	1.78	-0.21	-1.10	-0.08	-0.44	0.08	0.16	**0.44**	2.08	-0.08	-0.32	0.02	0.22
n	45		151		234		23		106		173		734	

Note: This table reports average standardized abnormal return on equally weighted portfolios formed over a subsample of stocks on the NYSE and AMEX for 7 trading days. The sample period is from January 2000 through September 2013. The payment date is trading day 0. Standardized abnormal return is calculated by subtracting the average return for trading days 6 through 55 from the raw portfolio returns. These differences are standardized by the estimated standard deviation of returns for trading days 6 through 55. t-values for the parametric CDA t-test are estimated using a method described by Brown and Warner (1980). Values in bold indicate significance at minimum the 5%-level.

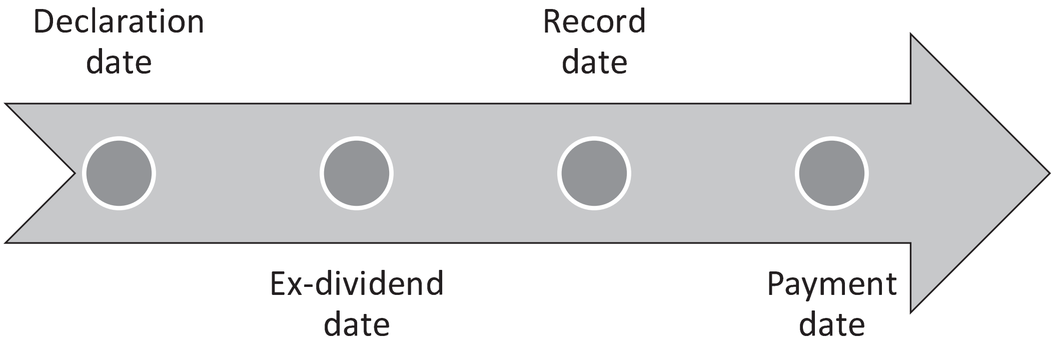

FIGURE I. Dividend Payment Process. This figure illustrates the different dates associated with the dividend payment process. The distance between the dots is not proportional to the expected number of days between the different dates.

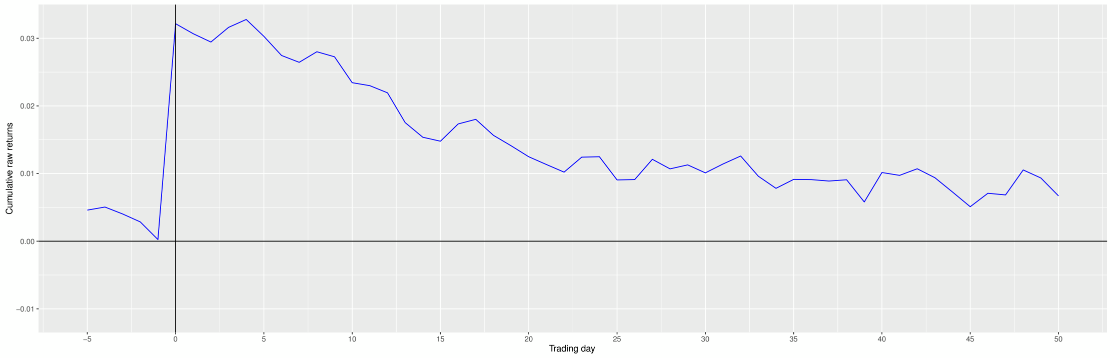

FIGURE II. Cumulative Raw Returns. This figure shows the cumulative raw return for a zero-cost portfolio with a long position in the top 50% stocks ordered by standardized abnormal returns on trading day $t = 0$ and a short position in the bottom 50% stocks ordered by standardized abnormal returns on trading day $t = 0$. The sample period is from January 2000 through September 2013.

