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The behavior of stock prices around the ex-day during a dividend shortage ♣

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Abstract

This paper investigates the behavior of stock prices around ex-dividend dates in Europe over the period 2018-2022. In the early months of the COVID-19 pandemic in 2020, a significant fraction of firms cut, suspended, or reduced their dividend payments, leading to a shortage. Using a comprehensive sample of 14,844 dividend payments from 17 countries, we find that the magnitude of abnormal returns around the ex-dividend date is significantly larger during this period compared to normal times as dividend-seeking investors searched for the remaining payers. This pattern is amplified for high-yielding dividend stocks and in countries that temporarily imposed short-selling bans. Our results are consistent with a price-pressure hypothesis and challenge standard interpretations derived from an efficient market framework.

JEL: G12; G14; G35

Keywords: dividend capture; price pressure; ex-dividend date; event study

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1 Introduction

"Dividends are quite important to me […] My problem is that companies cut dividends not because they couldn't pay them but because of political correctness in the current climate. That is troubling. It has real consequences." (Wigglesworth et al., 2020). Anecdotal evidence such as this is abundant as many investors, in this case, a Scottish retiree, rely on dividend streams to access stable returns and are left in distress when the stream stops flowing.

During the COVID-19 pandemic, many companies decided to cancel, cut, or delay dividend payments due to political pressure or fiduciary duties amid strong global economic uncertainty. Janus Henderson (2021) reports that global payouts fell by 12% in 2020—representing a reduction of more than USD 200 billion in cash distributions. This phenomenon was especially salient in Europe, which accounted for half of the global decline in dividends. The sudden disappearance of dividends in some countries had consequences for investors, who had to find quick solutions to a reduction in steady cash flows and problems implementing common dividend investment strategies.

This paper takes advantage of this unprecedented event in Europe to examine the impact of a dividend shortage on stock price behavior around the ex-dividend date. In the literature, much attention has been paid to the abnormal returns observed on the ex-dividend date, as the price decline is usually smaller than the amount of dividend paid (e.g., Elton and Gruber, 1970; Kalay, 1982). Less attention has been paid to price movements around the ex-dividend date, because in an efficient market, in the absence of information, there should be no significant price movement during this period. Nevertheless, a few papers have explicitly examined a window of a few days around the ex-dividend date and reported abnormal price behavior. Eades et al. (1984) and Lakonishok and Vermaelen (1986) analyze stock returns five days before and after the ex-dividend date. Both papers find significant positive abnormal returns before the ex-dividend date and significant negative abnormal returns after the ex-dividend date.

More recently, Hartzmark and Solomon (2013) find similar results and document the existence of a so-called dividend-month premium, as risk-adjusted returns are positive in months when the dividend is issued. These results call into question market efficiency, as there is no specific release of information about the dividend around the ex-dividend date. Hartzmark and Solomon (2013) attribute these results to the price pressure from dividend-seeking investors, who buy the stock to generate income. These investors range from unsophisticated individuals, such as the Scottish retiree in the first quote, to more sophisticated investors, such as equity mutual funds that engage in dividend capture strategies to increase their dividend yield (Harris et al., 2015). Henry and Koski (2017) show that institutional investors also actively use dividend capture strategies and that some of them successfully generate profits from these trades.

Dividend capture (also known as dividend harvesting or dividend scalping) is a short-term investment technique that involves buying a stock just before its ex-dividend date and selling it immediately thereafter. This strategy allows investors to receive an immediate cash payout regardless of the long-term price performance of the stock. In addition, Hartzmark and Solomon (2019) also show that investors, including individuals, mutual funds, and institutions, tend to view dividends as a free source of income and ignore the associated price decline on the ex-dividend date. This behavioral bias, called the free dividend fallacy, is likely to increase the demand for dividends prior to the ex-dividend date.

During the COVID-19 pandemic, firms suddenly cut, reduced, or postponed their dividend payments due to uncertainty about future earnings and/or regulatory or governmental pressure[1]. This led to an unexpected shortage of dividend payments in 2020, more specifically, between March and June of that year. Our study finds that about one-third of European companies

[1] For instance, the European Central Bank issued a statement on March 27, 2020, asking banks "not to pay dividends or buy back shares during COVID-19 pandemic until at least October 1, 2020".

suspended dividend payments in 2020, while about one-quarter reduced the amount of dividends paid. As some investors saw their potential income suddenly disappear, they were forced to invest in other dividend-paying firms to generate income. If the demand for dividends is constant, this situation will naturally lead to stronger price pressure before the ex-dividend date for the firms that continue to pay dividends. This paper uses this setting to examine the importance of increased investor demand for dividends in explaining price behavior around the ex-dividend date. The sudden and unpredictable nature of the shortage allows us to isolate the effect of increased price pressure.

In this study, we investigate the effect of the dividend shortage on the behavior of stock prices around the ex-dividend date using a sample of 3,029 dividend-paying companies and 14,844 payments in 17 European countries over the period 2018-2022. We first document a sharp decline in the number of companies paying a dividend in 2020 compared to the previous years, followed by a return to relative normality in subsequent years. In addition, we observe an unusual payment delay of about one month in 2020 for companies that pay a dividend. Second, we estimate cumulative abnormal returns (CAR) around ex-dividend dates and find a price pattern during the shortage period that is about twice as large as in the preceding and subsequent years. The limited number of dividends available has pushed investors toward remaining payers, inflating prices more than usual before the ex-dividend date, followed by a larger decline thereafter. This price pressure is also observed in higher-than-usual volumes around the ex-dividend date and in a stronger post-ex-dividend date price decline for those stocks that experienced more upward pressure prior to the ex-dividend date.

In additional analyses, we show that the CARs are significantly higher before the ex-dividend date in countries that banned short-selling during the shortage period. This result can be explained by the inability of arbitrageurs to absorb the excess demand for these stocks. We also show that investors did not only rush to high dividend-paying stocks during the shortage

period—although the CARs for these stocks are about two times higher—but were interested in any stock paying a dividend at that time. Finally, our results show that the scarcity effect remains highly significant after controlling for liquidity and dividend yield, both of which have a positive impact on CARs prior to the ex-dividend date.

Our main contribution to the literature is to identify a setting in which the effect of an imbalance between dividend supply and demand on stock prices around ex-dividend dates can be unambiguously observed. We use it to demonstrate several important facts. We find that additional price pressure during the shortage increased abnormal returns on the ex-dividend date by 0.2% and cumulative abnormal returns over a 5-day window before the ex-dividend date by 1.2%. Therefore, the sudden shortage of dividends led to more dividend capture than before. Moreover, investors tended to sell their stocks quickly after the ex-dividend date during the shortage, while they appeared to hold the stocks in their portfolios before. This led to a -1.5% lower cumulative abnormal return over a 5-day window after the ex-dividend date during the shortage period. This suggests that the dividend shortage changed investors' behavior. We also find that, after the shortage, investors continued to sell their shares quickly after the ex-dividend date, as cumulative abnormal returns are 0.6% lower in 2021 and 2022 compared to 2018 and 2019. Our study is one of the first to document the price behavior on the ex-dividend date in several European countries in light of the recent pandemic. Moreover, it provides new evidence on the changes in the dividend policy of European companies during this period.

Finally, this paper contributes to the asset pricing literature by addressing the fundamental question of how financial markets set prices. The classical efficient market hypothesis postulates that prices move only in response to new information. However, since the time window around the ex-dividend date does not contain any special information, our results showing the existence of price pressure and predictable price movements support theories that

deviate from the efficient market hypothesis and are discussed in Hartzmark and Solomon (2021).

This paper is structured as follows. Section 2 reviews the literature on stock price movements around ex-dividend dates and presents the hypotheses tested in this paper. Section 3 describes the data set and characterizes the dividend shortage period. It also provides methodological details. Section 4 presents our empirical results, while Section 5 concludes the paper.

2 Literature review and hypothesis

Stock price behavior on ex-dividend dates has attracted the attention of researchers since the seminal work of Campbell and Beranek (1955). In perfect capital markets, the stock price decline should be equal to the amount of the dividend paid out on the ex-dividend date. Since then, many studies have shown that this is not the case and that the ratio of price decline to dividend is consistently below one, thus generating positive returns (e.g., Elton and Gruber, 1970). Over time, several reasons have been offered to explain this phenomenon without reaching a consensus.[2]

Studies investigating the behavior before and after the ex-dividend date are less common. Since no specific information is released around this date, market efficiency postulates that there should be no abnormal price movements during this period. However, Eades et al. (1994) are the first to investigate and document the presence of significant positive (negative) abnormal returns five days before (after) the ex-dividend date for a large sample of US stocks. They

[2] Elton and Gruber (1970) propose a tax clientele effect. Stock price and ex-dividend day behavior depend on the differential taxation of capital gains and dividends. Later studies (e.g., Frank and Jagannathan, 1998) contradict this finding, as the effect appears to persist in the absence of differential tax treatment. Kalay (1982) suggests that the insufficient price decline reflects the transaction costs of arbitrageurs trading in such stocks. These short-term traders will generate abnormal profits through dividend capture. Michaely and Vila (1995), in a dynamic dividend clientele model, reconcile both explanations by examining all types of traders that affect the equilibrium price on the ex-dividend day. Finally, market microstructure may also explain the existence of this phenomenon. Bali and Hite (1998) and Frank and Jagannathan (1998) show that both price discreteness and a bid-ask bounce affect the ex-dividend price drop. More recently, Paudel et al. (2022) show that an important part of the ex-dividend price drop may be related to investor sentiment.

examine various explanations for their results, such as the proximity of the dividend announcement date to the ex-dividend date or the day-of-week effect, but cannot attribute their results to these factors. They conclude that their study reveals a pricing anomaly and call it the ex-dividend period anomaly. Lakonishok and Vermaelen (1986) also study the ex-dividend period and find similar results for a large sample of US stocks. They are the first to consider the buying pressure as a possible explanation for the positive returns observed before the ex-dividend date. These authors also examine the evolution of trading volumes around the ex-dividend date and report a significant increase in abnormal volumes around the ex-dividend date. They conclude that this additional trading activity is the result of so-called cum-ex traders, i.e., investors pursuing dividend capture strategies. More recently, Hartzmark and Solomon (2013) extend the observation window and consider the returns from 30 days before the ex-dividend date to 60 days after the ex-dividend date over the period 1927-2011 in the United States. They find significant positive (negative) abnormal returns before (after) the ex-dividend date. Hartzmark and Solomon (2018) and Eugster et al. (2022) find similar evidence for shorter time windows for samples covering international markets.

