Nonlinear Ex-Dividend Pricing: Disentangling Taxes and Frictions

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[Job Market Paper]

ABSTRACT

The literature documents that, on average, stock prices drop by only about 85 cents for each dollar of dividend paid on the ex-dividend day. I show that there is substantial heterogeneity in ex-dividend price adjustment across dividend sizes: the price-drop ratio is close to 95 percent for large dividends but only about 40 percent for small dividends, a pattern that cannot be explained by tax considerations alone. The growing prevalence of large-dividend events in recent decades provides a new empirical environment to study heterogeneity in ex-dividend price adjustment. Leveraging this variation and exploiting the U.S. Tick Size Pilot program as an exogenous increase in trading costs, this paper is the first to document a systematic nonlinear relationship between dividend size and the ex-dividend price-drop ratio, thereby reconciling the classical tax-clientele and trading-friction explanations. I show that trading frictions dominate the pricing of small-dividend events, while tax clienteles drive price adjustment for large dividends, with an implied marginal investor tax rate of approximately 4.9 percent. Building on this mechanism, the paper proposes a novel trading strategy that exploits tax-advantaged accounts, such as 401(k)s, to capture predictable overnight alpha around large-dividend events.

Keywords: Ex-dividend day, Dividends, U.S. Tick Size Pilot, Tax clienteles, Trading frictions

JEL Codes: G10, G12

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In a frictionless market without taxes or transaction costs, the stock price on the ex-dividend date should decline one for one with the cash dividend, as implied by the efficient market hypothesis. Empirically, this prediction does not hold. A large body of evidence shows that stock prices, on average, fall by less than the dividend amount on the ex-dividend day. This systematic deviation has motivated a long literature proposing two broad classes of explanations, most prominently taxation and trading frictions.

This paper reinterprets this long-standing puzzle through a simple but overlooked fact: the "0.85 benchmark" is not a unique feature of ex-dividend pricing. Instead, ex-dividend price adjustment exhibits substantial heterogeneity and a pronounced nonlinear relationship with dividend size. Using a comprehensive sample of 343,409 cash dividend events from 1970 to 2024, I show that the median price-drop ratio is close to one for large dividends but can be far below the tax-based benchmark for small dividends. This nonlinear pattern is difficult to reconcile with any single mechanism operating uniformly across events. Rather, it suggests that taxes and trading frictions dominate in different regions of the dividend distribution, helping explain why decades of research have not converged on a single explanation.

This nonlinear perspective also clarifies why the debate has persisted. The literature has largely emphasized average ex-dividend price responses and has typically lacked enough observations in the far-right tail of dividend sizes to map out how price adjustment behaves when trading frictions are plausibly muted. Large-dividend events provide exactly such a setting. When the dividend is large relative to execution costs and price discreteness, arbitrage becomes more feasible and frictions are less likely to bind, allowing the tax-based benchmark to be observed more directly. Crucially, large-dividend events have become substantially more prevalent in recent

decades, creating a unique empirical opportunity to use the right tail of the dividend distribution to disentangle tax-driven price adjustment from friction-driven under adjustment.

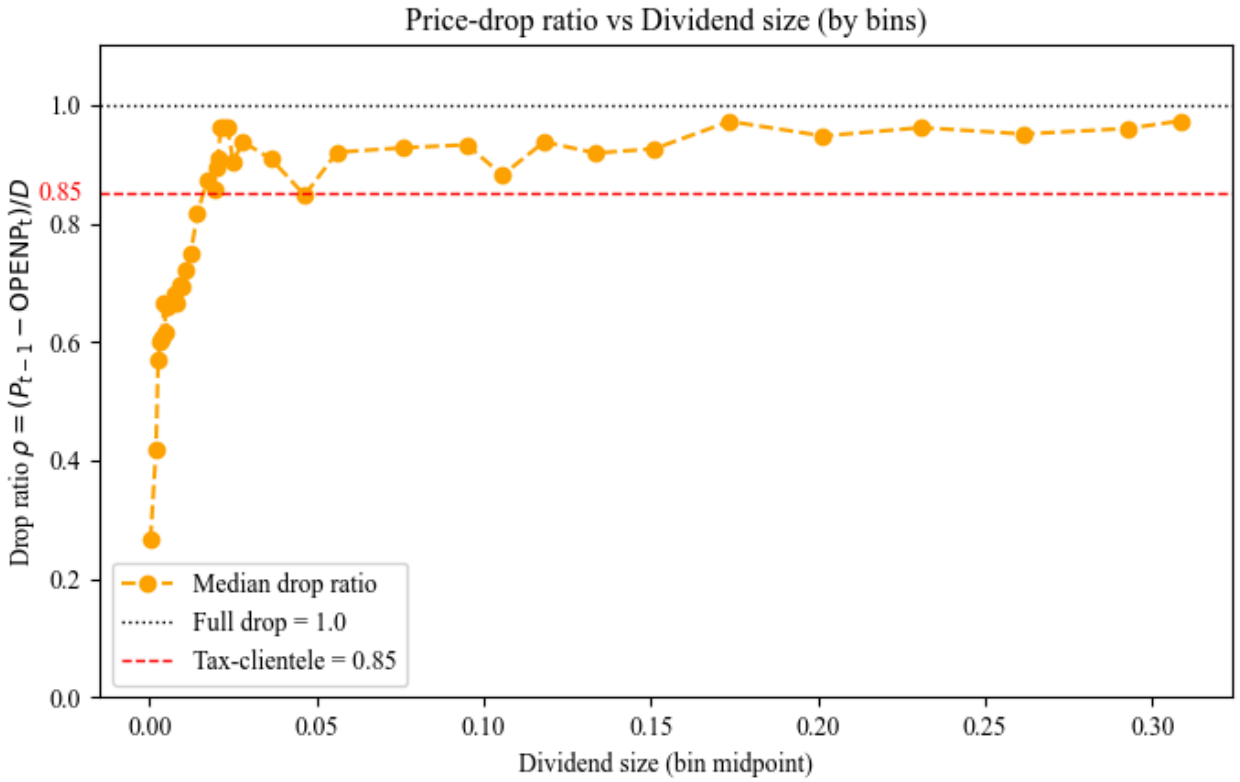


Figure 1. The nonlinear relationship: price-drop ratio vs. dividend size (by bins). This figure plots the median ex-dividend price-drop ratio against dividend size, where dividend events are grouped into bins based on dividend yield and plotted at the bin midpoints. The price-drop ratio rises sharply with dividend size at the lower end of the distribution and approaches a one-for-one price adjustment for large dividends. The horizontal black dashed line indicates the frictionless benchmark, and the red dashed line represents the tax-based benchmark commonly discussed in the literature. The pronounced nonlinearity highlights that ex-dividend price adjustment depends strongly on dividend size, motivating a framework that allows for heterogeneous mechanisms across small and large dividend events.

I show that the ex-dividend price-drop ratio is as high as 95% for large dividends but only about 40% for small dividends, a pattern that cannot be explained by tax considerations alone. For very large dividend events, the dividend amount is sufficient to cover trading costs, and the price-drop ratio converges toward one, as shown in Figure 1. Even in this regime, however, ex-dividend

prices still fall slightly short of the dividend amount, indicating that taxation remains the dominant force. For dividends exceeding 10% of price, the median drop ratio is 0.951, implying an effective marginal tax rate that is substantially lower than the 15% commonly reported in earlier studies and the implied tax rate is approximately 4.9%. At the other end of the distribution, small dividends exhibit drop-ratios well below the tax-based benchmark of 0.85[2], consistent with binding trading frictions. To test this mechanism, I exploit the Tick Size Pilot program as an exogenous increase in trading costs and find that, following the treatment, close-to-close returns around ex-dividend dates decline by 24 basis points. In a nonlinear return specification that controls for firm and month fixed effects as well as liquidity, volatility, size, and turnover, the quadratic term in dividend size is significantly negative, confirming a concave relationship between dividend size and ex-dividend price adjustment. Taken together, these results reconcile the long-standing debate in the literature by showing that taxes and trading frictions dominate in different regions of the dividend distribution. To the best of my knowledge, this paper is the first to provide unified evidence that ex-dividend price behavior is fundamentally nonlinear in dividend size, thereby integrating tax-based and friction-based explanations within a single empirical framework.

[2] Under the tax-clientele interpretation of Elton and Gruber (1970), their estimates imply drop ratios around 0.8-0.9, which has been widely summarized as a benchmark of approximately 0.85.

