The ex-day phenomenon and share price performance on emerging markets

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Abstract

We study share price performance at the ex-dividend date and its relation to trading volume and a set of factors corresponding to different explanatory theories. Among the investigated factors that may have impact on the ex-dividend date share price are dividend yield, capital gains tax rate and dividends tax rate, transaction costs, market microstructure characteristics, market stock risk, and the disposition effect. The research was conducted using the panel data of companies from the BRIC zone for the period of 2005-2015. According to the obtained results, dividend capturing and disposition effect theories are likely to have explanatory power for the ex-day phenomenon for our sample. Tax theory and dividend clientele theory have not found empirical support.

Introduction

The ex-dividend day is a cutoff point when new stock owners will not be eligible to receive the nearest dividend payment. It is natural to expect an ex-day share price decline that would approximately match dividend per share. However, as evidence suggests, this is not always true since quite often an ex-day share price decline is smaller than dividend per share. Existing studies of the ex-dividend phenomenon highlight tax theory, dividend clientele theory, short-term dividend capturing trading and behavioral theories, but there is still no consensus about a single explanatory theory.

We investigate share price performance and stock trading activity during an ex-dividend date event, studying ex-day events for the BRIC zone between 2005 and 2015. Existing evidence concentrates mostly on developed markets, namely on the USA, while for emerging markets there is mostly only evidence from Taiwan and China. According to existing studies, among the factors that may have impact upon the ex-dividend date share price are dividend yield, capital gains and dividend tax rates, transaction costs, market microstructure, stock risk, and behavioral factors. In order to distinguish between differ-

ent explanatory theories, it is also necessary to consider trading volume activity around the ex-day event.

There are several approaches in ex-day phenomenon research. One type relies on equilibrium conditions for after-tax income from capital gains and dividends [Boyd, Jagannathan, 1994; Michaely, Vila, 1995; Elton et al., 2005]. This approach gets an extension into the consideration of various types of market participants, each with his own equilibrium condition. As an alternative, we highlight the second method, which goes another way: first, price drop ratios are estimated and then the potential impact of various factors upon this ratio (or on abnormal return) is being tested [Milonas et al., 2006; Isaksson, 2013; Efthymiou, Leledakis, 2014]. The third approach scrutinizes detailed intraday trading data on ex-dividend days to understand which types of investors bought or sold stocks [Koski, Scruggs, 1998; Graham, Kumar, 2006; Rantapuska, 2008].

We concentrate on the second approach, because it does not require specific detailed information, as the third one does. Under this approach, as an alternative to the price drop ratio, a dividend-adjusted ex-day return may be estimated. Then, following the event study methodology, abnormal return as well as excess trading volume

are tested for significance. Next, we construct regression models with abnormal dividend-adjusted returns and relative trading volume as dependent variables to determine which factors are related to them. Combining the results, we make a conclusion about explanatory theories that are applicable to our sample.

The results of our research imply that tax theory and clientele theory are least likely to explain the ex-dividend phenomenon for the sample of BRIC zone stocks, while dividend capturing theory and disposition effect behavioral theory find substantial empirical support.

Our contribution to the literature consists of several parts. First, we investigate a sample of companies from emerging markets, namely the BRIC zone, which was not analyzed before. Second, we unite approaches used in various studies to construct a methodology for testing four main explanatory theories together. Our study has a practical application, as investment professionals may use the findings or replicate the research framework to make investment decisions regarding the stocks that go ex-dividend.

The paper is organized as follows: Section 1 provides an overview of existing research on the ex-day phenomenon and presents explanatory theories; Section 2 outlines the methodology and framework for our research on the ex-day phenomenon; Section 3 provides a description of the sample and reveals the results of empirical tests of the explanatory theories.

Review of existing studies of ex-dividend share price

Ex-dividend day share price return has been studied for decades, yet economists have not come to a single conclusion about its determinants. The ex-dividend day is the first trading day when new shareholders are not entitled to the dividend. Therefore, ex-day share price should be lower than the previous day (called cum-day) approximately by the size of dividend per share. Yet, in practice, the ex-day return is subject to influence of many factors, e.g., taxes and transaction costs.

An important fundamental dividend concept is "Tax preference theory". Shareholders may prefer larger or smaller dividend yield, according to the corresponding dividend and capital gains income tax rates. Ex-day share price change should take into account after-tax dividend size in relation to after-tax capital gains [Brigham & Houston, 2004]. Some studies examine changes in tax codes and try to find corresponding changes in ex-day share price behavior. Clientele effect theory predicts that investors have certain preferences for firms' dividend policies, implying that investors shall alter their holdings according to the amendments in dividend policies of corresponding companies. Such an adjustment should cause share price changes as well [Ross et al., 2005].

The majority of studies of the ex-day phenomenon employ the single marginal investor approach, while some also consider multiple investor types. Among the single marginal investor theories, there are different approaches to a marginal investor. The first group of articles describes tax-induced clientele theory. The next group studies arbitrageurs who have almost no transaction costs and low sensitivity to tax rates. Also, it concerns discreteness in pricing where the marginal investor is an arbitrageur. Finally, behavioral theory considers the investor disposition effect, i.e., investors would be more likely to sell, buy or keep certain stocks, depending on their accumulated unrealized gains or losses.

Among the studies of multiple clientele explanations for ex-day share pricing, many articles consider tax incentives for investors, but some also study non-tax factors: investor risk aversion, an ability to shift trades over time, and transaction costs differences.