Hartzmark and Solomon (2013) also examine the performance of a simple investment strategy based on these results. It involves buying stocks in the months in which they are predicted to issue a dividend in order to take advantage of the dividend month premium. Since their strategy yields positive and significant abnormal returns—as large as those of the value premium—it can be considered a new asset pricing anomaly. Its existence has been confirmed internationally by Ainsworth and Nicholson (2014), Koo and Chae (2020), and Kreidl and Scholz (2020). Hartzmark and Solomon (2013) further attribute the existence of abnormal returns around the ex-dividend date to the price pressure generated by dividend-seeking investors. They claim that supply and demand for dividend-paying stocks are likely to shift a few days before the ex-dividend date as some investors buy the stock to capture the dividend.

This will attract arbitrageurs who will profit from offsetting price movements due to this dividend-driven trading. Stock prices should rise if there is a demand overhang and arbitrageurs cannot offset it.

Strong demand for dividends may exist for several reasons. These include the catering theory (Baker and Wurgler, 2004), mutual funds investing in dividend-paying stocks before the ex-dividend date to increase their dividend yield (Harris et al., 2015), investors following dividend capture strategies (Henry and Koski, 2017), or investors not paying attention to the stock price decline from the cum-dividend to the ex-dividend date (Hartzmark and Solomon, 2019).

Hartzmark and Solomon (2013) claim that the existence of price pressure leads to predictions about the evolution of returns around the ex-dividend date. First, returns should be related to liquidity: less liquid securities are likely to experience larger price movements from a given level of excess buying. Second, price pressure should be higher on days closer to the ex-dividend date, as investors are unwilling to hold the stock longer than necessary, and returns closer to the ex-dividend date should be larger than those on days further from the ex-dividend date. Third, price pressure should lead to reversals after the ex-dividend date, either due to arbitrage traders unwinding their positions or catering investors having a lower preference for the stock. Finally, there should be a negative relationship between the price performance of a given stock before and after the abnormal ex-dividend date.

These predictions should hold for the same level of demand. However, the strength of demand is also variable. Hartzmark and Solomon (2013) suggest that the demand for dividends is affected by two factors. The first is the amount of the dividend. Demand should increase with the level of dividends paid because dividend-seeking investors will prefer stocks of companies that pay larger dividends, as measured by the dividend yield. Therefore, these stocks should have higher abnormal returns around ex-dividend dates. The second factor affecting dividend demand is economic uncertainty. This is consistent with behavioral theories that suggest that a

dividend is a safe payout. Therefore, the demand for dividends should be higher during periods of aggregate uncertainty. Hartzmark and Solomon (2013) propose to quantify uncertainty with two measures: the level of the VIX index, which measures the expected future volatility of the stock market, and the state of the economy, measured by periods of recessions as defined by the National Bureau of Economic Research.

In this paper, we consider another situation that should lead to an imbalance between dividend demand and supply: a period of dividend shortage. Specifically, if a substantial fraction of listed firms reduces their dividend payments and the number of dividend-seeking investors remains constant, the demand for the stocks of the remaining dividend-paying firms should increase. Consequently, we should observe the aforementioned price pressure effect with a stronger magnitude of abnormal returns. Such observations would provide new evidence of the important role of price pressure generated by dividend-seeking investors on the behavior of stock prices around the ex-dividend date. Therefore, we propose the following hypothesis:

H1: *The magnitude of the abnormal returns around the ex-dividend date is higher during the shortage period.*

The COVID-19 pandemic provides an ideal setting to test this hypothesis as we document a large decline in dividend payments among European listed firms. Several studies use the COVID-19 pandemic to expand the dividend literature. These papers report a decline in the number of dividend payments in the United States (Krieger et al., 2021; Pettenuzzo et al., 2023), G-12 and G-7 countries (Ali, 2022; Ntantamis and Zhou, 2022), and China (Liang et al., 2023). Janus Henderson (2021) documents that Europe is the region of the world where dividend payments have fallen the most. Pettenuzzo et al. (2023) also compare the change in dividend payments during the Global Financial Crisis and the pandemic. They report a much larger decrease in dividend payments during the pandemic. During the same period, Kumar et al. (2022) find a spike in dividend sentiment, suggesting an increase in dividend demand. While

most of the existing literature focuses on the pandemic outbreak, our paper exploits both the pandemic dividend drop, and the post-pandemic dividend rebound.

3 Data and methodology

3.1 Sample

European markets provide an ideal setting to study investor behavior in the face of a dividend shortage, as Europe was the most affected region by dividend cuts in 2020 (Janus Henderson, 2021). Our sample includes all companies from 17 European countries[3] from January 2018 to December 2022. Financial and accounting data are obtained from LSEG Datastream. We restrict the sample to companies listed in their own country (i.e., no cross-listings) with a minimum share price of EUR 1.00 and a market capitalization above EUR 50 million.[4] This gives us an initial sample of 4,570 companies, covering a large proportion of the total universe of publicly listed European companies. We further exclude companies that have never paid dividends in the five-year period and those that have paid more than four dividends in a single year. We end up with a sample of 3,029 dividend-paying companies and 14,844 payments.

Table 1 shows the final sample by country with the distribution of the number of dividend payments by company. The United Kingdom, Germany, Sweden, and France dominate the sample in terms of the number of companies and payouts, which is representative of the European market. Overall, about half of the dividends in our sample are paid on an annual basis, and more than a third on a semi-annual basis. Higher payment frequencies, such as quarterly payments, appear to be relatively negligible in Europe.

The high number of payments in the United Kingdom is explained by a larger number of listed companies and a higher payment frequency—as opposed to an annual payment frequency

[3] The list of countries selected for our study is based on the countries of companies included in the STOXX Europe 600 index, a leading index for Europe.
[4] We ensure that these three restrictions hold at the beginning of our sample period, just before the dividend shortage (January 2020) and at the end of our sample period.

in most continental European countries. While more than 95% of the dividends in Germany and Switzerland are paid on an annual basis, this applies to only 11% of the dividends paid in the United Kingdom. There, about 75% of dividends are paid semi-annually. Semi-annual payments are also more common in the Netherlands, Ireland, Luxembourg, and Spain.

[Insert Table 1 here]

3.2 The dividend shortage

The COVID-19 pandemic had a profound impact on the way companies did business. In terms of dividends, the health crisis and measures did not have a direct impact on companies. However, the high level of economic uncertainty associated with this novel type of crisis may have affected profits and, consequently, dividends. As a result, companies decided to modify their payout policies out of a sense of fiduciary responsibilities, in order to be better prepared in the event of a prolonged crisis with unknown consequences. At the same time, several European governments strongly discouraged or, in the case of the financial industry, banned the distribution of corporate profits.

To understand the changes in payout policy during the COVID-19 pandemic, we first focus on a subsample of firms with regular dividend payouts, i.e., firms that paid a similar number of dividends per year in the two years prior to the COVID-19 pandemic—either one, two, or four dividends per year. Table 2 reports descriptive statistics on the payout behavior of these companies over the period 2019 to 2022. Panel A compares 2020, the year of the dividend shortage, with the benchmark year 2019.[5] In 2020, more than one in three companies canceled its dividend payment. This is true for both annual and semi-annual dividend payers. For companies paying quarterly dividends, the cancellation rate drops to 7.6%. This can be explained by the fact that these companies omitted dividend payments in the early part of the

[5] Using 2018 or the average of 2018 and 2019 as benchmark does not change the results.

year when economic uncertainty was at its highest, but refrained from doing so later in the year when uncertainty had eased.

However, those companies that continued to pay dividends behaved differently. 27% increased the annual dividend amount in 2020, 24% decreased it, and 14% left it unchanged. Furthermore, a higher payment frequency led to relatively more dividend cuts. We also see that 54% of payers have not changed their payment frequency in 2020. However, this is mitigated by the results for higher frequencies, where dividend cuts were more common. Again, this can be explained by the fact that in 2020, companies omitted early payments and kept late payments. For annual payers, the decision to pay or cancel was mainly made instead of increasing the frequency (only 3.64%).