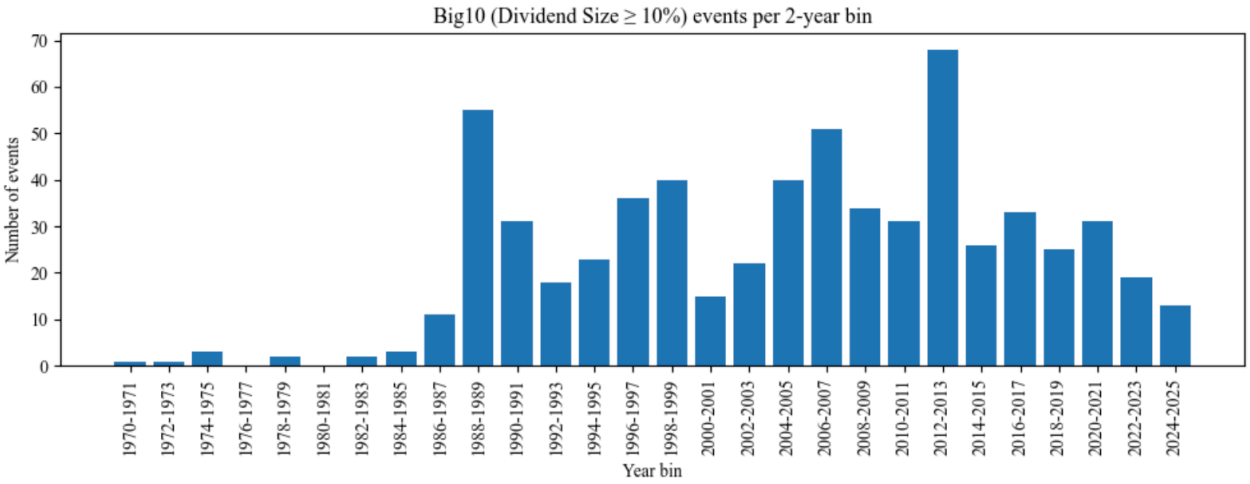


Figure 2. Number of big dividend yield events by year. This figure plots the annual number of dividend events with dividend yields of at least ten percent. The sample covers common stocks traded on major U.S. exchanges from 1970 to 2024. The figure illustrates the time-series variation in the frequency of large dividend events across dividend size groups.

Figure 2 documents the time-series variation in the frequency of dividend events with yields of at least ten percent (Big10). Large dividend events are rare in the early sample, with Big10 events occurring only sporadically during the 1970s. Beginning in the late 1980s, the frequency of large dividend events rises markedly and remains elevated thereafter. Big10 events increase to around 25-30 per year in the late 1980s and mid-2000s and exhibit pronounced spikes in certain years, most notably in 2012[3], when 53 Big10 events occur. This expansion in the right tail of the dividend distribution creates a unique empirical setting in which trading frictions are less likely to bind, allowing tax-driven price adjustment to be observed more cleanly. The growing prevalence of large-dividend events therefore provides the variation needed to disentangle tax-based and friction-based mechanisms across different regions of the dividend distribution.

[3] The spike in large-dividend events in 2012 is consistent with firms accelerating payouts ahead of the scheduled expiration of the Bush-era 15% dividend tax rate, which was widely expected to increase in 2013 following the sunset of the tax cuts and the introduction of the Medicare surtax. This interpretation is supported by Hanlon and Hoopes (2014), who document that firms adjust both special dividends and the timing of regular dividend payments in anticipation of dividend tax changes.

The paper also derives economically meaningful implications for trading strategies in tax-advantaged accounts. I show that the predictable under adjustment of prices around large-dividend events generates substantial overnight returns when dividends are tax exempt, such as in 401(k) accounts. The resulting strategy remains robust after controlling for standard risk factors and can sustain significantly higher trading costs than strategies based on smaller dividends, underscoring the economic relevance of the nonlinear ex-dividend pricing mechanism. I further quantify two economically meaningful thresholds that govern strategy profitability: a tax threshold and a trading-cost threshold. The implied tax threshold is approximately 12.7% for Big10 events and 14.7% for Big5-only events. Strategies focused on large dividends tolerate markedly higher per-trade costs, with maximum round-trip trading costs of about 146 basis points for Big10 events. Consistent with wider arbitrage margins, large-dividend strategies deliver substantially higher alpha per event, approximately 2.9% for Big10 events compared with about 0.9% for Big5-only events.

This paper contributes to the literature on ex-dividend price behavior by reexamining the long-standing debate between tax-based and friction-based explanations. To understand the efficient market hypothesis and why ex-dividend pricing deviates from the frictionless benchmark, a large literature studies which interpretation best explains ex-dividend price behavior using both theory and evidence from U.S. and international markets. In a frictionless benchmark, dividends and capital gains are perfect substitutes and ex-dividend prices should adjust one for one with the dividend payment (Miller and Modigliani, 1961). Once differential taxation is introduced, however, ex-dividend price adjustments reflect the tax preferences of marginal investors, giving rise to dividend clienteles and predictable deviations from the one-for-one benchmark (Elton and Gruber, 1970; Litzenberger and Ramaswamy, 1980). A large empirical literature documents ex-dividend

price drops that are systematically smaller than the dividend and links this behavior to dividend yields, tax regimes, and changes in tax policy across time and institutional settings, including evidence from historical tax reforms, mutual funds, and international markets (Barclay, 1987; Poterba, 1986; Elton, Gruber, and Blake, 2005; Callaghan and Barry, 2003; Hietala, 1990; McDonald, 2001; Bell and Jenkinson, 2002; Green and Rydqvist, 1999; Florentsen and Rydqvist, 2001; Michaely and Murgia, 1995; Lasfer, 1995; Kaplanis, 1986).

At the same time, a growing body of evidence challenges a purely tax-based interpretation. Studies documenting abnormal ex-dividend returns for non-taxable distributions, stock dividends, and splits, as well as evidence from markets where dividend taxation is weak or absent, are difficult to reconcile with tax clienteles alone (Eades, Hess, and Kim, 1984; Woolridge, 1983; Grinblatt, Masulis, and Titman, 1984; Shaw, 1991; Kadapakkam and Martinez, 2005). International evidence also shows that ex-dividend price behavior is sometimes insensitive to tax reforms or dividend tax differentials, pointing instead to the role of short-term trading and market frictions (Lakonishok and Vermaelen, 1983). These findings motivate an alternative framework in which transaction costs and short-term trading incentives shape ex-dividend price adjustment, and in which taxes and frictions jointly determine observed outcomes rather than operating in isolation.

A complementary literature formalizes this view by emphasizing trading frictions and market microstructure, beginning with Kalay (1982), who shows that a pure tax-clientele explanation is inconsistent with a no-arbitrage equilibrium. When transaction costs are low, short-term traders who are effectively tax neutral have incentives to trade around the ex-dividend day and capture dividends, eliminating excess returns. When transaction costs are sufficiently high, however, arbitrage becomes unprofitable, allowing prices to reflect relative taxation of dividends

and capital gains. This framework highlights the role of transaction costs in determining whether tax effects or short-term trading dominates ex-dividend price adjustment.

Building on this insight, a large body of empirical work documents patterns consistent with short-term trading and microstructure effects. Several studies show that ex-dividend trading volume increases sharply around the ex-date, particularly for high-yield stocks and in periods of lower trading costs, consistent with dividend-capturing activity by short-term traders (Lakonishok and Vermaelen, 1986; Kaproff and Walking, 1988, 1990; Michaely and Vila, 1995, 1996; Dhaliwal and Li, 2006). Related evidence indicates that price adjustment is closer to a full dividend drop in liquid, high-yield stocks that are more attractive to arbitrageurs, while incomplete adjustment is more common among illiquid stocks (Eades et al., 1994; Naranjo et al., 2000).

Another line of research focuses on market microstructure mechanisms that can generate ex-dividend price drops smaller than the dividend amount even in the absence of taxes. Price discreteness and tick size constraints mechanically limit the extent of price adjustment when dividends are small relative to the minimum price increment (Bali and Hite, 1998). Bid-ask bounce and order-handling rules can also induce systematic ex-dividend returns, as market makers exploit their comparative advantage in dividend collection and reinvestment, causing prices to shift from bid to ask across the ex-date (Frank and Jagannathan, 1998; Dubofsky, 1992).

More recent models integrate transaction costs, risk, and tax heterogeneity to jointly explain ex-dividend prices and trading volume. These studies show that risk exposure and trading costs limit dividend-capturing activity, while investor tax heterogeneity amplifies it, implying that ex-dividend price adjustment need not equal the dividend even when arbitrage opportunities exist in principle (Boyd and Jagannathan, 1994; Heath and Jarrow, 1988; Michaely, Vila, and Wang, 1996).

Despite decades of research, these explanations have remained in tension. The tax-based view is supported by evidence linking ex-dividend price drops to dividend yields, tax regimes, and policy changes, while a growing body of work points to the role of trading activity, transaction costs, and market microstructure. The central challenge is that the literature often treats the puzzle as an "either-or" contest—taxes or frictions—while the data suggest that the relative importance of these mechanisms may vary systematically across dividend events. Under the tax-clientele view, ex-dividend price drops should be approximately proportional to the dividend, implying a relatively constant price-drop ratio that reflects prevailing tax differentials. In contrast, friction-based theories predict that price adjustment should increase with dividend size, as fixed trading costs bind most tightly for small dividends and become negligible for sufficiently large payouts.