A brief structure of these approaches to the problem of perception of dividends by investors and to the ex-day phenomenon is summarized in a chart below.
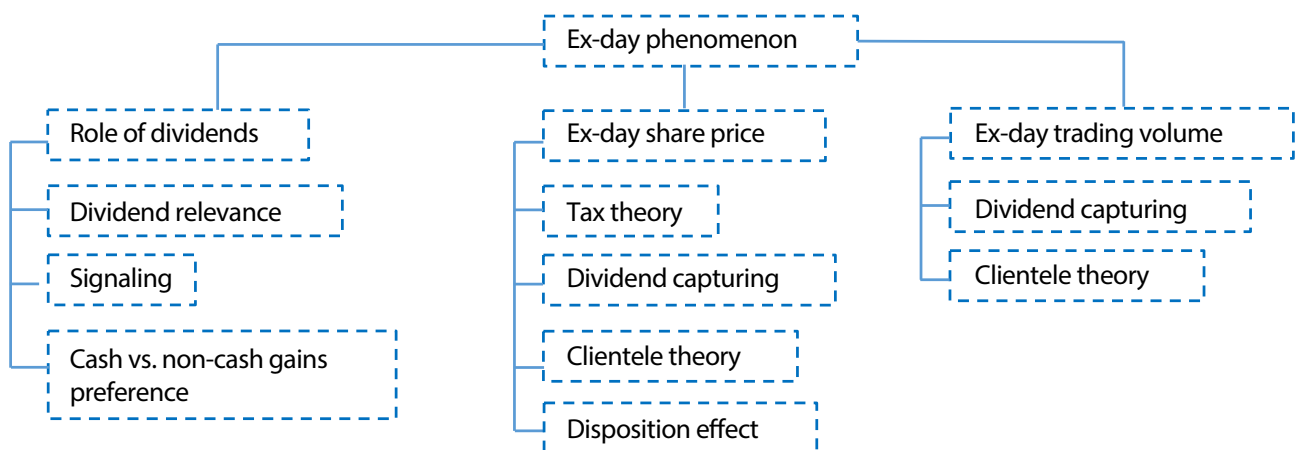

Figure 1. Approaches to studying the ex-dividend day phenomenon

There are several theories of ex-dividend day share price change determinants. The most common explanations are tax theory, clientele theory, and dividend capturing activity. Also, a new and promising view is presented in disposition effect theory that suggests behavioral explanations for the ex-day phenomenon.

Tax theory

Existing studies on ex-day share price performance do not solely concentrate on taxes. Many studies also try to relate the importance of taxes to various groups of investors, usually viewing the problem from a clientele theory approach.

Boyd, Jagannathan [1994] relate ex-day stock price movements to multiple tax bracket investors, transaction costs, stock volatility and arbitrage-seeking short-term trading activity. An ex-day price decline does not differ from dividend per share significantly. Because of different equilibrium sets for different dividend yields, the relationship between dividend yield and price decline is made of several linear parts.

Michaely, Vila [1995] revealed a relationship between ex-dividend date share price and trading volume activity to stock risk profile and tax heterogeneity. Even without transaction costs, an ex-day price decline does not have to equal the dividend per share. A price drop alone cannot help us determine the structure of tax clientele, but trading volume helps to do this.

Milonas et al. [2006] reveal ex-day tax specifics on the Chinese stock market. For the sub-sample that is not subject to taxes, an ex-day price drop is not statistically different from the dividend, consistent with Elton, Gruber [1970]. For the taxable sample for low dividend yield shares, a price drop is proportional to dividend amount, and for high yield shares, the price decline is influenced by an effective tax rate on dividends. This conclusion is in opposition to Frank, Jagannathan [1998], who did research for the Hong Kong market H-shares where both capital gains and dividend yields are not taxed. The taxable sample demonstrates an ex-day share price drop by a higher amount than justified by dividends, and the deviation is statistically significant. However, the results are driven by the high dividend yield subsample. This result is in contrast with prior findings by Grammatikos [1989], Michaely [1981], Bali, Hite [1988], who expect an ex-dividend date price decline to be smaller compared to dividends paid.

For developed stock markets, we may observe varied ex-day returns for domestic stocks and for American Depository Receipts (ADRs), explained by different sets of traders and applicable tax regimes. Gorman et al. [2004] compared ADRs' vs US stocks' ex-day returns and trading activity. They found that dividend capturing is limited for ADRs, demonstrating higher ex-day returns and smaller trading volumes.

Ainsworth, Lee [2014] confirms that before ex-dividend day deadline traders place more aggressive orders and spreads are narrower. Australia stock market is interesting because of its imputation tax system related to dividends for investors. Corporate tax is a pre-collection of personal income tax. That scheme creates two clienteles: domestic investors able to use tax credit and foreign investors not eligible for tax credit. In line with tax rationale, on average domestic investors are buyers and foreign investors are sellers on a cum-dividend day.

Liljeblom et al. [2001] study the impact of differential tax regimes for domestic and foreign investors on the Helsinki stock exchange. Investors were divided into 3 groups: domestic private and corporate investors with a tax priority of dividends, non-taxable firms without any preference among dividends and capital gains, and non-domestic investors that prefer capital gains. Foreign investors dominate the Helsinki stock exchange market. Ex-day price drop ratios were lower (this means higher return) for companies with higher foreign ownership. The relationship is strongest for high dividend yield shares.

Clientele theory

According to dividend clientele theory, investors with a lower tax rate on dividends should prefer stocks with a higher dividend yield and vice versa, which may affect trading activity around the ex-day.

Elton, Gruber [1970] were among the pioneers who suggested that the ex-dividend date price decline ratio may be lower than 1 because of the dividend clientele effect. There is a positive relationship between dividend yield and the ex-dividend date price decline ratio, implying that traders that have a smaller tax rate on dividends would choose high dividend yield shares. Companies manage to attract rational clientele.

Boyd, Jagannathan [1994] considered the influence of various investor types with different tax and risk profiles on ex-day share pricing. This complex set of investors could make the relationship between the ex-dividend date price change and dividend yield non-linear. The dividend clientele hypothesis was also supported by a number of studies. Lasfer [1995] also revealed that the ex-day share price performance of UK shares may be influenced by the time value of money, i.e., investors discounted dividends on the ex-dividend day from the actual payment day.

Chen et al. [2013] revealed the influence of heterogeneous tax rates on stock price and trading activity on the ex-day in Taiwan. Traders subject to higher tax rates on dividends sell stocks right before ex-day and purchase the stocks back on ex-day; investor types subject to lower taxes show a reverse trading pattern. The findings indicate evidence of a dynamic dividend clientele concept, consistent with Koski, Scruggs [1998], Felixson, Liljeblom [2008], Rantapuska [2008].