In addition to cancelling dividends or playing around with payment frequencies, managers had a third choice of simply delaying the payment in the hope that the uncertainty would decrease over the course of the year. Therefore, we calculate the number of days that the first dividend payment in 2020 was delayed compared to the first payment in 2019.[6] The results show that, on average, companies paid their first dividend in 2020, 32 days later than in 2019. This is particularly true for annual payers (29 days), while semi-annual payers were more delayed (43 days) and quarterly payers were less delayed (10 days).

[Insert Table 2 here]

Panels B and C perform an equivalent analysis by comparing 2021 and 2022 with the benchmark year 2019. Overall, the results show a return to relative normality for these two years. 86% to 97% of the companies that paid dividends in 2019 did so in these two years. More than half also showed higher or unchanged dividend amounts, while around three out of four

[6] For example, if a company paid its first (and perhaps only) dividend in 2019 on March 1 and in 2020 on March 31, the payment was delayed by 31 days.

companies returned to the same payment frequency as in 2019. Finally, the delay in payment also decreased sharply to 5.6 and 1.8 days in 2021 and 2022, respectively.

The change in firms' dividend policy is also likely to be reflected at the market level. Figure 1 shows the evolution of the number of dividends paid per day in our full sample of European companies (i.e., not just the regular payers). We observe that the number of dividend payments decreased from March 2020 to July 2020.

[Insert Figure 1 here]

A more detailed analysis shows this more clearly. Figure 2 illustrates the dividend availability in terms of the number of payments (Panel A) and amounts distributed (Panel B) per month for the full sample from 2018 to 2022. We observe a dividend season between March and June with the highest number of payments and aggregate amounts. In the pre-COVID years, almost 50% of the payments (about 60% in terms of amount) occurred during this window. In 2020, however, there was an apparent shortage of dividends. Over these four months, the number of payments decreased by 54.2% and the amount distributed by 51%, compared to the same period in 2019. This shortage is less pronounced as the year progresses and appears to reverse somewhat in the last quarter of 2020.

[Insert Figure 2 here]

Table 3 provides more specific results on the delay of dividend payments. The table reports the number of payments per calendar month for the subsample of annual dividends. This allows us to track companies accurately without worrying about firms playing around with payment frequency, which could bias our results. From 2018 to 2022 (excluding 2020), 76% to 81% of dividend payments occurred between March and June, with only a few occurring before or after this period. For 2020, however, we observe a change in this pattern, with two distinct trends. First, only 56% of dividend payments were made between March and June, compared to the usual 80%. Second, there was a catch-up effect, with an unusually high number of payments

from July to December. While only about 14% of payments are typically made during this period in normal years, the figure rose to about 37% in 2020. This again suggests that companies delayed their dividend payments in 2020. Finally, as before, we find evidence that the usual monthly distribution of payments returned to its pre-crisis shape in 2021 and especially in 2022.

[Insert Table 3 here]

Our findings thus far strongly suggest that 2020 was a special year and that as companies reacted to the economic uncertainty, there were disruptions and shortages of dividends, especially from March to June 2020. This has implications for how investors could benefit from a dividend capture strategy. Therefore, to test the various predictions regarding the impact of price pressure on returns around the ex-dividend date, we consider three separate periods: the shortage period (March to June 2020), the pre-shortage period (January 2018 to February 2020) and the post-shortage period (July 2020 to December 2022).

3.3 Methodology

To examine the dividend capture behavior of investors during the dividend shortage period, we use an event study methodology. To calculate abnormal returns, we calculate the difference in returns for stock *i* and its corresponding national stock market index *m* (as defined in Table 1). The equation is as follows:

$$AR_{i,t} = R_{i,t} - R_{m,t} \quad [1]$$

where $AR_{i,t}$ is the abnormal return of company *i* at time *t*, $R_{i,t}$ the return of company *i* at time *t*, and $R_{m,t}$ the return of the stock's corresponding national stock market index *m* at time *t*. Returns are calculated from the closing prices at time *t*. An exception is the price on date *0* (the ex-dividend date), which is the opening price on that day. $R_{i,0}$ is therefore computed as the overnight return in order to closely reflect the return on the ex-dividend date. Consequently, $R_{i,1}$

represents the return from the opening price on the ex-dividend date to the closing price at time t+1.

The cumulative abnormal returns before and after the ex-dividend date are then calculated as the sum of the abnormal returns over the event window *e*. The event window is defined as the period from 5, or 1 day before the ex-dividend date to the ex-dividend date (0) or from the day after the ex-dividend date (1) or 5 days after the ex-dividend date.[7] The equation for the cumulative abnormal returns is as follows:

$$CAR_{i,t} = \sum_{t=-e}^{t=0} AR_{i,t} \quad [2a]$$

$$CAR_{i,t} = \sum_{t=1}^{t=e} AR_{i,t} \quad [2b]$$

where $CAR_{i,t,}$ is the cumulative abnormal return of company *i* at time *t*. Finally, we perform a regression analysis to examine the factors that influence the CARs. The regression takes the form:

$$CAR_{i,t} = \alpha + \beta_1 shortage + \beta_2 X_{i,t} + \beta_3 country + \beta_4 industry + \varepsilon_{i,t} \quad [3]$$

where *shortage* (*post-shortage*) is a dummy variable equal to one for the shortage (post-shortage) period and zero otherwise. The shortage period is from March to June 2020, while the post-shortage period is from July 2020 to December 2022. $X_{i,t}$ denotes a vector of control variables, including firm size (natural logarithm of the market capitalization), beta (calculated over 250 days on the respective national stock index), and the book-to-market ratio (defined as the book value over the market value of equity). These three control variables proxy for the standard asset pricing factors. The description of all variables used in the analysis can be found

[7] We also examine a larger event window of up to 10 days before and after the ex-dividend dates. The results remain largely consistent, with a significant pattern occurring mainly between five days before and after the event date.

in Appendix A1. All specifications include country and industry fixed effects, and standard errors are clustered at the firm level.

4 Empirical results

4.1 Baseline results

Panel A of Table 4 reports summary statistics for the CARs. We find that CARs are, on average, positive before the ex-dividend date and negative after the ex-dividend date, a result consistent with the previous literature. Panel B presents summary statistics for the explanatory variables used in equation [3]. The average dividend yield of the firms included in our sample is 2.4%. Finally, Panel C provides difference-in-means tests between the CARs for the three subperiods: pre-shortage, shortage, and post-shortage. All three subperiods display a similar pattern, i.e., positive CARs before the ex-dividend date and negative CARs after the ex-dividend date. However, the results of the difference-in-means tests show that the CARs in the shortage period are significantly higher than in the other two periods before the ex-dividend date, and they are significantly lower after the ex-dividend date, in line with our hypothesis.

[Insert Table 4 here]

Figure 3 illustrates the evolution of cumulative abnormal returns, from five days before to five days after the ex-dividend dates for the three periods. Consistent with the price pressure hypothesis, we observe that dividend scarcity exacerbates the price pattern around the ex-dividend date. In all three periods, cumulative abnormal returns increase up to the ex-dividend date and decrease thereafter. While both the pre- and post-shortage periods show a narrow trend and a peak around 1%, this is not the case for the shortage period. Here, the cumulative abnormal returns increase much faster and peak at a higher level of more than 2%. On ex-dividend dates, cumulative abnormal returns are twice as high as in the other two periods. With

fewer dividends available to implement dividend capture strategies, investors chased the dividends of the remaining payers, pushing stock prices sharply higher.

As expected, the abnormal returns turn negative after the ex-dividend date as investors close their dividend positions. During the pre-shortage period, abnormal returns only decline slightly and remain relatively high after five days. This is consistent with the free dividend fallacy of Hartzmark and Solomon (2019), where investors buy the stock to get the cash payment but then keep the stock in their portfolio. However, we find that cumulative abnormal returns return to similar levels for both the shortage and post-shortage periods and are absorbed after five days. This discrepancy suggests a change in investor behavior. During the pre-shortage period, investors preferred to hold dividend-paying stocks in their portfolios. However, since the shortage period, they have tended to follow a pure dividend capture strategy and sell them immediately.

[Insert Figure 3 here]

Table 5 provides additional findings on the visual evidence. We regress the different cumulative abnormal returns on the shortage period and post-shortage periods, controlling for firm characteristics associated with stock returns and industry and country fixed effects. Overall, the results of Table 5 provide consistent results across the different event windows. The constant indicates that a reference company in the pre-shortage period had positive (negative) abnormal returns before (after) the ex-dividend date due to dividend capture. During the shortage period, the price pressure was significantly higher both before and after the ex-dividend dates. With fewer dividends available, investors rushed on the remaining payers and drove prices higher than in normal times, confirming our main hypothesis. This result holds for the post-shortage period, but to a much lesser extent. This could be partly explained by the fact that in 2021, the number of dividends available to investors did not fully recover to the pre-

shortage levels and that some companies did not pay dividends. Investors were, therefore, more inclined to pursue a pure dividend capture strategy.

[Insert Table 5 here]

We also consider trading volume to corroborate our findings on stock returns. Following Hartzmark and Solomon (2013) and Bali and Francis (2011), we compute the abnormal volume for stock *i* on day *t* as the trading value of stock *i* on day *t* divided by the average trading value of stock *i* over the previous 250 days.[8] The average abnormal volume is then computed as the average of the abnormal volumes of all dividend-paying stocks on that day minus one. Figure 4 shows the average abnormal volume observed each day around the ex-dividend date.