Two features distinguish this paper from earlier work. First, I document substantial heterogeneity in ex-dividend price adjustment across dividend sizes and show that the growing prevalence of large-dividend events in recent decades provides a new empirical environment in which this heterogeneity can be systematically studied. In this region of the dividend distribution, trading frictions are relatively muted, allowing tax effects to be more cleanly identified and contrasted with friction-driven under adjustment in the left tail. Second, I exploit pre-scheduled dividend payment dates and an exogenous increase in trading costs induced by the Tick Size Pilot program to causally assess the role of trading frictions, showing that higher transaction costs disproportionately hinder price adjustment for small dividends. Together, these results provide unified evidence that reconciles the long-standing debate by demonstrating that taxes and trading frictions dominate price adjustment in different regimes of the dividend size distribution.

The remainder of the paper is organized as follows. Section I describes the data, sample construction, variable definitions, and empirical methodology. Section II presents the main

empirical results. It documents a nonlinear relationship between dividend size and ex-dividend price adjustment, examines changes around U.S. decimalization in 2001, and provides causal evidence on the role of trading frictions using the Tick Size Pilot program. Section III concludes.

I. Data and Methodology

A. Data and Sample Construction

The ex-dividend puzzle refers to the empirical regularity that stock prices typically decline by less than the amount of the cash dividend when a stock goes ex dividend[4]. I study this phenomenon using a comprehensive sample of U.S. dividend events constructed from the CRSP daily stock files over the period 1970 to 2024. The data combine daily stock trading information, dividend event records, and firm level characteristics, allowing for a detailed measurement of price adjustments around ex dividend dates.

I begin from the universe of CRSP distribution events and restrict attention to ordinary common stocks traded on major U.S. exchanges. The sample is restricted to actively traded stocks by excluding illiquid observations with zero trading volume and penny stocks with cum-dividend prices below one dollar, ensuring reliable measurement of returns and price changes. Dividend events are identified using CRSP's distribution codes (DISTCD), which allow a precise classification of cash dividends by payment method and frequency. I retain only ordinary cash dividend distributions and exclude capital gains distributions, reinvestment-related payouts, and rights distributions. Specifically, I require the first digit of DISTCD to equal 1, indicating a cash distribution, and the second digit to equal 2, corresponding to an ordinary cash dividend. The third digit denotes the dividend frequency, and I do not impose any restriction on it. I exclude observations with the fourth digit corresponding to tax-status codes 0, 1, 3, or 4[5]. In addition, I explicitly drop DISTCD codes 1237, 1239 and 1279, which correspond to non-cash distributions

[4] The drop ratio puzzle is independent of the announcement. The test is on dividend payment dates (pre-scheduled), not dividend announcements.

[5] The fourth digit of DISTCD captures the tax status of the distribution. Codes 0 and 1 indicate that the tax status is unknown, not yet coded, or unspecified. Code 3 denotes non-taxable distributions, while code 4 corresponds to returns of capital rather than ordinary dividends. I exclude these observations to focus on standard taxable cash dividend payments.

such as capital gains, reinvestment-related payouts, or rights distributions. This restriction ensures that all events in the sample correspond to taxable cash dividends on common shares[6] and that the observed price changes are directly attributable to dividend payments rather than other forms of corporate distributions.

All prices, shares outstanding, and dividend amounts are adjusted using CRSP's price and share adjustment factors to maintain consistency across stock splits and other capital structure changes. When multiple cash dividends occur on the same ex-dividend date for a given firm, I aggregate them into a single event by summing the adjusted dividend amounts. To limit the influence of extreme outliers driven by infrequent special payments, I winsorize the upper tail of the dividend yield distribution at the 99.95th percentile.

For each dividend event, I measure the size of the dividend relative to the stock price on the cum dividend day and classify events into three groups based on this dividend size. I define large dividend events (big 10) as those with dividend yields of at least ten percent, medium to large dividend events (big 5) as those with yields of at least five percent, and an intermediate group (big 5-only) consisting of events with dividend yields between five and ten percent. This classification allows me to examine how ex dividend price behavior varies nonlinearly with dividend size and to distinguish settings in which taxes or trading frictions are likely to play a more prominent role.

To characterize trading conditions around the ex-dividend date, I compute firm characteristics using daily data from the 21 trading days preceding the ex-dividend date, requiring a minimum of 16 non-missing observations within this window. These characteristics capture firm

[6] The sample includes U.S. ordinary cash dividend distributions with DISTCD codes 1202, 1212, 1218, 1222, 1228, 1232, 1238, 1242, 1248, 1252, 1262, 1268, 1272, and 1278. These codes correspond to taxable cash dividends on common shares across all payment frequencies (including monthly, quarterly, semi-annual, annual, year-end, and extra or special dividends).

size, liquidity, trading activity, and return volatility, and are constructed exclusively from pre-event information to avoid contamination from ex-dividend price movements.

Table 1
Variable descriptions

This table describes the construction of the main variables used in the analysis. Dividend events and stock trading variables are obtained from CRSP. Prices, shares outstanding, and dividend amounts are adjusted using CRSP adjustment factors. Return measures decompose ex-dividend price adjustment into overnight, intraday, and close-to-close components. Firm characteristics are computed using daily data from the 21 trading days preceding the ex-dividend date, requiring at least 16 non-missing observations.

Variable of interest	Description
Dividend cash amount	DIVAMT is the cash dividend per share (adjusted).
Distribution code	DISTCD: a four-digit code indicating the type of distribution.
Dividend yield	Dividend amount / P_{cum}
Cum-day price (P_{cum})	Closing price on the cum-dividend day (date t–1).
Ex-day price (P_{ex})	Closing price on the ex-dividend day (date t).
Open price	Daily open price corresponds to the price of the first trade at the market open on the ex-dividend day.
Volume	Total number of shares traded.
Number of shares outstanding	Publicly held shares (in thousands), adjusted using the share factor.
Return	Daily stock return collected from CRSP.
Big 5_only	5%≤Dividend yield<10%.
Big5	Dividend yield≥5%.
Big 10	Dividend yield≥10%.
Overnight return	$(\frac{\mathrm{OpenPrc_{ex}+divamt}}{\mathrm{P_{cum}}})$-1

Close-to-close return	$(\frac{P_{ex}+divamt}{P_{cum}})$-1
Intraday return	$(\frac{P_{ex}}{OpenPrc_{ex}})$-1
Drop ratio	$\frac{P_{cum} - OpenPrc_{ex}}{divamt}$
Price drop	1- $\frac{P_{ex}}{P_{cum}}$
Log (Mtkcap)	Log (shares outstanding × price), averaged over the 21 trading days before ex-date (min: 16 days).
Log (Amihud illiquidity)	Log (|ret| / dollar volume), averaged over the 21 trading days before ex-date (min: 16 days).
Turnover	Volume/ shares outstanding × 1000, 21-day pre-ex-date average (min: 16 days).
Volatility	The standard deviation of daily returns over the 21-day window before ex-date × √252 (min: 16 days).

B. The Tick Size Pilot Program

To identify the causal role of trading frictions in ex-dividend price adjustment, I exploit the Tick Size Pilot Program, a large-scale market-structure experiment implemented by the U.S. Securities and Exchange Commission. The program was designed to evaluate how an exogenous increase in minimum tick size affects liquidity provision and trading outcomes for relatively small capitalization stocks. Importantly for my setting, the experiment generates a sharp and plausibly exogenous increase in trading frictions without directly affecting firms' dividend policies or the timing of dividend events.

The Tick Size Pilot Program was launched on October 3, 2016 and ran through September 28, 2018. Eligible stocks were randomly assigned into one control group and three treatment

groups. Stocks in the control group continued to trade with a minimum tick size of one cent, while stocks in the treatment groups were subject to a wider minimum tick size of five cents, with additional quoting and trade-at restrictions varying across treatment arms.

The program mechanically increases trading frictions by limiting price improvement and widening effective spreads. A larger minimum tick size raises execution costs, increases discretization in prices, and reduces the scope for finely priced arbitrage trades. Prior studies using the Tick Size Pilot Program show that these changes weaken liquidity provision (Chung, Lee, and Rösch, 2020; Albuquerque, Song, and Yao, 2020) and reduce trading efficiency, particularly for securities that already face thin margins for arbitrage.