Rantapuska [2008] supports the dynamic clientele theory for Finland – traders who have a choice regarding dividends purchase stocks right before the ex-day and dispose of them on the ex-day and vice versa. Idiosyncratic risk was determined to be a significant factor in the preference for shares to make an ex-dividend event

trade. Dividend yield and transaction costs were found to be related with ex-day short-term trading volume. The complete trade datasheet containing data on various types of shareholders was studied in order to find traders' behavioral patterns.

Armstrong, Hoffmeister [2012] studied tax-induced clienteles in the United States. The authors found evidence of several clienteles, in contrast to one marginal shareholder, influencing the ex-dividend date share price performance. Following the tax reform, ex-day abnormal return increased but remained negative, leading the authors to conclude that both tax clienteles – corporations and individuals – affect ex-day return.

Graham, Kumar [2006] reveal evidence of a larger ex-dividend date price drop ratio for firms having older shareholders as well as less wealthy investors. Dhaliwal, Li [2006] used the share of institutional shareholders to account for tax variability and revealed low trade activity in the case of shares having very high or low stakes owned by institutional investors.

Lee et al. [2006] find the dividend clientele effect on the Taiwan stock exchange. They conclude that traders having a larger tax on dividend income choose to keep the shares of lower dividend yield and dispose of the shares of companies if they raise dividends. Institutional investors demonstrate no reaction to dividend increases or decreases, while individual investors' trading shows patterns consistent with tax clientele theory.

Dividend capturing, market microstructure, and transaction costs

Transaction costs and implicit stock risk can influence ex-day returns, preventing ex-day arbitrage and dividend-capturing trading activity. Also, market microstructure, e.g., discrete pricing, may influence ex-day returns.

Boyd, Jagannathan [1994] presented evidence of transaction costs impacting ex-dividend date share price dynamics by incorporating transaction costs into the equilibrium equations for various traders' categories. Rantapushka [2008] confirmed the relationship between ex-dividend date trading activity and transaction costs.

Kalay [1982] re-examined the sample and found that transaction costs prevent short-term ex-day arbitrage. Short-term arbitrageurs performing dividend-capturing minimize the difference between dividend per share and a share price decline on the ex-dividend date.

Karpoff, Walkling [1988] showed that ex-dividend date share price dynamics and bid-ask spread have a positive correlation, implying that transaction costs are an obstacle to dividend-capturing. Authors state that arbitrageurs with low transaction costs may take profit from opportunities arising from dividend tax penalty on US stock market. Thus, dividend tax penalty is a source of attractive short-term trades for arbitrageurs who have low transaction costs. Most importantly, short-term trading and dividend tax penalty theories are not competing, but complement each other.

Michaely [1981] reveals that change of ex-dividend date share price dynamics in the USA for the period surrounding the 1980s tax reform was driven not by the tax changes themselves, but by transaction cost changes, indicating that arbitrageurs and corporate investors dominate the market on the ex-day. Several studies confirm that a decrease in transaction costs in 1975 increased ex-day premiums, bringing them closer to 1 [Eades et al., 1994; Lakonishok, Vermaelen, 1986].

Bali, Hite [1988] claimed the microstructure effect of discrete prices as a cause of ex-day price decline ratio being less than 1. Similar patterns are present for taxable cash dividends and non-taxable stock-dividend distributions.

Frank, Jagannathan [1998] suggest that individual shareholders are not comfortable collecting and reinvesting dividend income, yet this is not the case for market makers. Therefore, individual investors dispose of the shares before the ex-day and purchase them back afterwards.

Jacob, Ma [2007] find that the microstructure influence of limit order adjustments has a strong influence on ex-dividend date share price in the case of dividends that are equal to or less than a tick. For a larger dividend size, there is evidence of both microstructure and tax effects.

Kaustia, Rantapuska [2012] study individual investors' trading at dividend and tender offer distributions. Individual investors would not reinvest cash dividend proceeds. Yet, in case of tender offers, it is more likely that cash will be reinvested, supporting the theory of mental accounting. Younger investors were more likely to reinvest cash proceeds.

Blau et al. [2011] study short-selling activity at dividend announcement events and ex-days. Before the ex-day, demand for the shares from dividend-capturing traders increases their price in excess of the fundamentally justified amount, generating opportunities for short-sellers. On and after the ex-day, short selling volume and return predictability are substantially higher vs. non-event periods, especially in the case of high dividend yield.

Among studies of the ex-dividend phenomenon on the Russian market, we highlight the paper by Teplova [2010a] that examines the opportunities created by dividend capturing strategies on the Russian stock market. Teplova notes that it is necessary to consider both the price drop ratio and abnormal trade volume during ex-dividend events. On the Russian stock market, a consistent relationship between share price return and dividend yield is observed for a limited set of preferred shares. In case of the Russian market, the dividend capturing strategy is likely to yield low benefits, bearing a high risk level.

Disposition effect

Efthyimiou, Leledakis [2014] present a new view on the explanation of an ex-dividend share price drop. The authors introduce a behavioral concept, studying the impact of capital gains overhang on the ex-dividend day price drop ratio. The disposition effect predicts that investors

are more likely to sell stocks with accrued gains than shares with prior unrealized losses in their portfolios. This prediction is based upon the logic that people like to confirm their correct decisions (thus, realizing prior gain and selling the stock) and do not like to acknowledge mistakes (preferring to hold stocks that declined in price in their portfolios, instead of realizing a loss). During a corporate event, this effect may lead to order imbalances that influence share quotes.

Efthymiou, Leledakis [2014] test whether the behavioral disposition phenomenon drives share quote change from the cum-dividend date to the ex-dividend date. The study is built upon a theoretical ex-dividend date share price, which is the price on the cum-dividend date less the amount of dividends corrected for tax preference. The ex-dividend date is good for studying the disposition effect as this is an event that does not bring additional information for investors, in contrast to other corporate events.