[Insert Figure 4 here]

We observe a similar pattern for the three sub-periods. Volumes are abnormally high before the ex-dividend date—reflecting a higher trading activity—leading to positive abnormal returns. This indicates that there is a higher demand for these stocks before the ex-dividend date. There is high trading activity on the ex-dividend date, most likely because dividend capture strategies are closed, and from day +1 onwards, volumes return to normal. This evolution of trading volume is consistent with the results found in the previous literature (e.g., Lakonishok and Vermaelen, 1986; Bali and Francis, 2011). We observe almost identical patterns for the periods before and after the shortage. However, the shortage period has two peculiarities. First, it is characterized by higher abnormal volumes, which may be related to the higher trading activity observed globally during the COVID-19 pandemic (Chiah and Zhong, 2020). Second, these higher trading volumes also reflect the fact that the remaining dividend-paying stocks were targeted by a larger number of investors. The higher volume can explain the larger higher abnormal returns observed over the period. Another peculiarity is that trading volumes remain at high levels after the ex-dividend date, which is related to the previous point. Nevertheless,

[8] As there are no overnight volumes, here, t=0 corresponds to the abnormal volumes at the end of the ex-date.

we also observe abnormal volumes on date +1, which could reflect a higher trading activity related to the closing of the positions of dividend capture strategies.

Dividend capture is also expected to exert abnormal upward pressure on prices in the run-up to the ex-dividend date and, conversely, lead to a decline in the following days as investors unload their shares. Thus, we expect a negative relationship between the cumulative abnormal returns before and after the ex-dividend date. The findings in Table 6 confirm this relationship and align with the predictions of Hartzmark and Solomon (2013) regarding the presence of price pressure. In general, abnormal returns were significantly more pronounced during the shortage and post-shortage periods, consistent with our previous findings. However, we find that higher cumulative abnormal returns before the ex-dividend date lead to a proportionally stronger response after the event. Moreover, this relationship is more pronounced during the shortage period, suggesting an increased intensity of dividend capture activity during such periods, as evidenced by the significant coefficients for the interaction term with the shortage period.

[Insert Table 6 here]

4.2 The role of arbitrageurs

Standard financial theory postulates that an excess demand associated with dividend-seeking investors should attract arbitrageurs who profit from offsetting movements and absorbing this excess demand, in particular by shorting stocks in the period leading up to the ex-dividend date (Hartzmark and Solomon, 2013). During the initial phase of the COVID-19 pandemic, aggregate stock prices experienced a rapid decline in February and March 2020. Six market authorities in Europe responded to this situation by introducing market-wide short-selling bans in the hope of stabilizing prices and reducing volatility (Spolaore and Le Moign, 2023). The

bans were introduced simultaneously by Austria, Belgium, France, Greece, Italy, and Spain for the period from March 18 to May 18, 2020.[9]

Since this event occurs during our shortage period, we create a dummy variable equal to one for the stocks of dividend-paying firms located in one of these six countries during the period of the short-selling ban. Thus, we estimate equation [3] with an additional dummy for the ban. Since short-sellers are particularly useful for absorbing some of the excess demand prior to the ex-dividend date, we expect that their disappearance should lead to higher abnormal returns for the stocks located in these countries during this period. The results are shown in Table 7.

[Insert Table 7 here]

We observe that the CARs for the firms affected by the ban are significantly higher for the five days before the ex-dividend date and especially for the day before. The results for the shortage period are unaffected and remain significant. The CARs after the ex-dividend date are not significant, but short-sellers are less important for price formation after the ex-dividend date when investors sell their shares. This result provides additional evidence that price pressure plays an important role as a driver of abnormal returns before the ex-dividend date.

4.3 The effect of dividend intensity

Dividend payments are heterogeneous, particularly in terms of their size. Due to the presence of search and trading costs, as well as the risks associated with price volatility, it is reasonable to expect that investors may choose dividend capture strategies that primarily target securities with high dividend yields in order to maximize returns. For this reason, Hartzmark and Solomon (2013) argue that the level of dividends is one of the main drivers of the demand for dividends, and therefore, stronger abnormal returns should be observed for these stocks.

[9] Italy and Spain started their short-selling bans one day earlier on March 17, 2020.

In Figure 5, we present this hypothesis by splitting the sample according to the level of the dividend yield. Panel A reports the cumulative abnormal returns for companies with dividend yields above 3%, while Panel B shows the cumulative abnormal returns for stocks of firms with dividend yields below 3%.[10]

[Insert Figure 5 here]

Consistent with the results in Figure 3, cumulative abnormal returns before ex-dividend dates are always positive. However, the magnitude varies significantly across the different groups. Stocks in the high-yield category exhibit cumulative abnormal returns approximately twice as high as those in the low-yield category, making them the most profitable and, therefore, the most purchased. Regardless of the size of the dividend yield, the highest cumulative abnormal returns occur during the shortage period in both panels. Thus, not only did investors rush for high dividend yields in this period, but any company paying dividends was of interest.

For the days following the ex-dividend date, abnormal returns appear to decline again but, in most cases, remain at a cumulative abnormal return level of around 1% after five days. Panel B shows that the lowest-yielding stocks were less sought during the post-shortage period, as their returns were the lowest and, in some cases, did not even allow for a positive return.

Table 8 extends the analysis of Figure 5. The dummy indicating observations with a dividend yield above 3% is highly significant and consistent with the hypothesis of price pressure and preference for high dividend yield stocks. However, the shortage period dummy also remains highly significant, suggesting a dividend scarcity effect over and above the dividend yield effect. The interaction term between the shortage and high dividend dummies shows a moderate relationship between these two dimensions only in a very narrow event window around the ex-

[10] These cut-offs are in line with the top and bottom quartiles of the dividend yield distribution. We prefer fixed cut-offs as investors a priori do not exactly know the distribution of dividend yields. They are probably more inclined to have a certain yield in mind above which a trade is deemed interesting.

dividend date. This suggests that, due to the limited availability of dividends, investors showed interest in all companies that continued to pay dividends.

[Insert Table 8 here]

4.4 Robustness tests

One may wonder whether the scarcity effect is not explained by other factors known in the literature to drive dividend capture, such as stock liquidity or dividend yield. We may have a sample bias on these two dimensions in the shortage period if only a certain type of company continued to pay dividends. In Table 9, we run our analysis, including continuous variables for dividend yields and stock illiquidity (proxied by Amihud's illiquidity measure). We find that both illiquidity and dividend yield have a significant positive effect on cumulative abnormal returns prior to the ex-dividend date. However, both variables become much less significant after the ex-dividend date. This suggests that they play an important role in the build-up of price pressure, but not in the unwinding of positions. These results are consistent with the prediction of Hartzmark and Solomon (2013) regarding the existence of a price pressure effect. However, we find that the scarcity effect remains highly significant even after controlling for illiquidity and dividend yield. This suggests that the scarcity of dividends has a specific impact and that it has increased the price pressure effect around ex-dividend dates.

[Insert Table 9 here]

We also examine whether our results are sensitive to the definition of the shortage period. First, we extend the shortage period to the entire year 2020, as it can be argued that there were differences in dividend payments throughout the whole year. Second, since most dividend payments in Europe take place in the March-June period, we compare the 2020 shortage period with dividend payments in other years only in the March-June period. The results are presented in Appendix Tables A2 and A3, respectively. In both tables, the coefficients on the shortage

period are significant and have a similar magnitude to our baseline results. Thus, our initial findings are not driven by the definition of the shortage period.

Finally, in unreported results, we find that our results are similar when we: (1) compute the ex-dividend date return using cum- and ex-dividend date closing prices—instead of overnight returns; (2) compute abnormal returns using a market model to adjust raw returns; and (3) cluster the standard errors at the firm and day levels to account for the fact that some days have a clustering of dividend payments as shown in Figure 1.

5 Conclusion

The assumptions of perfect capital markets and market efficiency postulate that investors are rational and fully aware of the price drop that should occur on the ex-dividend date. Since no specific information is released on the ex-dividend date, no abnormal returns should be observed on the days surrounding the ex-dividend date. The empirical evidence presented in this paper contributes to the literature showing that stock prices behave differently than expected in the standard theoretical framework.

We first identify a period in which dividends suddenly became scarce. In the period from March to June 2020, about one-third of European companies suspended their dividend payments due to the uncertainty created by the outbreak of the COVID-19 pandemic. This forced investors in need of dividends to buy stocks of firms that continued to pay dividends during this period. This situation increased the demand for these stocks and magnified the price patterns observed around the ex-dividend date. The rush manifested itself not only in high-yielding dividend-payers but also in any type of payment and translated into higher-than-normal volumes. It was also amplified in countries where short-selling was temporarily banned. Finally, we document that the scarcity of dividends led more investors to adopt dividend capture strategies. Our evidence is consistent with a price-pressure explanation for the abnormal returns observed around the ex-dividend date and with behavioral finance theories.

Our results also provide interesting insights into the impact of regulation on stock prices. First, they show that market-wide short-selling bans have a detrimental effect on pricing, as they induce larger abnormal returns around the ex-dividend date. They also highlight the possible impact of a restriction on dividend payments, such as the one imposed by the European Central Bank in May 2020.