This setting is especially well suited for examining the ex-dividend puzzle. Ex-dividend arbitrage relies on narrow spreads, low execution costs, and the ability to trade close to fundamental values (Health and Jarrow, 1988). These conditions are most critical for small-dividend events, where the mechanical price adjustment is small in absolute magnitude and the arbitrage profit is thin. For large-dividend events, by contrast, the price change is substantial, and arbitrage incentives remain strong even in the presence of moderate frictions. As a result, an exogenous increase in trading frictions should disproportionately affect ex-dividend returns for small-dividend events while leaving large-dividend events largely unaffected.

I combine the Tick Size Pilot assignment with dividend events occurring during the pilot period and a matched pre-pilot window. The pre-pilot period spans October 1, 2014, through October 2, 2016, while the post-pilot period coincides with the program's implementation. Dividend events are classified using the same dividend size definitions described in the data section. Tick Size Pilot treatment assignments are obtained from the Financial Industry Regulatory Authority (FINRA) website.

C. Difference-in-Differences Design

I use a difference-in-differences design to identify the causal effect of trading frictions on ex-dividend price adjustment. The design compares ex-dividend close-to-close returns for stocks assigned to the Tick Size Pilot treatment groups and the control group, before and after the introduction of the wider minimum tick size.

Because assignment to the pilot was randomized and unrelated to dividend policies, differential changes in ex-dividend returns between treated and control stocks can be attributed to the exogenous increase in trading frictions. I further exploit variation in dividend size to examine heterogeneous effects. If trading frictions are an important determinant of the ex-dividend puzzle, the widening of tick size should disproportionately reduce ex-dividend returns for small-dividend events, where arbitrage margins are thin, while having little effect on large-dividend events. This differential response across dividend sizes provides a direct test of whether trading frictions contribute to the nonlinear ex-dividend price drop.

The baseline difference-in-differences specification is estimated using the following panel regression:

$$Return_{i,t} = \beta_1(Treat_i \times Post_t) + X'_{i,t}\beta + \mu_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

$$X_{i,t} = [log(Amihud), Turnover, Volatility, log(MtkCap)]$$

To examine dividend-size heterogeneity, I augment the baseline specification with an interaction between treatment exposure and a large-dividend indicator, estimated as:

$$Return_{i,t} = \beta_1(Treat_i \times Post_t) + \beta_2(Treat_i \times Post_t \times Big5_i) + \gamma' X_{it} + \alpha_i + \lambda_t + \varepsilon_{i,t} \quad (2)$$

D. Nonlinear Return Specification

To allow for flexible responses of ex-dividend pricing to dividend size, I employ a nonlinear return specification with overnight return[7] as the dependent variable, measured from the cum-dividend close to the ex-dividend open. I model overnight returns as a quadratic function of dividend yield by including both the level and the squared term, which permits the marginal effect of dividend size on price adjustment to vary across the distribution.

In addition, I use indicator variables based on dividend size thresholds to provide a complementary, discrete characterization of nonlinearity. Dividend events are classified as large-dividend events (Big10), defined as dividend yields of at least ten percent, and intermediate-dividend events (Big5-only), defined as dividend yields between five and ten percent. This specification facilitates transparent comparisons across dividend size groups and is particularly well suited for examining heterogeneous responses to changes in trading frictions.

All regressions include standard firm-level controls capturing size, liquidity, turnover, and return volatility, each measured over the pre-event window described earlier, as well as firm and time fixed effects.

I estimate a quadratic specification relating overnight returns to dividend yield：

$$Overnight\ \ Return_{i,t} = \beta_1 Dividend\ yield_{i,t} + \beta_2 ividend\ yield_{i,t}^2 + X_{i,t}'\beta + \mu_i + \gamma_t + \varepsilon_{i,t} \quad (3)$$

I also estimate a specification using dividend-size indicator variables：

$$Overnight\ \ Return_{i,t} = \theta_1 Big10_i + \theta_2 Big5_only_i + X_{i,t}'\theta + \mu_i + \gamma_t + \varepsilon_{i,t} \quad (4)$$

E. Fama French Five Factors Regression

[7] I use overnight returns rather than the traditional price-drop ratio to avoid mechanical distortions arising from small denominators and zero-dividend observations, which can generate extreme or undefined values of the drop ratio (Bali and Hite, 1998). Overnight returns provide a well-defined, continuous measure of ex-dividend price adjustment that preserves the economic content of the test while improving statistical stability and interpretability.

To evaluate the risk-adjusted performance of dividend-capture strategies, I estimate time-series regressions using the Fama–French five-factor model (Fama and French, 2015). A key feature of the analysis is that strategy returns are generated through systematic churn around dividend events, rather than through continuous portfolio holding.

For each dividend-yield group, I first construct stock-level event returns associated with individual dividend events. Each event corresponds to a one-off trade that exploits the ex-dividend price adjustment, with positions taken only around the dividend payment and closed immediately thereafter. The strategy does not maintain positions outside these event windows.

The factor data span the period from January 1970 through December 2024 and define the full trading-day calendar used to align event returns with the Fama–French factors. When multiple qualifying dividend events occur on the same trading day, I aggregate stock-level event returns by taking an equal-weighted average across all events on that date. This produces a daily event return that reflects the strategy's exposure on that day. On days without qualifying dividend events, the strategy holds no positions and keeps cash.

I align the daily event return series with the full trading-day calendar and compute excess returns relative to the risk-free rate on event days only. These excess returns serve as the dependent variable in the Fama–French five-factor regressions. The regressors include the market excess return (Mkt-RF), size (SMB), value (HML), profitability (RMW), and investment factors (CMA). The regression intercept captures the average abnormal return generated by the dividend-capture strategy after controlling for systematic risk exposures, while the factor loadings characterize the strategy's risk profile during event days.

Event returns are evaluated using the Fama–French five-factor model estimated in time-series regressions：

$$Event\ Return_t = \alpha + \beta_m(Mkt - RF)_t + \beta_s SMB_t + \beta_h HML_t + \beta_r RMW_t + \beta_c CMA_t + \varepsilon_t \quad (5)$$

II. Empirical Results

A. Summary Statistics

Table 2
Full Sample Summary Statistics

This table reports summary statistics for the full sample of dividend events. The sample consists of common stocks traded on major U.S. exchanges from 1970 to 2024. Dividend yield is defined as the cash dividend scaled by the cum-dividend price. Overnight, intraday, and close-to-close returns measure different components of the ex-dividend price adjustment. Firm characteristics, including turnover, volatility, market capitalization, and Amihud illiquidity, are computed using daily data from the 21 trading days preceding the ex-dividend date, requiring at least 16 non-missing observations. Reported t-statistics test whether the mean of each variable differs from zero, except for the drop ratio, for which the null hypothesis is that the mean equals one.

Variable	N	Mean	Std	p5	p25	p50	p75	p95
Dividend yield	343,409	0.847%	1.499%	0.143%	0.385%	0.663%	1.049%	1.900%
Overnight return	343,409	0.225%	2.069%	-2.571%	-0.514%	0.182%	0.882%	3.176%
		(63.812)						
Close-to-Close return	343,409	0.258%	2.534%	-3.286%	-0.884%	0.237%	1.293%	3.947%
		(59.782)						
Intraday return	343,409	0.038%	1.808%	-2.399%	-0.073%	0.000%	0.189%	2.523%
		(12.440)						
Drop ratio	343,409	0.739	14.238	-5.000	-0.044	0.730	1.785	6.250
		(-10.704)						
Turnover	342,736	0.797%	11.592%	0.010%	0.052%	0.157%	0.454%	1.414%
Volatility	342,956	33.439%	20.603%	12.625%	20.569%	28.732%	40.539%	69.372%
Log (Mktcap)	343,009	17.154	1.771	14.436	15.882	17.076	18.324	20.194

Log (Amihud illiquidity)	326,099	-17.954	3.138	-23.246	-20.317	-17.789	-15.542	-13.102

t-statistics are reported in parentheses.

The sample covers 343,409 dividend events for common stocks between 1970 and 2024. Dividend yields are generally small on average, with a mean of 0.847% and a median of 0.663%, but the distribution exhibits substantial right skewness, with the upper tail capturing infrequent but economically large dividend events.

Ex-dividend returns display pronounced heterogeneity across components. Overnight returns account for the bulk of the price adjustment, while intraday returns are comparatively small on average. The drop ratio has a median of approximately 0.730, well below the frictionless benchmark of one-for-one price adjustment, consistent with the classic ex-dividend puzzle. The wide dispersion in drop ratios motivates the subsequent analysis of nonlinear price responses and the role of trading frictions in shaping ex-dividend returns.

The firms in the sample are economically large. The median log market capitalization is 17.076, which corresponds to a market value of approximately $26 billion, while the interquartile range spans roughly $7 billion to $91 billion, indicating that dividend events occur predominantly among large firms. Turnover and volatility exhibit substantial dispersion, and Amihud illiquidity shows a wide range, reflecting heterogeneity in trading frictions across stocks and time.