Their study is based upon the calculation of capital gains overhang – a measure of the difference between the stock quote on the cum-day and weighted average share price on the prior estimation window, to identify aggregate accrued gains or losses to market participants. Shares with prior unrealized gains demonstrate a higher price drop ratio, and that price drop ratio is positively related to the capital gains overhang measure, confirming the authors' predictions. Notably, the other factors have not demonstrated a significant relationship with the price drop ratio. The findings hold within separate subsamples by dividend yield and liquidity, confirming that the results were not driven by short-term arbitrageurs or dividend clienteles.

Liquidity / trading volume

Some papers present evidence that ex-day share performance depends on short-term trading activity [Kalay, 1982; Miller, Scholes, 1982]. If there is indeed such short-term trading activity, then we should observe abnormally high trading volume.

Lakonishok, Vermaelen [1986] conclude that share prices and trading volume should be considered together to determine which of the theories find support. For taxable cash dividends, trading volume increases around the ex-day. The most significant shift in trading volume is observed for high dividend yield stocks, especially for most liquid ones, and after the introduction of negotiable broker commissions in the USA. There is excess positive return preceding the ex-day and an excess decline after the ex-day, supporting the dividend capturing concept. For non-cash events such as stock dividends and stock splits abnormally low trade activity at the ex-dividend event was observed.

Isaksson [2013] presents evidence of a stock liquidity explanation for ex-dividend day return and trade volume, studying blue chips stocks on four major markets (the US, the UK, China, Japan). For the New York and Shanghai stock exchanges, the decline of the stock quote on the ex-dividend date is found to be the same as the size of the dividend, without signs of short-term trading. In case of the Tokyo stock exchange, the decline of share quotes

is smaller compared to the dividend size, and on the London stock exchange, a share quote decline is higher compared to the dividend size. Also, on the Tokyo and London stock exchanges, excess trading activity around ex-day is observed – these observations are can be attributed to the financial crisis in the UK and short-term trading in Japan.

A number of studies present evidence of a rise in trading activity between the announcement date and the ex-date, implying that some investors aim to conduct dividend-capturing [Michaely, Vila, 1995; Akhmedov, Jakob, 2010].

Chen et al. (2014) study stocks liquidity and individual traders' behavior preceding the announcement of dividends on the Taiwan stock exchange. There is a positive relationship between trading volume by individual investors before the dividend announcement and the abnormal return afterwards. This relationship appears to depend on stock liquidity, consistent with a study of the U.S. stock market by Kaniel et al. [2012].

All in all, trading volume around the ex-day may signal the presence or absence of short-term dividend capturing trading activity, it also may help us understand whether there are dividend clienteles. In turn, trading activity at the ex-dividend event is influenced by multiple factors, such as dividend yield, market stock risk and transaction costs.

To recap, there are various theories aiming to explain the ex-dividend share price phenomenon. Still we see no consensus view that would tell which of explanatory theories actually takes place. Yet, many authors acknowledge that in order to understand this phenomenon, it is necessary to study not only share price changes around ex-day, but also relative trading volume. Among the most common factors related to ex-day share price changes and relative trading volume are dividend yield, the relationship between taxes on capital gains and taxes on dividend income, transaction costs and stock market risk, as well as capital gains overhang.

Methodology

Approaches to ex-dividend events research in existing studies

The three common frameworks used in the existing research of ex-dividend events are: the event study approach; equilibrium condition frameworks inferring different marginal investors; and detailed transaction studies that investigate trade patterns by separate categories of investors. As we follow the event study approach, we will present it in more detail.

The majority of ex-day studies follow the event study approach, modified for the purposes of ex-day analysis [Elton, Gruber, 1970; Milonas et al., 2006; Isaksson, 2013]. They focus on ex-dividend date share quote decline ratios in relation to the dividend amount per share, as well as on excess trading volume.

The most commonly studied variables are the raw price ratio (RPR), market-adjusted price ratio, as well as market and dividend-adjusted ex-day return. In a similar manner, when analyzing trading activity, Isaksson (2013) has considered relative trading volume (RTV). These ratios are studied within the event study framework. The corresponding formulas for these metrics are presented below:

Raw price ratio (RPR):

$$RPR = \frac{P_{-1} - P_0}{D} \qquad (1)$$

where P_{-1} – price before ex-day, P_0 – price on ex-day, D – dividend per share

Market-adjusted ex-day return (MAAR):

$$MAAR = R_0 - R_m \qquad (2)$$

$$R_0 = \frac{P_0 - P_{-1} + D}{P_{-1}} \qquad (3)$$

where R_m is market return on the ex-day

Relative trading volume (RTV):

$$RTV_t = \frac{V_{it}}{AVTV_i} \qquad (4)$$

where V – trading volume on day t for stock i,
$AVTV$ – average trading volume for company i before and after the ex-day event window.

The event windows are rather short. In fact, the more common window is {0}. The shorter window is especially relevant when considering share price, as the ex-day is an informationless event. Yet, longer windows, such as [-2; 2] and [-5; 5] are also taken into consideration. With the analysis of the latter window, existing evidence suggests that for dividend-capturing theory there should be positive excess returns preceding the event day and negative abnormal return following the ex-date.

The longer window, [-5; 5], is more commonly used for the analysis of abnormal trading volume and its patterns, which helps one draw a conclusion regarding an explanatory theory. For example, according to the dividend clientele theory, we expect positive abnormal trading volume before and on the ex-day and negative afterwards, as stock will be held by the relevant clientele. In total, for dividend clientele theory, abnormal trading volume should be zero.

As for estimation windows, we see more divergence among existing studies. In market microstructure studies, the estimation windows are further from the ex-dividend event day, studies testing tax theory concentrate on windows that are closer to the ex-day. Studies of the impact of transaction costs on ex-day returns and trading activity present a longer estimation window. As we are going to test several explanatory theories, we stick to average proximity to the event day. We choose {0} and [-5; 5] event windows, as well as [-90; -5] estimation window.