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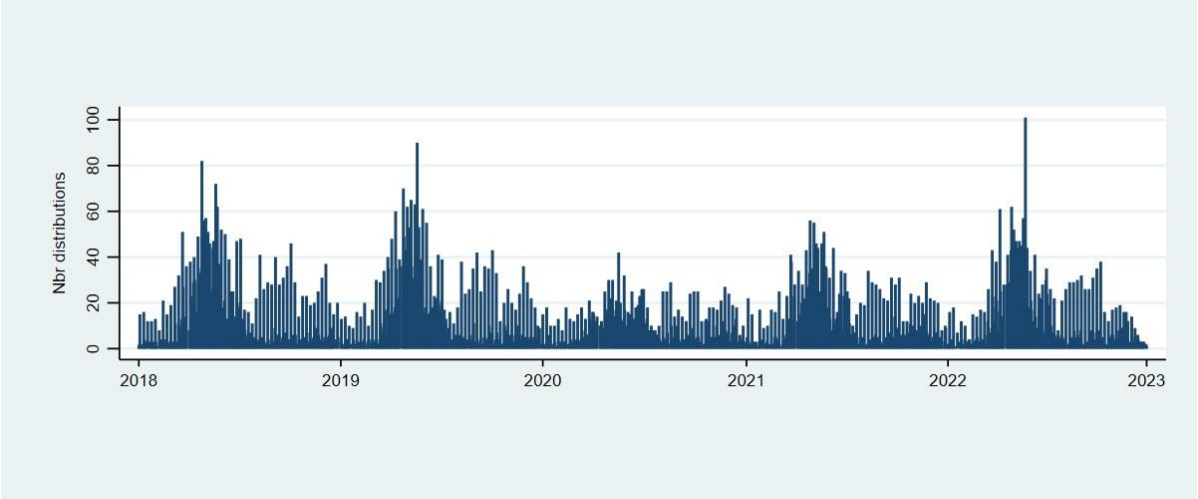
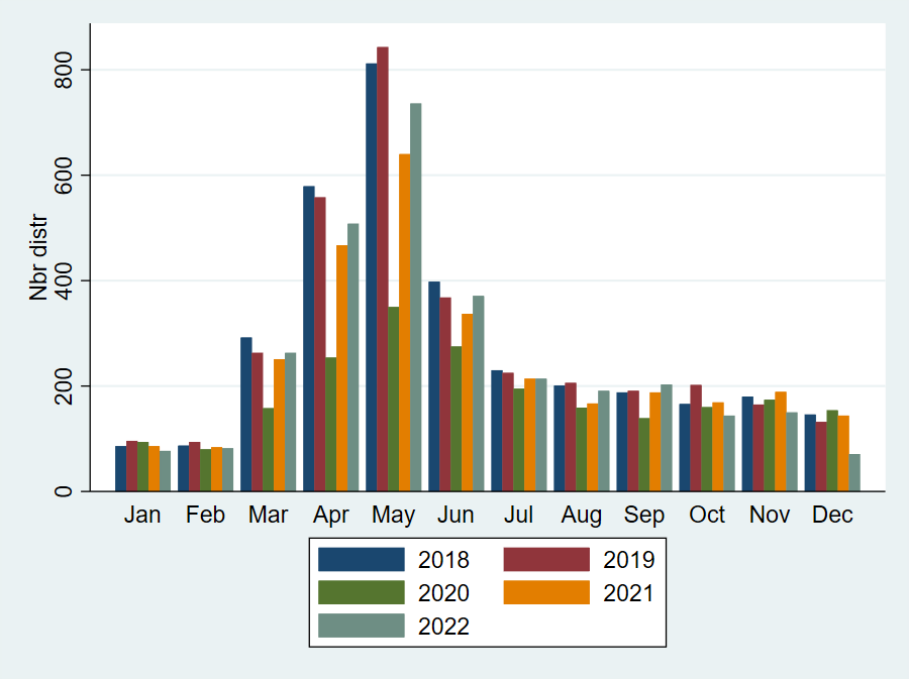
Figure 1
Daily dividend payments



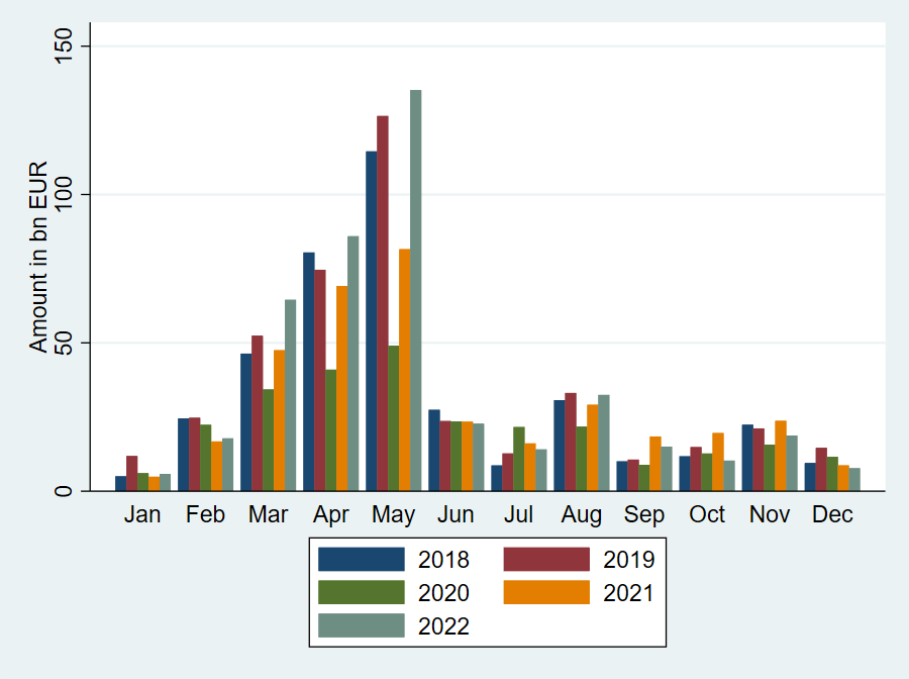
The figure reports the daily number of dividend payments from 2018 to 2022 for all sample firms.