Table 3
Big-5 Sample Summary Statistics

This table reports summary statistics for the subsample of dividend events with dividend yields of at least five percent. The sample consists of common stocks traded on major U.S. exchanges over the period 1970 to 2024. Firm characteristics are computed using daily data from the 21 trading days preceding the ex-dividend date, requiring at least 16 non-missing observations. Reported t-

statistics test whether the mean of each variable differs from zero, except for the drop ratio, for which the null hypothesis corresponds to a one-for-one price adjustment.

Variable	N	Mean	Std	p5	p25	p50	p75	p95
Dividend yield	1,376	15.891%	15.950%	5.232%	6.200%	8.979%	18.716%	50.766%
Overnight return	1,376	2.068%	7.962%	−4.216%	−0.292%	0.785%	3.180%	11.942%
		(9.633)						
Close-to-Close return	1,376	1.492%	8.234%	−5.829%	−1.245%	0.618%	3.194%	12.368%
		(6.772)						
Intraday return	1,376	−0.364%	7.301%	−8.365%	−2.176%	0.000%	1.111%	6.958%
		(-1.849)						
Drop ratio	1,376	0.853	0.621	0.000	0.723	0.940	1.021	1.474
		(-8.761)						
Turnover	1,372	2.592%	25.895%	0.030%	0.165%	0.467%	1.092%	4.498%
Volatility	1,372	53.430%	42.812%	15.657%	27.780%	40.500%	63.634%	130.821%
Log (Mktcap)	1,373	16.432	1.690	13.835	15.278	16.515	17.604	19.086
Log (Amihud illiquidity)	1,269	−17.306	3.270	−22.446	−19.911	−17.439	−14.844	−11.888

t-statistics are reported in parentheses.

Table 4
Summary Statistics by Dividend Yield Group

This table reports summary statistics for dividend events grouped by dividend yield. Dividend yield is defined as the cash dividend scaled by the cum-dividend price. Panel A reports statistics for overnight returns, Panel B reports statistics for the ex-dividend price-drop ratio, and Panel C reports statistics for the price drop. Groups are defined based on dividend yield thresholds of 5 percent and 10 percent. Reported t-statistics test whether the mean of each variable differs from zero, except for the drop ratio, for which the null hypothesis corresponds to a one-for-one price adjustment.

Group	N	Mean	SD	p5	p25	p50	p75	p95

Panel A. Overnight Return								
5%–10%	742	1.073%	4.473%	−3.512%	−0.459%	0.485%	2.224%	6.898%
		(6.532)						
≥10%	634	3.232%	10.572%	−5.161%	−0.119%	1.129%	4.478%	17.624%
		(7.698)						
≥5%	1376	2.068%	7.962%	−4.216%	−0.292%	0.785%	3.180%	11.942%
		(9.633)						
Panel B. Drop Ratio								
5%–10%	742	0.837	0.743	0.000	0.667	0.927	1.069	1.560
		(-5.990)						
≥10%	634	0.873	0.439	0.080	0.800	0.951	1.006	1.252
		(-7.314)						
≥5%	1376	0.853	0.621	0.000	0.724	0.940	1.021	1.475
		(-8.761)						
Panel C. Price Drop								
5%–10%	742	5.612%	4.622%	0.000%	4.003%	5.772%	7.631%	10.526%
		(33.075)						
≥10%	634	23.435%	18.838%	1.232%	11.167%	17.916%	30.830%	65.475%
		(31.324)						
≥5%	1376	13.824%	15.933%	0.000%	5.178%	8.270%	16.667%	48.701%
		(32.184)						

t-statistics are reported in parentheses.

Tables 3 and 4 zoom in on dividend events with economically large dividend yields and document how ex-dividend price behavior varies across dividend size groups. Table 3 reports summary statistics for the subsample of dividend events with dividend yields of at least five percent. Relative to the full sample, these events are associated with substantially larger overnight

and close-to-close returns, as well as higher volatility and turnover, indicating that large-dividend events occur in periods of intensified trading activity. The median drop ratio in this subsample is notably higher than in the full sample, suggesting that price adjustment is more complete when dividend size is large.

Table 4 further stratifies dividend events by dividend yield thresholds and highlights sharp heterogeneity in ex-dividend price adjustment. The sample contains 634 Big-10 events[8] and 742 Big-5-only events, for a total of 1,376 dividend events with yields above five percent. Panel A shows that overnight returns increase monotonically with dividend size, while Panel B documents that the drop ratio rises toward a one-for-one price adjustment as dividend yields increase. Panel C shows that the absolute price drop scales strongly with dividend size. Together, these patterns indicate that both returns and price adjustment vary systematically with dividend size, rather than following a constant linear relationship.

In the next section, I formally examine the nonlinear relationship between dividend size and ex-dividend returns using panel regressions. I then exploit an exogenous increase in trading frictions provided by the Tick Size Pilot Program to assess whether small-dividend events are more sensitive to frictions than large-dividend events, shedding light on the mechanisms underlying the observed heterogeneity in ex-dividend price adjustment.

B. Nonlinear Return Regression Results

Table 5
Regression Results for Overnight Returns Around Dividend Events

This table reports panel regression results for overnight returns around dividend events. The dependent variable is the overnight return measured from the cum-dividend close to the ex-

[8] Among 634 big 10 events, there are 568 events considered as extra/special dividends.

dividend open, inclusive of the cash dividend. Dividend yield is defined as the cash dividend scaled by the cum-dividend price. Columns include specifications with a quadratic function of dividend yield and indicator variables for large dividend events. All regressions control for firm characteristics measured over the pre-event window, include firm and month fixed effects, and are estimated using the full sample of dividend events. t-statistics are reported in parentheses.

	Overnight Return				
	(1)	(2)	(3)	(4)	(5)
Dividend yield	0.116***	0.220***	0.093***	0.199***	
	(5.667)	(11.390)	(4.482)	(10.078)	
Dividend yield²		-0.503***		-0.498***	
		(-3.425)		(-3.401)	
Big10					0.012***
					(2.893)
Big5_only					0.004***
					(3.030)
Log (Amihud illiquidity)			0.000***	0.000***	0.000***
			(5.496)	(3.784)	(8.094)
Turnover			0.002*	0.002*	0.002*
			(1.753)	(1.795)	(1.856)
Volatility			0.001**	0.001**	0.001**
			(2.374)	(2.519)	(2.431)
Log (Mtkcap)			0.000***	0.000***	0.000***
			(3.544)	(4.124)	(2.668)
Month FE	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y
Adj. R-squared	0.002	0.003	0.002	0.002	0.001
Observations	343,409	343,409	326,099	326,099	326,099

Table 5 reports panel regression results for overnight returns around dividend events. The dependent variable is the close-to-open overnight return from the cum-dividend day to the ex-dividend day. All specifications include firm and month fixed effects and control for firm characteristics measured over the pre-event window.

Across specifications, dividend yield is positively related to overnight returns. In the linear specification, a one percentage point increase in dividend yield is associated with an increase in overnight returns of approximately 9 to 12 basis points, indicating stronger ex-dividend price adjustment for larger cash distributions. When allowing for nonlinearity, the coefficient on the squared dividend-yield term is significantly negative, around -0.5, implying diminishing marginal effects of dividend size. Economically, while overnight returns increase with dividend yield, the incremental response flattens for sufficiently large dividends.

An alternative specification using indicator variables for large-dividend events yields in column (5) consistent evidence. Events with dividend yields of at least ten percent are associated with an additional 0.012 increase in overnight returns relative to smaller dividends, while dividends in the five-to-ten percent range exhibit a more modest but still statistically significant effect of about 0.004. These results suggest that the ex-dividend price response is highly nonlinear and concentrated among large dividend events. This nonlinear relationship between dividend size and ex-dividend overnight returns, motivating the subsequent analysis of whether trading frictions can account for the muted price adjustment observed for smaller dividend events.