Capital gains overhang measure

Efthymiou, Leledakis [2014] construct a capital gains overhang (CGOH) estimate as a behavioral factor that may explain the ex-dividend date share price. CGOH is estimated as the difference between the share price on the cum-day and the volume weighted average share price over the estimation window, showing whether overall investors have accrued unrealized gain or loss on a position in a stock. This estimate is based on the approach introduced by Grinblatt, Han (2005):

$$CGOH_i^T = \frac{P_i^{cum} - RP_i^T}{P_i^{cum}} * 100\% \qquad (5)$$

where *CGOH* – capital gains overhang,

P^{cum} – share price on the cum-day,

RP – volume weighted average price of purchase in investors' portfolios over the assumed holding period.

The volume weighted average price of purchase (*RP*) is estimated in the following way:

$$RP_i^T = \frac{1}{\sum_{n=1}^{T} w_{t-n}} \sum_{n=1}^{T} w_{t-n} P_{t-n}$$

$$\text{where} \qquad w_{t-n} = \left[V_{t-n} \prod_{t=1}^{n-1} (1 - V_{t-n+\tau}) \right] \qquad (6)$$

The authors have also considered a specific relative turnover measure that takes into account the percentage of shares traded relative to total shares outstanding:

$$TO_{it} = \log\left(100 * \left(\frac{Vol_{it}}{N_{it}}\right) + 0.01\right) \qquad (7)$$

where *TO* – the turnover measure, *Vol* – the daily number of shares traded, *N* – the number of shares outstanding.

Hypotheses

The majority of research papers dedicated to the ex-day phenomenon that follow the event study approach consider rather similar basic hypotheses regarding the expected values of the price drop ratio, abnormal return and relative trading volume, with slight variations regarding the adjustments for market return. The corresponding tested variables are raw price ratio (RPR), market-adjusted price ratio (MAPR), raw price drop (RPD), market-adjusted price drop (MAPD), market-adjusted abnormal return (MAAR) and relative trading volume (RTV). The examples of typical hypotheses concerning the share quote and trading activity ratios at the ex-dividend event are presented in the study of Isaksson (2013):

- mean (median) *RPR* = 1;
- mean (median) *MAPR* = 1;
- mean (median) *RPD* = dividend yield;
- mean (median) *MAPD* = dividend yield;

- mean (median) *MAAR* =0.
- mean (median) *RTV* = 1.

In addition, it is necessary to test the relationship between the various factors and share price change and trading volume measures.

Based on the overview of existing studies, we develop the following three groups of hypotheses. The first group considers tests of the presence of statistically significant abnormal share price returns around the ex-day. The second group of hypotheses is aimed at testing the presence of abnormal trading volume. The third group of hypotheses is aimed at testing the relationship between various factors and ex-day share price return / ex-day relative trading volume.

The first group of hypotheses.
Tests for abnormal returns around ex-day

The first hypothesis aims to assess whether stock quote drops at the ex-date by the same value as dividend per share, and whether there is any ex-dividend day phenomenon at all:

H 1.1: A raw price drop on the ex-day equals dividend per share.

To take into account stock market movements around ex-day, market-adjusted share price return is considered. This leads us to formulating the second hypothesis in this group:

H 1.2: A market-adjusted price drop equals dividend per share.

As the most common explanation for the inequality between the share quote decline and dividend amount is the difference between dividend and capital gain income taxes, we may isolate the tax effect and check whether there is room for other explanations, considering the third hypothesis in this group:

H 1.3: An ex-day price drop equals dividend per share in after-tax terms.

The three hypotheses in this group help us determine whether ex-date abnormal return exists, and whether it is caused by market movements, by tax regime, or by other factors that need investigation.

The second group of hypotheses.
Tests for abnormal trading volume

As evidence suggests, trading volume should also be taken into account to determine which explanatory theory really works. Therefore, the only hypothesis is formulated in the following way:

H 2: Relative trading volume ratio around the ex-day equals 1.

The third group of hypotheses. Determinants of ex-day price drop ratio/abnormal trading volume

An important part of determining what theory explains the ex-day phenomenon is the analysis of factors that are related to share price return or trading volume around ex-day.

The first factor is dividend yield. As predicted by dividend clientele theory, traders having a relatively low tax rate on dividends will hold shares with higher dividend yield, therefore, an ex-day share price drop should be higher for high dividend yield shares [Lakonishok, Vermaelen, 1986; Elton et al., 2005]. Alternatively, under dividend capturing theory, high dividend yield shares should attract short-term dividend capturing "arbitrageurs", so positive excess trade activity is expected for high dividend yield shares [Karpoff, Walkling, 1988]. This leads to the formulation of the first hypothesis in the third group of hypotheses:

H 3.1: Abnormal return/relative trading2 volume around the ex-day are related to dividend yield.

The tax explanation is among most common concepts of ex-dividend date share price change [Elton et al., 2005; Milonas et al., 2006; Armstrong, Hoffmeister, 2012]. Thus, it is essential to test whether the difference between tax rates on dividends and capital gains is related to the ex-dividend date share quote decline ratio, as expressed in the next hypothesis:

H 3.2: Ex-day abnormal return depends on the difference between the capital gains tax rate and the dividend tax rate.

In order to test evidence of dividend capturing theory, it is necessary to consider whether transaction costs, implied by bid-ask spread and stock volatility, are related to trading volume and share price return around ex-day [Lakonishok, Vermaelen, 1986; Karpoff, Walkling, 1988]. Thus, we formulate the third hypothesis in this group of hypotheses:

H 3.3: Abnormal return/relative trading volume around ex-day are related to transaction costs (bid-ask spread, stock return volatility).

The next hypothesis aims to test whether the disposition effect has an impact on share pricing on ex-dividend days, following Efthymiou, Leledakis [2014]. With higher estimated unrealized gain (loss), we expect more negative (positive) ex-day abnormal return, because the influence of the disposition effect on trading activity will be amplified. The disposition effect is measured by a capital gains overhang variable, which is the difference between the share price before ex-day and volume weighted average share price over the preceding estimation window.