Figure 2
Evolution of dividends by month

Panel A: number of monthly dividend payments

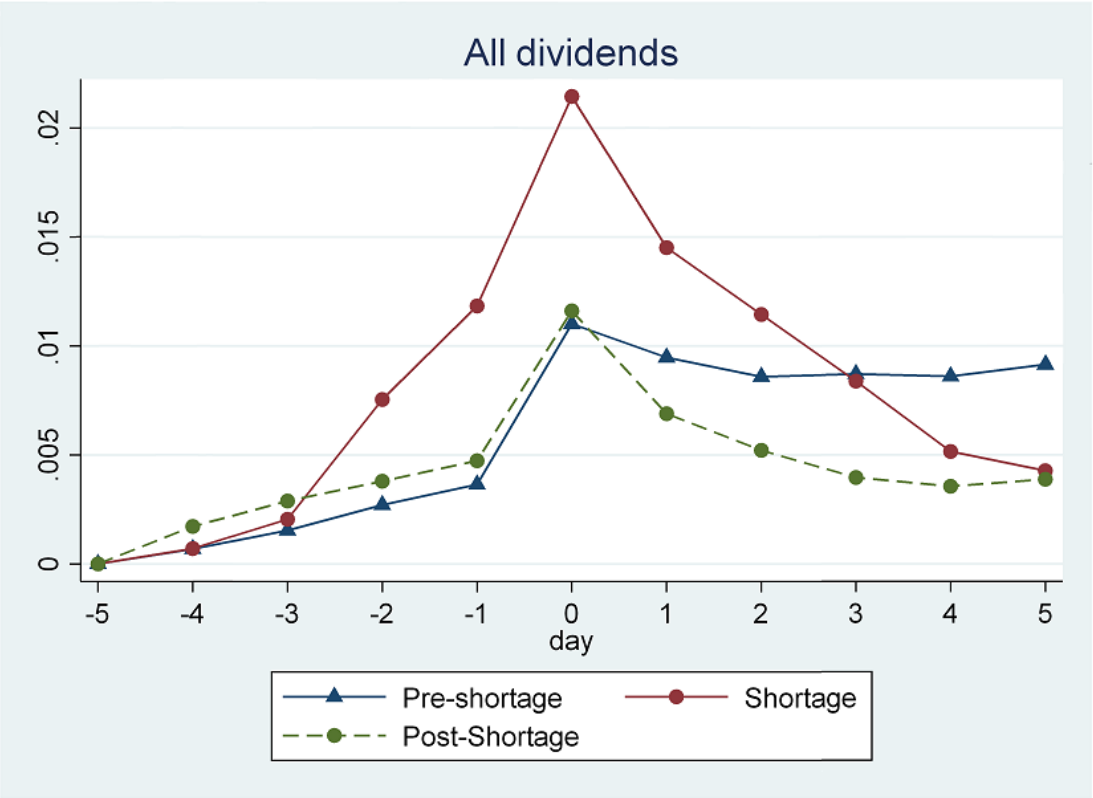


Panel B: aggregated monthly amount distributed



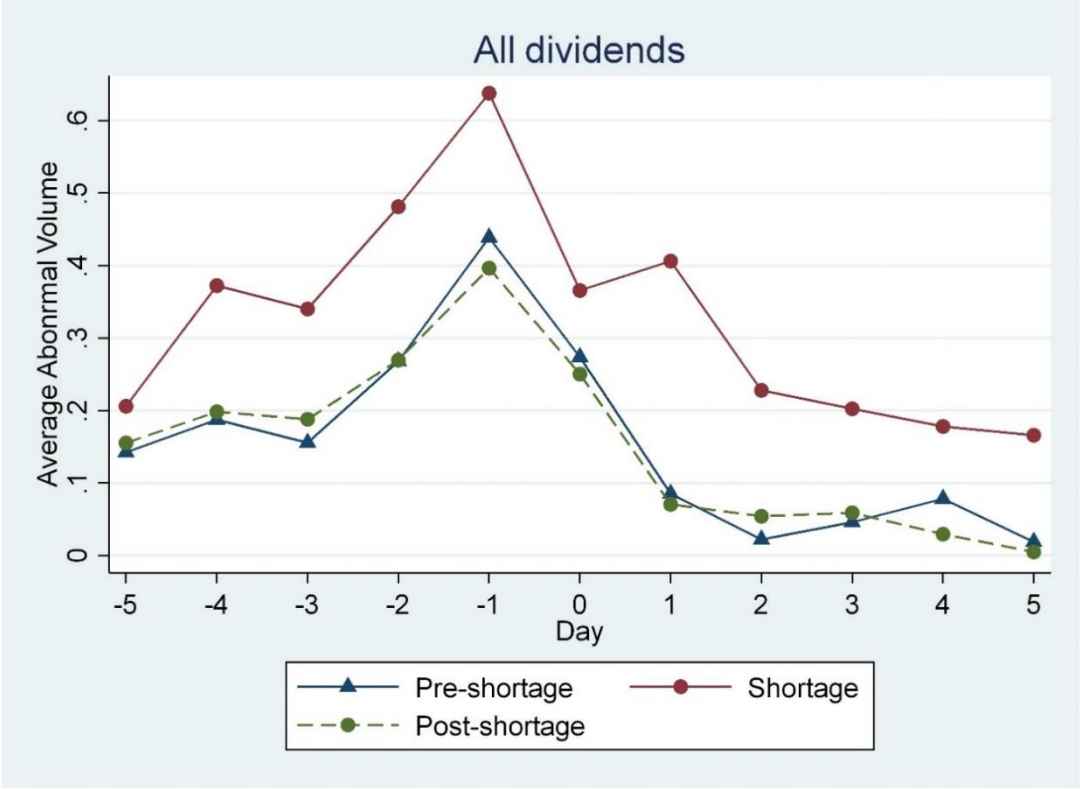
The figure reports the monthly number of dividend payments (Panel A) and the monthly aggregated euro amount of dividends paid (Panel B) from 2018 to 2022 for all sample firms.

Figure 3
Cumulated abnormal return around ex-dividend dates



The figure reports the evolution of abnormal returns from 5 days before to 5 days after ex-dividend dates for all dividends paid. The period before the shortage is from January 2018 to February 2020, the shortage period is between March and June 2020, and the post-shortage period is between July 2020 and December 2022.

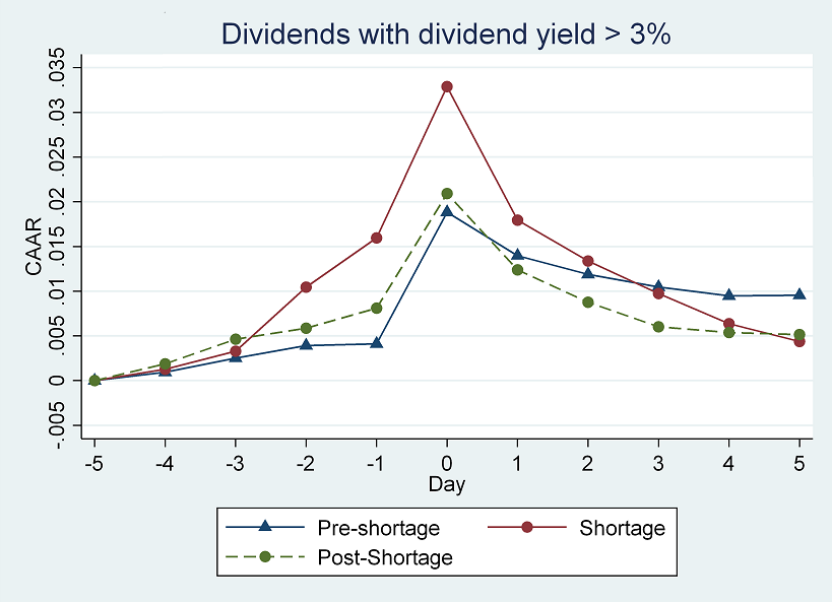
Figure 4
Average abnormal volumes around ex-dividend dates



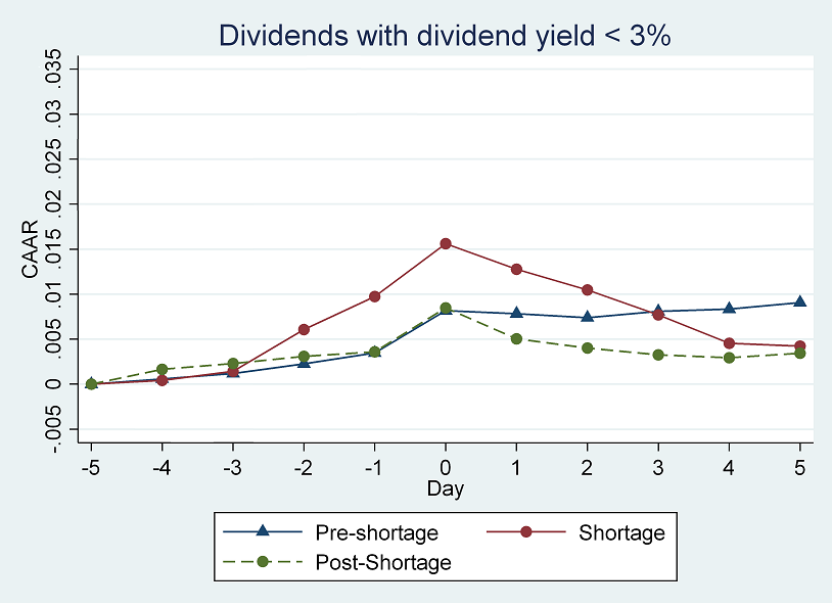
The figure reports the evolution of average abnormal volumes from 5 days before to 5 days after ex-dividend dates for all dividends paid. The period before the shortage is from January 2018 to February 2020, the shortage period is between March and June 2020, and the post-shortage period is between July 2020 and December 2022. We follow Hartzmark and Solomon (2013) and Bali and Francis (2011) and compute the abnormal volumes for stock *i* at time *t* as the trading value of stock *i* on day *t* divided by the average trading value of stock *i* over the previous 250 days. Average abnormal volume is then computed as the average of all dividend-paying stocks' abnormal volumes on that day minus one.

Figure 5
Cumulated abnormal return around ex-dividend dates by dividend intensity

Panel A: Dividend yields > 3%



Panel B: Dividend yield <3%



The figure reports the evolution of abnormal returns from 5 days before to 5 days after ex-dividend dates. Panel A shows the cumulative abnormal returns of stocks with dividend yield larger than 3%, Panel B shows the cumulative abnormal returns of stocks with dividend yield less than 3%. The period before the shortage is from January 2018 to February 2020, the shortage period is between March and June 2020, and the post-shortage period is between July 2020 and December 2022.

Table 1
Number of payments by country

			Number of payments				
Market	Benchmark index	Nb. Firms	All	One p.a.	Two p.a.	Three p.a.	Four p.a.
Austria	ATX	48	178	165	10	3	0
Belgium	BEL All share	81	400	263	127	3	7
Denmark	OMX Copenhagen	87	360	274	65	6	15
Finland	OMX Helsinki	132	646	367	231	9	39
France	CAC All-tradable	350	1,395	1,142	218	3	32
Germany	XETRA Prime All-share	396	1,543	1,503	29	0	11
Ireland	ISEQ All-share	27	174	27	118	6	23
Italy	FTSE MIB	210	767	638	122	7	0
Luxembourg	Luxembourg SE General	4	20	6	14	0	0
Netherlands	AEX	79	460	164	226	10	60
Norway	Oslo SE OBX	139	755	321	188	49	197
Poland	Warsaw General Index 20	150	487	428	46	10	3
Portugal	PSI All-share	20	92	56	36	0	0
Spain	Madrid SE IGBM	117	619	181	258	80	100
Sweden	OMX Stockholm	334	1,607	885	428	69	225
Switzerland	Swiss Performance Index	215	899	870	14	3	12
United Kingdom	FTSE All-share	640	4,442	453	3,349	201	439
	Total	3,029	14,844	7,743	5,479	459	1,163

This table presents the different markets used in the study, their benchmark index, the number of dividend-paying companies, the total number of payments, and the number of payments by frequency (i.e., one, two, three, and four payments per year) for the period 2018-2022.