C. Ex-Dividend Price Adjustment Before and After Decimalization

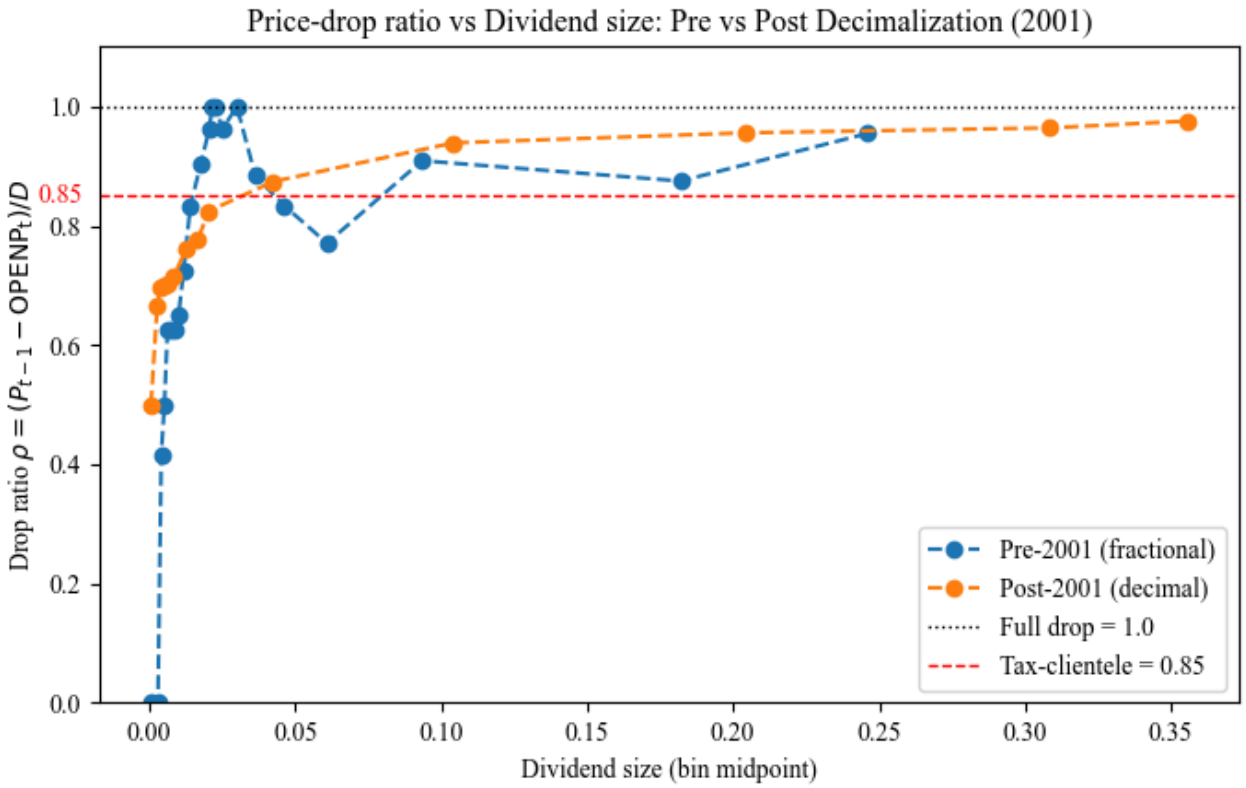


Figure 3. Price-drop ratio vs Dividend size: Pre vs Post Decimalization (2001). This figure plots the median ex-dividend price-drop ratio against dividend size using adaptive dividend-size bins. The blue (dashed) line shows observations before 2001, when U.S. stocks were quoted in fractional tick sizes (primarily 1/8 and 1/16), while the orange (dashed) line shows observations after decimalization, when the minimum tick size was reduced to one cent. The horizontal dotted line marks a full price drop (ρ=1), and the horizontal dashed line indicates the tax-clientele benchmark (ρ=0.85). There are 206,714 observations before 2001 and 136,695 observations after 2001. Among large-dividend events, there are 233 (401) Big10 events and 465 (911) Big5 events before (after) 2001, of which 232 (510) are classified as Big5-only events.

U.S. decimalization in 2001 represents a sharp, market-wide reduction in minimum tick sizes, substantially lowering trading frictions, especially for small price adjustments. Against this background, Figure 3 shows how the relationship between the ex-dividend price-drop ratio and dividend size differs before and after decimalization. Prior to decimalization, stock prices were quoted in fractional increments (primarily 1/8 and 1/16 of a dollar), which imposed a relatively large minimum tick size and mechanically constrained small price adjustments.

Consistent with this institutional feature, the pre-2001 curve exhibits nonlinearity for small dividends. The drop ratio is substantially below one and displays large dispersion at the left tail, reflecting the fact that dividend-induced price adjustments of only a few cents were often smaller than the minimum tick size and therefore difficult to arbitrage. In some bins, the drop ratio takes extreme values, indicating that price discreteness dominates the adjustment process for small dividends under fractional pricing.

Following decimalization, the minimum tick size was reduced to one cent, substantially lowering trading frictions. As shown by the post-2001 curve, the drop ratio for small dividends shifts upward. Price adjustments become smoother and more tightly clustered around the tax-clientele benchmark, indicating that dividend-related price changes are no longer mechanically constrained by tick size.

For sufficiently large dividends, the price-drop ratio is close to one in both periods, while large-dividend events are relatively infrequent prior to 2001, suggesting that trading frictions are less relevant when the dividend is large relative to the tick size.

Taken together, decimalization represents a market-wide overnight change without a natural treated and control group, and therefore cannot by itself provide causal identification. Instead, Figure 3 serves as a motivating example highlighting the central role of trading frictions in shaping ex-dividend price adjustment. This insight motivates my use of the Tick Size Pilot as a quasi-experimental setting to identify the causal effect of trading frictions on ex-dividend pricing.

D. Difference-in-Differences: Trading Frictions and Ex-Dividend Returns

This section examines the role of trading frictions in shaping ex-dividend price adjustment using a difference-in-differences framework. While the preceding analysis documents a

pronounced nonlinear relationship between dividend size and ex-dividend returns, such patterns may reflect both tax considerations and trading frictions. To isolate the causal effect of frictions, I exploit the Tick Size Pilot Program, which provides an exogenous increase in trading costs through a mandated widening of the minimum tick size for a subset of stocks. By comparing treated and control stocks before and after the policy implementation, this design allows a clean test of whether higher trading frictions impede ex-dividend price adjustment, and whether this effect varies systematically with dividend size.

D.1 Dividend Yield Distributions in the TSP Sample

Table 6
Dividend yield distribution in TSP sample

This table reports the distribution of dividend yields for stocks in the Tick Size Pilot sample, separately for treated and control groups and for the pre- and post-pilot periods. Dividend yield is defined as the cash dividend scaled by the cum-dividend price. The table also reports the number of large-dividend events based on the five percent and ten percent dividend yield thresholds. This table illustrates the comparability of dividend size distributions across treatment status and time periods.

			Dividend Yield								
Group	Period	N	Mean	Std	p5	p25	p50	p75	p95	Big5_only	Big10
Control	Post	1027	0.705%	0.017	0.114%	0.307%	0.479%	0.729%	1.515%	0	6
Control	Pre	1076	0.789%	0.016	0.139%	0.350%	0.550%	0.823%	1.745%	4	5
Treated	Post	1163	0.707%	0.017	0.114%	0.312%	0.503%	0.767%	1.552%	9	1
Treated	Pre	1193	0.738%	0.012	0.156%	0.349%	0.555%	0.842%	1.441%	7	3

Table 6 reports dividend yield distributions for treated and control stocks in the Tick Size Pilot sample over the pre-pilot period from October 2014 to October 2016 and the post-pilot period from October 2016 to September 2018. Dividend yield distributions are highly comparable across treatment status and over time, with similar means, medians, and percentile ranges across periods. The frequency of large-dividend events is low and broadly balanced across treated and control groups, with no evidence of differential clustering of dividends above the five percent or ten

percent thresholds around the introduction of the Tick Size Pilot. This stability in dividend size distributions supports the identifying assumption of the difference-in-differences design, indicating that subsequent differences in ex-dividend returns reflect changes in trading frictions rather than shifts in the composition or magnitude of dividend events.

D.2 Difference-in-Difference Results

Table 7
Regression results of the impact of TSP on returns

This table reports difference-in-differences regression results examining the impact of the Tick Size Pilot Program on ex-dividend returns. The dependent variables are close-to-close returns, intraday returns, and overnight returns around dividend events. The key explanatory variable is an indicator equal to one for treated stocks in the post-pilot period. All regressions include firm and month fixed effects and control for firm characteristics measured prior to the ex-dividend date. t-statistics are reported in parentheses.

	Close-to-Close Return	*Intraday Return*	*Overnight Return*
	(1)	(2)	(3)
Treat × Post	-0.240%***	-0.186%**	-0.055%
	(-2.869)	(-2.146)	(-0.804)
Log (Amihud illiquidity)	-0.000	0.000	-0.001
	(-0.684)	(0.658)	(-1.519)
Turnover	-0.000	0.001	-0.002
	(-0.066)	(0.665)	(-1.670)
Volatility	0.002	0.002	0.000
	(0.432)	(0.448)	(0.114)
Log (Mtkcap)	-0.005**	-0.003	-0.002
	(-2.140)	(-1.410)	(-1.306)
Month FE	Y	Y	Y
Firm FE	Y	Y	Y
Adj. R-squared	0.001	0.000	0.001
Observations	4420	4420	4420

∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01. t-statistics are reported in parentheses.