H 3.4: The higher the unrealized gain (loss) accrued on the stock, the more negative (positive) the ex-dividend day abnormal return.

We use the results of testing these hypotheses together with the event study results in a multiple-step approach in order to find out which explanatory theory finds support for the studied sample in each country.

Outline of the study algorithm and steps in research

Based on the overview of existing studies, our research algorithm relies on three main steps:

Step 1: Estimate dividend-adjusted price change and cumulative abnormal returns.

Step 2: Construct regression models together with mean abnormal return and relative trading volume tests that would allow us to test each of the four main explanatory theories of ex-dividend day share price change.

Step 3: Test these models for the studied sample of each of the BRIC zone countries and draw conclusions about the evidence of explanatory theories in each country.

Based upon the overview of existing articles, we have developed specific procedures to test each of these explanatory theories, which are presented further.

Step 1. Testing tax theory of ex-day share price change

To test tax theory, we should test whether there is supporting evidence for the following three predictions:

1. For non-taxable dividends, an ex-day share price drop should be equal to or higher than the dividend [Elton et al., 2005; Milonas et al., 2006].

For the first prediction, we use a sample mean test to check whether it differs from 1.

2. For taxable distributions, an ex-day share price drop should depend on the tax rate on dividend income, implying a positive relationship between ex-day return and dividend tax rate [Elton et al., 2005; Milonas et al., 2006; Armstrong, Hoffmeister, 2012].

For the second prediction, we construct the regression model presented in the equation:

$$R = i + a * DVDTaxrate + \\ + b * Country + c * Crisis \qquad (8)$$

where R – ex-day event dividend-adjusted and market-adjusted share price return, which can be estimated in several ways depending on the event window;

$DVDTaxrate$ – tax rate on dividend income minus capital gain tax;

$Country$ – a country dummy;

$Crisis$ – a dummy for the global crisis period of 2008–2009;

i – intercept,

a, b, c – coefficients

3. The relationship between ex-day return and tax rates should be stronger for high dividend yield stocks.

For the third prediction, we split the sample into sub-samples by dividend yield and run the same regression models as in the second prediction. We expect that for the subsample of ex-dividend events with higher dividend yield, the relationship between dividend tax rate and ex-day return would be stronger, because investors would be more sensitive to tax effects.

Step 2. Testing clientele theory of ex-day share price change

Investor clienteles may prefer to hold certain stocks based on fundamental characteristics, but due to their tax profile, they might prefer to not receive dividends on high dividend stocks or vice versa. This leads to a specific pattern: tax-induced clienteles hold the stock until the cum-day, sell it on cum-day and buy it back on the ex-day, which creates abnormal activity in terms of trading volume on the ex-day and the day before. However, if dividend clienteles really determine share price on the ex-day, then we expect to see negative abnormal trading volume on the days surrounding ex-day and cum-day, because the dividend clientele investors prefer to make their trades as close to the event date as possible. This activity should be amplified in the case of higher dividend yield shares. We formulate two predictions that will need to be tested:

1. An ex-day price drop should be higher (return should be lower) for high dividend yield shares [Lakonishok, Vermaelen, 1986; Elton et al., 2005].

For testing the first prediction, we use the following regression model:

$$R = i + a * DVDYield + b * Country + \\ + c * Crisis \qquad (9)$$

where R – ex-day event dividend-adjusted and market-adjusted share price return, which can be estimated in several ways depending on the event window;

$DVDYld$ – dividend yield based on share price prior to the ex-day;

$Country$ – a country dummy;

$Crisis$ – a dummy for the global crisis period of 2008–2009;

i – intercept,

a, b, c – coefficients.

2. A) No abnormal trading volume at the event window around ex-day should be observed [Lakonishok, Vermaelen, 1986]; B) There should be positive abnormal trading volume on the ex-day and the day before, and negative relative trading volume on the surrounding days [Green, Rydqvist, 1999].

For prediction 2.A, we test whether average cumulative RTV (relative trading volume) on the event window equals 1. For prediction 2.B, we investigate RTV for each of event window days and compare it with the pattern proposed by Green, Rydqvist (1999).

Step 3. Testing dividend capturing theory of ex-day share price change

Dividend capturing theory supposes that short-term arbitrageurs' trading activity leads to a minimization of the gap between dividend per share and share price decline. The presence of such short-term trading activity depends on the implicit transaction costs and risks associated with certain stock. Dividend capturing trades are expected

to happen more often in the case of high dividend yield shares where the potential benefits are higher. Based on existing studies, we formulate the following four predictions:

1. Stock return volatility and/or transaction costs would limit dividend capturing activity, thus higher transaction costs should lead to higher ex-day return [Karpoff, Walkling, 1988].

To test prediction 1, we construct the following regression model:

$$R = i + a * Spread + b * Vol + \\ + c * Country + d * Crisis \qquad (10)$$

where R – ex-day event dividend-adjusted and market-adjusted share price return, which can be estimated in several ways depending on the event window;

Spread – bid-ask spread relative to share price, estimated for the period of 30 trading days before ex-day;

Vol – standard deviation of historic stock return;

Country – a country dummy;

Crisis – a dummy for the global crisis period of 2008-2009;

i – intercept,

a, b, c, d – coefficients.

2. For higher dividend yield shares, the relationship between transaction costs and ex-day return is stronger [Karpoff, Walkling, 1988].

For prediction 2, we split the sample into quintiles by dividend yield and compare the relationship of transaction costs and share price return around ex-day for these quintiles.

3. We expect relative trading volume around ex-day to be positively related to dividend yield and negatively related to transaction costs or to historic stock return volatility [Lakonishok, Vermaelen, 1986].

Prediction 3 is tested with the help of a regression model that considers stock volatility, bid-ask spread and dividend yield in relation to trading volume:

$$TV = v + x * Spread + y * Vol + \\ + z * DVDYld + w * Country + u * Crisis \qquad (11)$$

where RTV – relative trading volume;

Spread – bid-ask spread relative to share price, estimated for the period of 30 trading days before ex-day;

DVDYld – dividend yield based on share price prior to ex-day;

Vol – standard deviation of historic stock return;

Country – a country dummy;

Crisis – a dummy for the global crisis period of 2008–2009.