Table 2
Dividend payment analysis

Panel A: 2020 vs 2019				
	All	1 payment	2 payments	4 payments
Cancellation	35.23%	36.06%	35.73%	7.55%
Continuation	64.77%	63.94%	64.27%	92.45%
Dividend amount				
Increase	27.05%	27.61%	25.41%	28.30%
Unchanged	13.60%	16.76%	5.89%	5.66%
Decrease	24.12%	19.57%	32.97%	58.49%
Dividend frequency				
Increase	3.17%	3.64%	2.21%	-
Unchanged	54.00%	60.30%	37.02%	54.72%
Decrease	7.60%	-	25.05%	37.74%
Delay 1st dividend (in days)	+32.00	+29.12	+42.71	+10.45
Nb. Observations	2,052	1,456	543	53
Panel B: 2021 vs 2019				
	All	1 payment	2 payments	4 payments
Cancellation	4.38%	4.00%	5.45%	4.08%
Continuation	95.62%	96.00%	94.55%	95.92%
Dividend amount				
Increase	44.74%	41.92%	36.73%	43.80%
Unchanged	9.97%	12.41%	3.76%	6.12%
Decrease	28.15%	24.96%	34.40%	53.06%
Dividend frequency				
Increase	5.13%	6.24%	2.63%	-
Unchanged	73.29%	75.88%	66.35%	73.47%
Decrease	3.49%	-	11.09%	22.45%
Delay 1st dividend (in days)	+5.56	+2.81	+12.81	+8.28
Nb. Observations	2,007	1,426	532	49
Panel C: 2022 vs 2019				
	All	1 payment	2 payments	4 payments
Cancellation	13.85%	13.73%	14.99%	4.55%
Continuation	86.15%	86.27%	85.60%	95.45%
Dividend amount				
Increase	55.25%	58.45%	48.52%	31.82%
Unchanged	6.59%	8.34%	1.97%	4.55%
Decrease	24.30%	19.48%	34.52%	59.09%
Dividend frequency				
Increase	4.12%	4.53%	3.35%	-
Unchanged	79.15%	81.88%	72.19%	72.73%
Decrease	3.14%	-	10.06%	22.73%
Delay 1st dividend (in days)	+1.81	+0.50	+4.83	+8.43
Nb. Observations	1,942	1391	507	44

This table presents results on the payout behavior of a subsample of regular dividend-paying companies, i.e., firms that paid a similar number of dividends in 2018 and 2019. Panel A compares the base year 2019 to 2020, Panel B to 2021, and Panel C to 2022. The table reports findings for the entire subsample and according to payment frequency. Cancellation and continuation denote the percentage of companies that canceled or continued dividend payouts. The following six rows indicate the proportion of dividend payers that increased, decreased, or had unchanged dividend amounts or payment frequencies. Delay 1st dividend is the average calendar-day difference between the first dividend payment in a given year and the payment of the first dividend in 2019 by the company.

Table 3
Monthly dividend payments

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total
2018	14	26	161	385	600	271	145	41	36	20	28	23	1,750
	(0.8%)	(1.5%)	(9.2%)	(22.0%)	(34.3%)	(15.5%)	(8.3%)	(2.3%)	(2.1%)	(1.1%)	(1.6%)	(1.3%)	(100%)
2019	21	29	149	350	625	243	139	42	29	22	21	23	1,693
	(1.2%)	(1.7%)	(8.8%)	(20.7%)	(36.9%)	(14.4%)	(8.2%)	(2.5%)	(1.7%)	(1.3%)	(1.2%)	(1.4%)	(100%)
2020	44	37	87	167	244	197	126	62	67	74	68	69	1,242
	(3.5%)	(3.0%)	(7.0%)	(13.4%)	(19.6%)	(15.9%)	(10.1%)	(5.0%)	(5.4%)	(6.0%)	(5.5%)	(5.6%)	(100%)
2021	19	18	133	278	469	234	126	41	44	38	39	28	1,467
	(1.3%)	(1.2%)	(9.1%)	(19.0%)	(32.0%)	(16.0%)	(8.6%)	(2.8%)	(3.0%)	(2.6%)	(2.7%)	(1.9%)	(100%)
2022	18	23	144	322	570	242	131	45	36	21	21	18	1,591
	(1.1%)	(1.4%)	(9.1%)	(20.2%)	(35.8%)	(15.2%)	(8.2%)	(2.8%)	(2.3%)	(1.3%)	(1.3%)	(1.1%)	(100%)
Total	116	133	674	1502	2508	1187	667	231	212	175	177	161	7,743
	(1.5%)	(1.7%)	(8.7%)	(19.4%)	(32.4%)	(15.3%)	(8.6%)	(3.0%)	(2.7%)	(2.3%)	(2.3%)	(2.1%)	(100%)

This table reports the number and frequency of monthly dividend payments for firms paying one dividend per year.

Table 4
Descriptive statistics

Panel A: Summary statistics - predicted variables

	N	Mean	SD	p25	Median	p75
CAR(-5,0)	14,844	0.013	0.051	-0.012	0.010	0.036
CAR(-1,0)	14,844	0.008	0.030	-0.006	0.006	0.021
AR(0)	14,844	0.007	0.020	-0.001	0.006	0.014
AR(+1)	14,844	-0.003	0.029	-0.018	-0.003	0.012
CAR(+1,+5)	14,844	-0.006	0.047	-0.03	-0.005	0.020

Panel B: Summary statistics – explanatory variables

	N	Mean	SD	p25	Median	p75
Beta	14,841	0.643	0.424	0.320	0.615	0.928
Size	14,840	7.329	1.999	5.857	7.185	8.674
Book to Market	14,416	0.720	1.849	0.292	0.536	0.926
Dividend Yield (in %)	14,844	2.472	4.429	0.982	1.816	3.101
Stock illiquidity (in ‰)	14,247	1.499	4.550	0.002	0.034	0.439

Panel C: Difference-in-means test

	Mean			Difference		
	Pre-shortage period (1)	Shortage period (2)	Post-shortage period (3)	(2) − (1)	(2) − (3)	(3) − (1)
CAR(-5,0)	0.012	0.024	0.013	0.012***	0.011***	0.002**
CAR(-1,0)	0.008	0.014	0.008	0.006***	0.006***	-0.000
AR(0)	0.007	0.010	0.007	0.002***	0.003***	-0.000
AR(+1)	-0.002	-0.007	-0.005	-0.005***	-0.002*	-0.003***
CAR(+1,+5)	-0.002	-0.017	-0.008	-0.015***	-0.009***	-0.006***
N	6,881	1,037	6,926	7,918	7,963	13,807

This table provides summary statistics for the predicted variables (Panel A) and explanatory variables (Panel B) used in the main specifications, as well as difference-in-means tests for the predicted variables (Panel C). The descriptive statistics are based on the full sample consisting of 14,844 dividend distributions for the period 2018–2022. The variables' definitions are presented in Appendix Table A1.

Table 5
Abnormal returns during and after the shortage

	(1)	(2)	(3)	(4)	(5)
	CAR(-5,0)	CAR(-1,0)	AR(0)	AR(+1)	CAR(+1,+5)
Shortage Period	0.012***	0.005***	0.002***	-0.005***	-0.015***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Post-shortage Period	0.002**	-0.000	-0.000	-0.003***	-0.006***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
Beta	-0.003**	-0.001*	-0.001	-0.002***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size	-0.004***	-0.002***	-0.002***	0.001***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Book to Market	-0.001*	-0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.041***	0.026***	0.021***	-0.008***	-0.019***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Country FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Observations	14,407	14,407	14,407	14,407	14,407
R2	0.040	0.051	0.075	0.019	0.024

This table reports regression results on cumulated abnormal returns around ex-dividend dates. 0 indicates the ex-dividend day, and the other figures are the number of days before (negative) and after (positive) the ex-dividend day. The variables' definitions are presented in Appendix Table A1. All specifications include country and industry fixed effects. Standard errors are clustered at the firm level. ***, **, * show significance at the 1%, 5%, and 10% levels, respectively.

Table 6
Effect of pre ex-dividend date abnormal returns on post ex-dividend date abnormal returns

	(1)	(2)
	AR(+1)	CAR(+1,+5)
CAR(-5,0)	-0.052***	-0.062***
	(0.011)	(0.016)
CAR(-5,0) x Shortage	-0.089***	-0.126***
	(0.030)	(0.043)
CAR(-5,0) x Post-shortage	-0.027*	-0.036
	(0.016)	(0.024)
Shortage Period	-0.002	-0.011***
	(0.001)	(0.002)
Post-shortage Period	-0.002***	-0.005***
	(0.000)	(0.001)
Beta	-0.002***	-0.004***
	(0.001)	(0.001)
Size	0.001***	0.002***
	(0.000)	(0.000)
Book to Market	-0.000	-0.000
	(0.000)	(0.000)
Constant	-0.005***	-0.016***
	(0.001)	(0.002)
Country FE	YES	YES
Industry FE	YES	YES
Observations	14,407	14,407
R2	0.037	0.036

This table reports regression results on cumulated abnormal returns around ex-dividend dates. 0 indicates the ex-dividend day, and the other figures are the number of days before (negative) and after (positive) the ex-dividend day. The variables' definitions are presented in Appendix Table A1. All specifications include country and industry fixed effects. Standard errors are clustered at the firm level. ***, **, * show significance at the 1%, 5%, and 10% levels, respectively.