Table 7 reports difference-in-differences estimates of the impact of the Tick Size Pilot Program on ex-dividend returns. The Tick Size Pilot provides an exogenous increase in trading frictions through a mandated widening of the minimum tick size, allowing a causal test of whether higher trading costs hinder price adjustment on the ex-dividend date.

The key coefficient of interest is the interaction between treatment status and the post-pilot period. Following the introduction of the Tick Size Pilot, treated stocks experience a decline of 0.002 in close-to-close ex-dividend returns (about 0.240%) relative to control stocks. Intraday returns decline by 0.002 (about 0.186%), while the effect on overnight returns is economically small at -0.001 (about -0.055%).

This pattern indicates that higher trading frictions primarily impede price adjustment during regular trading hours, consistent with limits to arbitrage operating through execution costs and price discreteness. Overall, the DiD estimates provide causal evidence that increased trading frictions reduce ex-dividend price adjustment, supporting the view that frictions play a first-order role in shaping ex-dividend returns.

D.3 Dividend-size heterogeneity

Table 8
Heterogeneous Impact of Tick Size Pilot on Ex-Dividend Returns

This table reports difference-in-differences regression results examining heterogeneous effects of the Tick Size Pilot Program on ex-dividend returns across dividend size groups. The dependent variables are close-to-close returns, intraday returns, and overnight returns around dividend events. The specification augments the baseline difference-in-differences model with an interaction between treatment exposure in the post-pilot period and an indicator for large dividend events. All regressions include firm and month fixed effects and control for firm characteristics measured prior to the ex-dividend date. t-statistics are reported in parentheses.

	Close-to-Close Return	*Intraday Return*	*Overnight Return*
	(1)	(2)	(3)
Treat × Post	-0.242%***	-0.184%**	-0.058%

	(-2.895)	(-2.128)	(-0.838)
Treat × Post × Big5	0.210%	-0.193%	0.334%***
	(0.199)	(-0.155)	(2.788)
Log (Amihud illiquidity)	-0.000	0.000	-0.001
	(-0.685)	(0.659)	(-1.522)
Turnover	-0.000	0.002	-0.002
	(-0.068)	(0.656)	(-1.671)
Volatility	0.002	0.002	0.000
	(0.428)	(0.450)	(0.103)
Log (Mtkcap)	-0.005**	-0.003	-0.002
	(-2.168)	(-1.407)	(-1.325)
Month FE	Y	Y	Y
Firm FE	Y	Y	Y
Adj. R-squared	0.001	0.000	0.001
Observations	4420	4420	4420

∗p<0.1, ∗∗p<0.05, ∗∗∗p<0.01. t-statistics are reported in parentheses.

Table 8 extends the baseline difference-in-differences analysis by allowing the impact of the Tick Size Pilot to vary across dividend size groups. The specification augments the baseline model with an interaction between treatment exposure in the post-pilot period and an indicator for large-dividend events. The baseline treatment effect remains negative and significant for close-to-close and intraday returns, indicating that higher trading frictions reduce ex-dividend price adjustment on average. In contrast, the interaction term shows that large-dividend events are substantially less affected by the increase in tick size.

This pattern implies that the adverse effect of higher trading frictions is concentrated among smaller dividend events, for which arbitrage margins are thin and execution costs are more binding. In other words, trading frictions dominate the ex-dividend price adjustment process for

small-dividend events, while large-dividend events are relatively insulated from friction-induced distortions.

E. Dividend-Capture Strategy

The preceding analysis establishes that large-dividend events exhibit stronger and more complete ex-dividend price adjustment, and that trading frictions primarily bind for smaller dividend events. These findings naturally raise the question of whether the observed nonlinear pricing patterns translate into economically meaningful returns when implemented as a trading strategy. In this section, I evaluate the performance of a dividend-capture strategy that systematically exploits large-dividend events, focusing on returns generated through repeated event-driven trades rather than long-horizon portfolio holding.

E.1 Event-Driven Returns

Table 9 reports Fama–French five-factor regressions for dividend-capture event returns grouped by dividend yield categories. The estimated alphas are positive and statistically significant across all groups, with magnitudes increasing sharply with dividend size. Event returns associated with dividend yields between five and ten percent generate an average alpha of 0.050% per event ($t = 5.512$), corresponding to an annualized alpha of 12.663%. In contrast, large-dividend events with dividend yields of at least ten percent deliver substantially larger abnormal performance, with an average event-level alpha of 0.134% ($t = 6.560$) and an annualized alpha of 33.684%. The combined sample of dividends above five percent exhibits the strongest performance, with an event-level alpha of 0.177% ($t = 7.972$), translating into an annualized alpha of 44.723%.

Factor loadings are generally small and statistically insignificant, indicating that the returns are not driven by systematic exposure to standard risk factors but instead reflect event-specific pricing effects.

From an economic perspective, the estimated alphas correspond to sizable annualized abnormal returns and attractive Sharpe ratios, particularly for large-dividend events[9]. By concentrating trading activity on a small number of predictable, high-dividend events, the strategy captures ex-dividend price adjustments that are largely orthogonal to conventional risk factors.

Accordingly, the strategy is most attractive for tax-advantaged investors (e.g., 401(k) accounts), where dividends are effectively tax-free, and execution costs become negligible relative to the size of large dividend payments.

Table 9
Fama–French 5-Factor Regression for Dividend-Capture Event Returns

This table reports Fama–French five-factor regression results for dividend-capture event returns. Event returns are constructed around dividend payment dates and are grouped by dividend yield categories. Columns report regressions for intermediate dividend events with dividend yields between five and ten percent, large dividend events with dividend yields of at least ten percent, and the combined sample with dividend yields of at least five percent. The table reports estimated factor loadings and intercepts from time-series regressions. Annualized alphas and Sharpe ratios are reported for each portfolio. t-statistics are reported in parentheses.

	Event return		
Dividend yield	(1) 5% ~ 10%	(2) >= 10%	(3) >= 5%
Alpha	0.050%***	0.134%***	0.177%***
	(5.512)	(6.560)	(7.972)
Mkt-RF	0.025*	-0.002	0.021
	(1.824)	(-0.138)	(0.909)
SMB	0.011	-0.018	-0.009

[9] In appendix A, I determine optimal exposure to dividend-capture strategies by maximizing expected utility under constant relative risk aversion (CRRA), with risk aversion set to γ=7.5. For the Big-10 strategy, the optimal leverage is approximately 0.422. Economically, this implies that on each Big-10 ex-dividend date, an investor allocates about 42% of total wealth to the dividend-capture position and keeps the remaining 58% in cash earning the risk-free rate.

	(0.698)	(-0.686)	(-0.321)
HML	0.022	-0.000	0.028
	(0.747)	(-0.009)	(0.750)
RMW	0.028	0.053	0.076
	(1.561)	(1.007)	(1.341)
CMA	-0.036	0.101	0.058
	(-1.173)	(1.513)	(0.808)
Annualized Alpha (%)	12.663	33.684	44.723
Annualized Sharpe Ratio	0.788	0.938	1.148
Adj. R-squared	0.001	0.000	0.000
Observations	13871	13871	13871

$*p<0.1$, $**p<0.05$, $***p<0.01$. t-statistics are reported in parentheses.

E.2 Economic Thresholds: Taxes and Trading Costs

While the previous section establishes that dividend-capture strategies generate economically and statistically significant abnormal returns, their practicability depends on taxes and trading costs. This section translates the observed ex-dividend price adjustment and estimated strategy alphas into economically interpretable thresholds that characterize when dividend-capture strategies remain viable.

Table 10 quantifies these thresholds across dividend-yield groups. For each group, the implied tax threshold is determined by the average price-drop ratio and represents the maximum dividend tax rate consistent with nonnegative profits. Large-dividend strategies tolerate substantially higher tax rates: the implied tax threshold is approximately 12.739% for Big10 events and 14.676% for the Big5 sample, compared with 16.331% for Big5-only events. These magnitudes highlight that dividend-capture strategies based on large dividends remain profitable even under relatively high dividend taxation.

The table also reports transaction cost thresholds implied by event-level alphas and the frequency of dividend opportunities. Strategies focused on large dividends support markedly higher per-trade costs, with maximum round-trip trading costs of approximately 146 basis points for Big10 events and 89 basis points for the Big5 sample, compared with only 47 basis points for Big5-only events. Consistent with wider arbitrage margins, large-dividend strategies deliver higher alpha per event, with approximately 2.922% for Big10 events compared to about 0.938% for Big5-only events and remain profitable even when accounting for substantial execution costs.

Table 10
Tax and Transaction Cost Thresholds for Dividend-Capture Strategies

This table quantifies tax and transaction cost thresholds for dividend-capture strategies across dividend-yield groups. For each group, the table reports the average price-drop ratio, the implied tax threshold at which dividend-capture becomes unprofitable, and the maximum per-trade transaction cost consistent with nonnegative strategy profitability. Annualized alphas are obtained from Fama–French five-factor regressions, and events per year measure the average frequency of dividend opportunities. The thresholds translate observed ex-dividend price adjustment into economically interpretable bounds on taxes and trading costs.