4. There is an abnormal price increase before the ex-day and an abnormal price decrease afterwards within the event window [Lakonishok, Vermaelen, 1986].

To test prediction 4, we test whether on average cumulative abnormal returns before and after the ex-day are higher or lower than 1.

Step 4. Testing the disposition effect theory of ex-day share price change

To test the disposition effect theory, it is necessary to check whether there is a relationship between ex-day return and capital gain overhang measure (CGOH). In order to distinguish this theory from other concepts, we also check whether the relationship between CGOH and ex-day return holds for different subsamples by dividend yield and stock turnover. We have to test two predictions:

1. Capital gains overhang measure should be positively related to the ex-day price drop ratio (negatively related to ex-day return).

The basic regression model used for prediction 1 is the following:

$$R = i + a * CGOH + b * Country + c * Crisis \qquad (12)$$

where R – ex-day event dividend-adjusted and market-adjusted share price return;

CGOH – capital gains overhang measure;

Country – a country dummy;

Crisis – a dummy for the global crisis period of 2008–2009.

2. Distinguish it from clientele and short-term trading theories: the relationship between capital gains overhang and the price drop ratio should hold within separate subsamples that correspond to different clientele groups defined by dividend yield and turnover measures.

It is important to note that all of the regressions presented in the steps above are being implemented with OLS, fixed effects (FE) and random effects (RE) specifications. Then, in each case the best specification is chosen based on the corresponding specification tests (the Hausman test to choose between fixed effects and random effects specification, Breusch–Pagan test to choose between OLS and random effects, F-test to choose between OLS and fixed effects). We consider both short regression models (i.e., containing only key independent variables) and long regression models (that also contain additional control variables). We consider only these linear regression model specifications, as we follow the consensus approach presented in the studies that test explanatory theories for the ex-day phenomenon.

Empirical research

Sample description

We study ex-day events of companies traded on BRIC countries' stock exchanges, with a study period of 2005–2015. The period of the global economic crisis, 2008–2009, is factored in via a dummy variable.

All market data is obtained from Bloomberg, while tax rates are obtained from open sources, such as the World Bank database and tax regime reports by KPMG and PricewaterhouseCoopers.

Among Russian companies, we have included a broad sample of companies present in the RTS, MICEX or MSCI Russia indexes. Regarding other countries, we have studied the constituents of the respective national MSCI indexes.

We have removed irrelevant observations (i.e., stock dividends, stock splits) and observations where there was no sufficient market data for the estimation window. The preliminary sample consisted of 2800 observations for the events with dividend yield not less than 0.5%.

However, we have decided to exclude the events with dividend yield below 2%. This decision is explained by two reasons. First, for the initial sample with dividend yield not less than 0.5%, the explanatory power of regression models was very weak, with R-squared and adjusted R-squared measures being at the level of about 3%. Second, for low dividend yield observations, the estimates of abnormal return or price drop ratio can be very volatile and easily distorted. Moreover, with low dividend yield events it is unlikely that investors would get involved in event-driven trades because of the low potential benefits.

The final sample of ex-day events consists of 857 observations. The sample comprises dividend events of 217 companies. Among these companies 70 companies are from Russia, 29 from Brazil, 29 from India, and 89 from China.

The descriptive statistics for the market-adjusted price drop ratio reveals that on average for the total sample the market-adjusted price drop ratio equals 0.92. According to the t-test, the average value of the market-adjusted price drop ratio is below 1 at the 0.01 significance level, which gives us the preliminary indication of the existence of the ex-day phenomenon. For Russian companies, the average price drop ratio is 0.59, below 1 at the 0.01 significance level. For Indian companies, average value is 0.82, below 1 at the 0.01 significance level. For Chinese companies' stocks, the average value of the market-adjusted price drop ratio is 1.11, higher than 1 at the 0.05 significance level. Finally, for Brazilian companies, average value is 1.08, which is not statistically higher than 1 at the 0.05 confidence level. The average values of the market-adjusted price drop ratio for the subsamples by country are summarized in Figure 2.
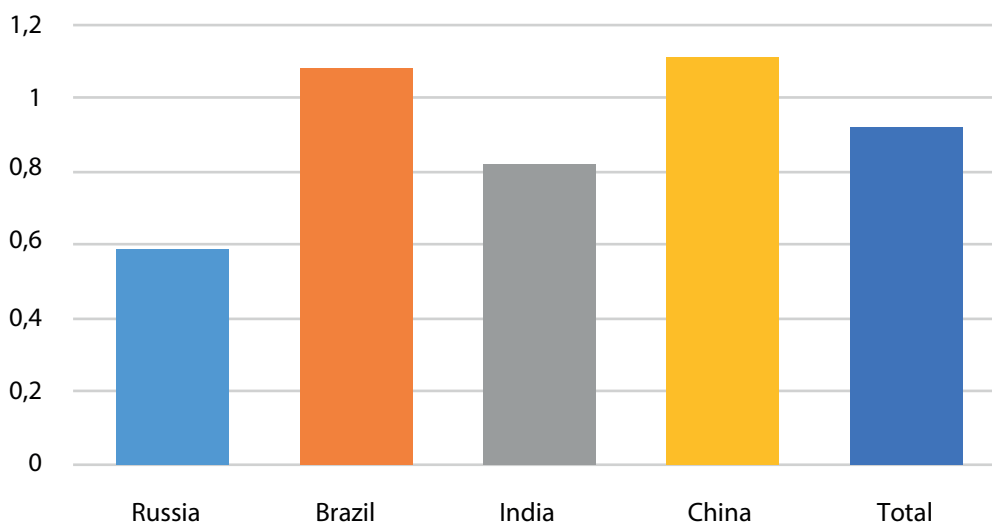
Figure 2. Average market-adjusted ex-day price drop by country

We have compared the average market-adjusted price drop ratio for each country with the theoretical value predicted by the tax rate-based equilibrium condition. The results are presented in Table 1. For all of the subsamples, the actual price drop ratio is smaller than the "theoretical" one, implying that even in the case where there is an influence of taxes, there should also be some other effects that influence share price during the ex-dividend event.