Table 7
Abnormal returns during and after the shortage considering short-selling bans

	(1)	(2)	(3)	(4)	(5)
	CAR(-5,0)	CAR(-1,0)	AR(0)	AR(+1)	CAR(+1,+5)
Shortage Period	0.011***	0.004***	0.002*	-0.004***	-0.015***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Post-shortage Period	0.002**	-0.000	-0.000	-0.003***	-0.006***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
Short-selling Ban	0.012**	0.008**	0.004	-0.006	0.001
	(0.005)	(0.003)	(0.002)	(0.004)	(0.006)
Beta	-0.004***	-0.002***	-0.002***	0.001***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	-0.003**	-0.001*	-0.001	-0.002***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Book to Market	-0.001*	-0.000*	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.041***	0.026***	0.021***	-0.008***	-0.019***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Country FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Observations	14,407	14,407	14,407	14,407	14,407
R2	0.041	0.052	0.075	0.019	0.024

This table reports regression results on cumulated abnormal returns around ex-dividend dates. 0 indicates the ex-dividend day, and the other figures are the number of days before (negative) and after (positive) the ex-dividend day. The variables' definitions are presented in Appendix Table A1. All specifications include country and industry fixed effects. Standard errors are clustered at the firm level. ***, **, * show significance at the 1%, 5%, and 10% levels, respectively.

Table 8
Dividend intensity effect

	(1) CAR(-5,0)	(2) CAR(-1,0)	(3) AR(0)	(4) AR(+1)	(5) CAR(+1,+5)
High Dividend	0.008***	0.006***	0.007***	-0.004***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Shortage Period	0.009***	0.003**	0.001	-0.003	-0.012***
	(0.003)	(0.001)	(0.001)	(0.002)	(0.003)
Post-shortage Period	0.002*	-0.001	0.000	-0.003***	-0.006***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
High Dividend x Shortage	0.008*	0.005*	0.001	-0.007**	-0.006
	(0.005)	(0.003)	(0.002)	(0.003)	(0.004)
High Dividend x Post-shortage	0.002	0.001	-0.002**	-0.001	-0.000
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Beta	-0.003**	-0.001*	-0.001	-0.002***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size	-0.004***	-0.002***	-0.002***	0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Book to Market	-0.001**	-0.000**	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.037***	0.023***	0.018***	-0.006***	-0.015***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Country FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Observations	14,407	14,407	14,407	14,407	14,407
R2	0.047	0.060	0.097	0.025	0.032

This table reports regression results on cumulated abnormal returns around ex-dividend dates. 0 indicates the ex-dividend day, and the other figures are the number of days before (negative) and after (positive) the ex-dividend day. The variables' definitions are presented in Appendix Table A1. All specifications include country and industry fixed effects. Standard errors are clustered at the firm level. ***, **, * show significance at the 1%, 5%, and 10% levels, respectively.

Table 9
Illiquidity and dividend level effects

	(1)	(2)	(3)	(4)	(5)
	CAR(-5,0)	CAR(-1,0)	AR(0)	AR(+1)	CAR(+1,+5)
Shortage	0.012***	0.005***	0.002**	-0.005***	-0.014***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Post-shortage	0.002**	-0.000	-0.000	-0.003***	-0.006***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
Dividend Yield	0.002***	0.002***	0.002***	-0.000	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Stock Illiquidity	0.542***	0.380***	0.171**	0.130	0.080
	(0.158)	(0.096)	(0.086)	(0.098)	(0.142)
Beta	-0.002	-0.001	-0.001	-0.002**	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size	-0.003***	-0.002***	-0.001***	0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Book to Market	-0.001**	-0.000**	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.030***	0.017***	0.014***	-0.007***	-0.015***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.003)
Country FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Observations	13,822	13,822	13,822	13,822	13,822
R2	0.054	0.078	0.133	0.020	0.029

This table reports regression results on cumulated abnormal returns around ex-dividend dates. 0 indicates the ex-dividend day, and the other figures are the number of days before (negative) and after (positive) the ex-dividend day. The variables' definitions are presented in Appendix Table A1. All specifications include country and industry fixed effects. Standard errors are clustered at the firm level. ***, **, * show significance at the 1%, 5%, and 10% levels, respectively.

Appendix

Table A1
Variable definitions

Variable	Description of variables
	Predicted variables
Abnormal return	Difference in returns for stock *i* on day *t* and its corresponding national stock market index *m*
CAR(-5,0)	Sum of the abnormal returns 5 days before the ex-dividend date to the ex-dividend date
CAR(-1,0)	Sum of the abnormal returns 1 day before the ex-dividend date to the ex-dividend date
AR(0)	Abnormal return of the overnight return on the ex-dividend date
AR(+1)	Abnormal return of the day after the ex-dividend date
CAR(+1,+5)	Sum of the abnormal returns from the day after the ex-dividend date to 5 days after the ex-dividend date
	Explanatory Variables
Shortage Period	Dummy equals to one if the ex-dividend date is between March and June 2020
Post-shortage Period	Dummy equals to one if the ex-dividend date is between July 2020 and December 2022
Beta	Calculated by regressing stock returns on the respective national index over a 250-day window and measured 21 days before the ex-dividend date
Size	Natural logarithm of the market capitalization measured 21 days before the ex-dividend date
Book to Market	Book value over the market value measured 21 days before the ex-dividend date
Dividend Yield	Dividends over earnings per share calculated the day before the ex-dividend date
High Dividend	Dummy equals to one if the dividend yield is larger than 3%
Stock Illiquidity	Amihud illiquidity measure defined as the absolute return of a stock on a given day divided by its volume, calculated as a mean over a 250-day window and measured 21 days before the ex-dividend date
Short-selling Ban	Dummy equals to one for dividends of firms from Austria, Belgium, France, and Greece over the period March 18 to May 18, 2020, and firms from Italy and Spain over the period March 17 to May 18, 2020
	Other Variables
Abnormal volume	The trading value of stock *i* on day *t* divided by the average trading value of stock *i* over the previous 250 days minus one

This table reports the definitions of the variables employed in the study.

Table A2
Abnormal returns during and after the shortage, using the whole year 2020 as the shortage period

	(1)	(2)	(3)	(4)	(5)
	CAR(-5,0)	CAR(-1,0)	AR(0)	AR(+1)	CAR(+1,+5)
Shortage Period	0.009***	0.002***	0.000	-0.003***	-0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Post-shortage Period	0.001	-0.000	-0.000	-0.003***	-0.006***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Beta	-0.004***	-0.002***	-0.002***	0.001***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	-0.003**	-0.001*	-0.001	-0.002***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Book to Market	-0.001*	-0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.041***	0.026***	0.021***	-0.008***	-0.019***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Country FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Observations	14,407	14,407	14,407	14,407	14,407
R2	0.041	0.050	0.074	0.018	0.023

This table reports regression results on cumulated abnormal returns around ex-dividend dates. 0 indicates the ex-dividend day, and the other figures are the number of days before (negative) and after (positive) the ex-dividend day. The variables' definitions are presented in Appendix Table A1. All specifications include country and industry fixed effects. Standard errors are clustered at the firm level. ***, **, * show significance at the 1%, 5%, and 10% levels, respectively.

Table A3
Abnormal returns during and after the shortage, using only dividends paid from March-June

	(1)	(2)	(3)	(4)	(5)
	CAR(-5,0)	CAR(-1,0)	AR(0)	AR(+1)	CAR(+1,+5)
Shortage Period	0.010***	0.005***	0.001**	-0.005***	-0.014***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Post-shortage Period	0.000	-0.001	-0.001	-0.003***	-0.006***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Beta	-0.004***	-0.003***	-0.002***	0.001***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	-0.003*	-0.002*	-0.000	-0.004***	-0.006***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Book to Market	-0.001***	-0.000***	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.047***	0.029***	0.022***	-0.008***	-0.019***
	(0.003)	(0.002)	(0.001)	(0.002)	(0.003)
Country FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Observations	8,484	8,484	8,484	8,484	8,484
R2	0.052	0.063	0.086	0.024	0.030

This table reports regression results on cumulated abnormal returns around ex-dividend dates. 0 indicates the ex-dividend day, and the other figures are the number of days before (negative) and after (positive) the ex-dividend day. The variables' definitions are presented in Appendix Table A1. All specifications include country and industry fixed effects. Standard errors are clustered at the firm level. ***, **, * show significance at the 1%, 5%, and 10% levels, respectively.

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Abstract

This paper investigates the behavior of stock prices around ex-dividend dates in Europe over the period 2018-2022. In the early months of the COVID-19 pandemic in 2020, a significant fraction of firms cut, suspended, or reduced their dividend payments, leading to a shortage. Using a comprehensive sample of 14,844 dividend payments from 17 countries, we find that the magnitude of abnormal returns around the ex-dividend date is significantly larger during this period compared to normal times as dividend-seeking investors searched for the remaining payers. This pattern is amplified for high-yielding dividend stocks and in countries that temporarily imposed short-selling bans. Our results are consistent with a price-pressure hypothesis and challenge standard interpretations derived from an efficient market framework.

JEL Classification
G12; G14; G35

Keywords
Dividend capture; price pressure; ex-dividend date; event study

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