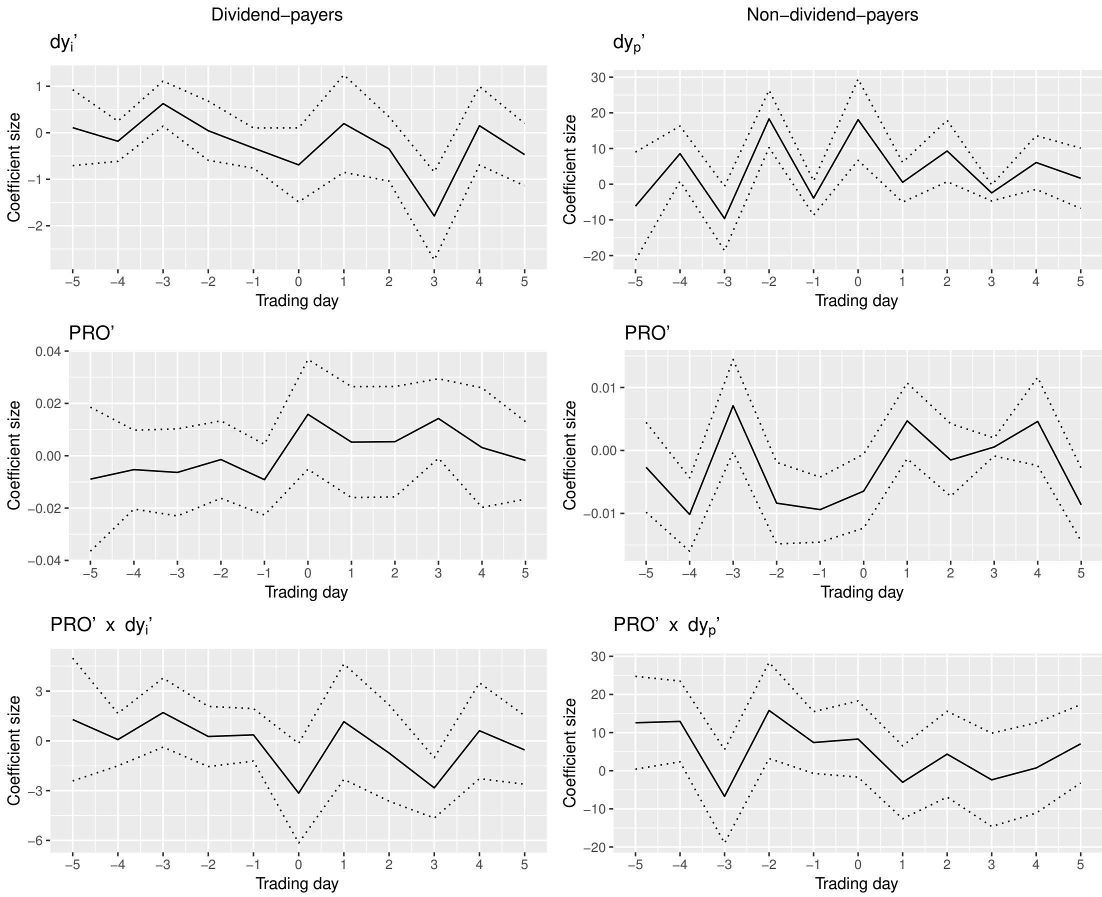

FIGURE III. Time-series of Coefficient Estimates. This figure shows time-series of coefficient sizes from estimating $r_{i,t} - \bar{r}_i = \beta_0 + \beta_1 JAN + \beta_2 mc_{i,t} + \beta_3 JAN * mc_{i,t} + \beta_4 dy'_{i,t} + \beta_5 DRIP_i + \beta_6 * PRO'_{i,t} + \beta_7 * PRO'_{i,t} * dy'_{i,t} + \epsilon_{i,t}$ and $r_{i,t} - \bar{r}_i = \beta_0 + \beta_1 JAN + \beta_2 mc_{i,t} + \beta_3 JAN * mc_{i,t} + \beta_4 dy'_{p,t} + \beta_5 * PRO'_{i,t} + \beta_6 * PRO'_{i,t} * dy'_{p,t} + \epsilon_{i,t}$. The variable dy' is (demeaned) dividend yield for individual stocks, denoted i, and a portfolio of stocks, denoted p. PRO' is the (demeaned) ratio of professional ownership for the stocks. A two standard error confidence interval enclose the coefficient estimates. Standard errors are adjusted for heteroskedasticity and autocorrelation using a Bertlett kernel with an automatic bandwith selection procedure (Newey and West 1987, 1994). The sample period is from January 2000 through September 2013, while the DRIPs data is for the years 1998 through 2008.