Group	Annualized Alpha (FF5)	Drop Ratio	Tax Threshold	Events / Year	Alpha per Event	Max Trading Cost (per trade)
Big 5-only	12.663%	0.837	16.331%	13.490	0.938%	46.934 bps
Big 10	33.684%	0.873	12.739%	11.527	2.922%	146.109 bps
Big 5	44.723%	0.853	14.676%	25.000	1.789%	89.446 bps

III. Conclusion

In frictionless markets, ex-dividend prices should adjust one for one with dividend payments. Empirically, however, ex-dividend price drops have long been observed to fall short of the dividend, giving rise to competing explanations based on taxes and trading frictions. This paper shows that the persistence of this debate reflects a deeper nonlinear structure in ex-dividend price behavior rather than a failure of either mechanism.

Using a comprehensive sample of cash dividend events, I document a pronounced nonlinear relationship between ex-dividend price adjustment and dividend size. Small dividends exhibit substantial under adjustment, consistent with binding trading frictions that impede arbitrage. In contrast, for sufficiently large dividends, price drops approach the dividend amount, indicating that trading frictions become negligible and tax considerations dominate price formation. Large-dividend events provide a natural setting in which trading frictions are less binding, allowing the tax-based benchmark to be observed. The increasing prevalence of such events in recent decades creates a unique empirical opportunity to disentangle tax-driven price adjustment from friction-driven effects across the dividend distribution. Exploiting the Tick Size Pilot as an exogenous increase in trading costs, I provide causal evidence that higher transaction costs disproportionately hinder price adjustment for small dividends, while having little impact on large-dividend events.

The findings have direct economic implications. Predictable under adjustment around large-dividend events generates economically significant overnight returns in tax-advantaged accounts, with strategies focused on large dividends tolerating substantially higher trading costs and delivering higher per-event alphas than strategies based on smaller dividends. More broadly,

the results highlight the importance of nonlinearities and regime dependence in asset pricing, suggesting that long-standing empirical puzzles may persist when analysis is confined to average effects.

APPENDIX A

Optimal Leverage Under CRRA Preferences

I determine optimal exposure to dividend-capture strategies by maximizing expected utility under constant relative risk aversion (CRRA), with risk aversion set to $\gamma=7.5$ (Campbell and Viceira, 2002). Because returns arise only on ex-dividend dates, portfolio choice is event-driven: on dividend event days, the investor allocates a fixed fraction of total wealth to the strategy, while the remaining wealth is held in cash earning the risk-free rate; on non-event days, no position is taken.

The optimal exposure is chosen subject to three economically motivated constraints. First, wealth must remain strictly positive on all days, ruling out allocations that would imply bankruptcy given realized returns. Second, when allowing separate allocations across dividend-size categories, exposure to smaller-dividend events is restricted not to exceed exposure to larger-dividend events, reflecting the stronger and more reliable price adjustment associated with large dividends. Third, feasible allocations are bounded by the empirical return distributions within each dividend category, ensuring that the optimization respects realized downside risk.

I also consider a dual-allocation strategy that permits distinct wealth shares for large-dividend and medium-dividend events when both occur on the same day. The optimal solution assigns greater exposure to large-dividend events and lower exposure to smaller ones, consistent with their differential economic importance.

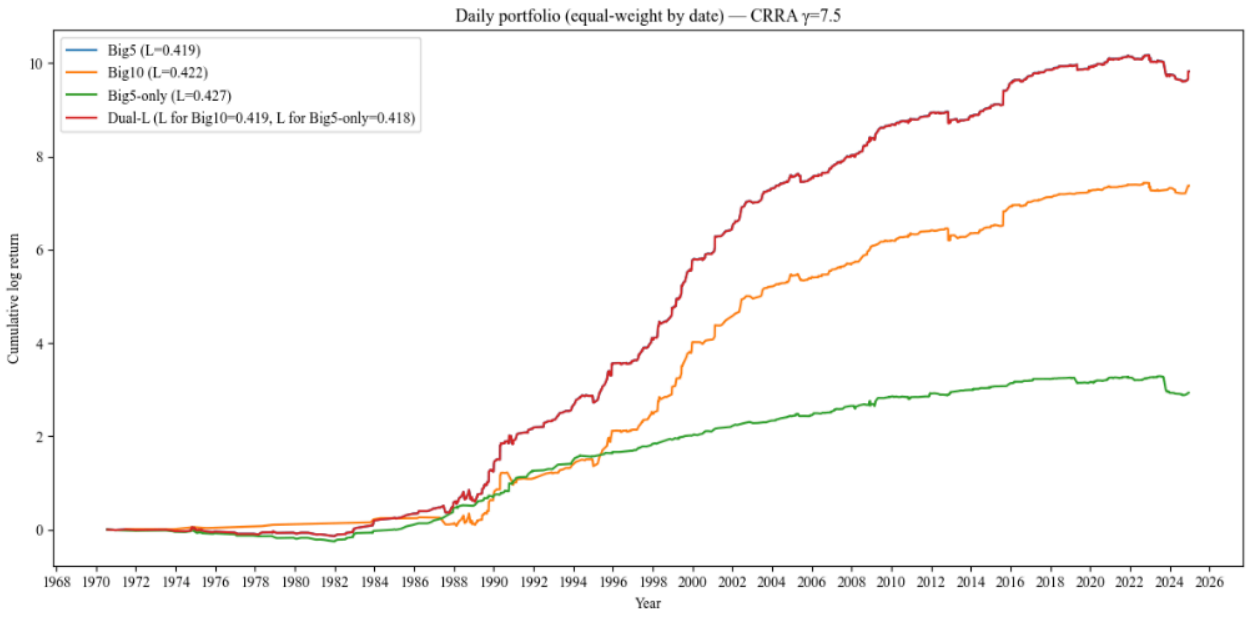


Figure A. Cumulative Log Return Performance of Dividend-Yield Portfolios. This figure plots cumulative log returns for dividend-yield–based portfolios constructed from dividend-capture events. Portfolios are formed by grouping events into Big 5, Big 10, and Big 5-only categories and are rebalanced daily using equal weighting across events on each date. Portfolio returns are scaled by a constant relative risk aversion parameter to account for optimal exposure to event returns. The figure illustrates the long-run performance of dividend-capture strategies across dividend-yield groups.

Figure A illustrates the long-run performance of dividend-capture strategies when portfolio exposure is scaled according to optimal leverage implied by constant relative risk aversion (CRRA) preferences. The purpose of this figure is to provide an economically interpretable benchmark for how the event-driven returns documented earlier translate into cumulative performance once risk preferences are considered. Because dividend-capture profits arise from discrete, short-lived events rather than continuous portfolio holding, the figure aggregates event returns over time after adjusting each day's exposure to reflect optimal risk-taking under a fixed risk-aversion parameter (γ=7.5).

Several patterns emerge clearly. Strategies concentrating on larger dividend events outperform those focused on smaller dividends by a wide margin. The Big10 strategy exhibits

substantially higher cumulative log returns than the Big5-only strategy. This ranking mirrors the cross-sectional evidence from the event-return regressions, where large-dividend events generate stronger and more stable abnormal returns. Importantly, the relative performance gaps persist over the full sample period, indicating that the profitability of large-dividend events is not driven by a short-lived episode but reflects a systematic feature of ex-dividend price adjustment.

Finally, the figure highlights that the economic value of dividend-capture strategies is concentrated in a small number of predictable, high-dividend events. Under CRRA preferences, the optimal exposure to large-dividend events is modest in magnitude: for the Big-10 strategy, the optimal leverage is approximately 0.422[10]. Economically, this implies that on each Big-10 ex-dividend date, an investor allocates about 42% of total wealth to the dividend-capture position and keeps the remaining 58% in cash earning the risk-free rate.

Despite this conservative allocation, the cumulative log return series exhibits strong and persistent growth over multiple decades. The performance gap between large-dividend and smaller-dividend strategies remains pronounced throughout the sample, consistent with the higher per-event abnormal returns documented earlier.

[10] Under CRRA preferences with $\gamma = 7.5$, the optimal exposure is 0.42 of total wealth per Big-10 event. This implies that the strategy typically operates without net borrowing: on days with one or two Big-10 events, total exposure remains below full wealth (0.42 or 0.84). Days with three or more events, which would require aggregate exposure exceeding unity, are rare in the sample. Among 588 unique Big-10 event days, only 7 days (about 1.2%) feature three or more events. As a result, the cumulative return profiles of the baseline strategy and a version imposing a no-borrowing constraint are nearly indistinguishable.

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