Table 1

Average values of market-adjusted price drop ratio by country

Sample	Total	Russia	Brazil	India	China
Average market-adjusted price drop ratio	0.92	0.59	1.08	0.82	1.11
Theoretical tax-based price drop ratio	1.07	1.04	1.18	1.18	1.0

Testing explanatory theories

Tax theory

For the first prediction within tax theory, we conduct a sample mean t-test. For the subsample of non-taxable dividend events, the average value of the ex-dividend date market-adjusted price drop ratio equals 1.05, not statistically different from 1 at the 0.05 significance level. We obtain supportive evidence for the first prediction within tax theory.

To test the second prediction within tax theory, we construct "short" and "long" regression models. In each of these models we check whether there is a significant positive relationship between the ex-dividend date market and dividend-adjusted return (dependent variable) and dividend tax rate. Estimation results are presented in Table 2. The dependent variable is market- and dividend-adjusted ex-day return.

Table 2

Regression models to test the second prediction for tax theory

Variable	Short model			Long models		
	OLS	RE	FE	OLS	RE	FE
Dvdtax	-0.012	-0.024	-0.062	-0.108	-0.106	-0.114
Ru	0.024*	0.026*		0.025*	0.024*	
Br	-0.001	-0.001		-0.003	-0.002	
Ind	0.008**	0.009		0.005	0.006	
Crisis	0.011***	0.011***	0.011***	0.006	0.006	0.005
Dvdyld				-0.004	0.002	0.021
Vol				0.0002**	0.0002**	0.0002*
Bidask				0.046	0.043	-0.003
Mcap				-6.1e-08**	-5.8e-08*	-4.6e-08
Cgoh				-0.012	-0.012	-0.011
To				-0.008***	-0.008***	-0.006
Arb				-0.059**	-0.058*	-0.060*
Cons	-0.005***	-0.005**	0.004	-0.016***	-0.016***	-0.007
F (RE: chi2)	0.000	0.000	0.001	0.000	0.000	0.000
R2	0.133	0.133		0.197	0.197	
R2_adj	0.128			0.185		

Legend: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Source: Author's calculations.

Dvdtax – tax rate on dividends;

Ru – Russia dummy,
Br – Brazil dummy,
Ind – India dummy,
Crisis – 2008–2009 global crisis period dummy;

Dvdyld – dividend yield;

Vol – historic stock return volatility based on Bloomberg data;

Bidask – estimated historic bid-ask spread based on Bloomberg data;

Mcap – market capitalization;

Cgoh – capital gain overhang estimate;

To – turnover estimate based on daily trade volume and number of shares outstanding for the [-90; -5] estimation window;

Arb – abnormal return over 5 days preceding ex-day;

Cons – intercept.

As shown in Table 2, for each of the regression models, the variable of dividend tax rate is not statistically significant at the 0.05 confidence level, and even at the 0.1 confidence level. We do not find supporting evidence for the second prediction.

To check the third prediction within tax theory, we constructed regression models similar to the ones presented above, but apply them for the subsamples by dividend yield. In our total sample, average dividend yield is 3.5%, so we use it as a threshold for the two subsamples. The regression models estimation is presented in Table 3.

Table 3

Regression models to test the third prediction for tax theory

Variable	Low dividend yield subsample			High dividend yield subsample		
	OLS	RE	FE	OLS	RE	FE
Dvdtax	-0.057	-0.085	-0.098	0.029	0.029	-0.009
Ru	0.023	0.027		0.024	0.024	
Br	0.002	0.001		-0.008	-0.008	
Ind	0.009**	0.010*		0.006	0.006	
Crisis	0.007*	0.007*	0.007*	0.021**	0.021**	0.012
Cons	-0.005**	-0.004*	0.002	-0.006	-0.007	0.008
Observations	591	591	591	266	266	266
F (RE: chi2)	0.000	0.000	0.084	0.000	0.000	0.245
R2	0.071	0.071		0.220	0.220	
R2_adj	0.063			0.205		

*Legend: * p < 0.05, ** p < 0.01, *** p < 0.001.*
Source: author's calculations.

Once again the dividend tax variable is not significant in all of the regression specifications; we see no evidence in support of the third prediction.

To summarize, only the first prediction for tax theory – that for a non-taxable dividends price drop is not statistically different from 1 – shows supporting evidence, while the other two predictions are rejected. It looks like factors other than taxes may have explanatory power for ex-dividend day stock price performance within our sample.

Clientele theory

The first prediction within clientele theory aims to test the relationship between ex-day share price return and dividend yield. The corresponding regression estimates are presented in Table 4. The dependent variable is market- and dividend-adjusted share price return on the ex-day.

Table 4

Regression models to test the first prediction for clientele theory

Variable	Short model			Long models		
	OLS	RE	FE	OLS	RE	FE
Dvdyld	0.003	0.010	0.041	-0.004	0.002	0.021
Ru	0.023***	0.023***		0.025*	0.024*	
Br	-0.001	-0.001		-0.003	-0.002	

Variable	Short model			Long models		
	OLS	RE	FE	OLS	RE	FE
Ind	0.008**	0.009*		0.005	0.006	
Crisis	0.011***	0.011***	0.011***	0.006	0.006	0.005
Dvdtax				-0.108	-0.105	-0.114
Vol				0.0002**	0.0002**	0.0002*
Bidask				0.046	0.043	-0.003
Mcap				-6.1e-08**	-5.8e-08*	-4.6e-08
Cgoh				-0.012	-0.012	-0.011
To				-0.008***	-0.008***	-0.006
Arb				-0.059**	-0.058*	-0.060*
Cons	-0.005***	-0.005**	0.001	-0.016***	-0.016***	-0.007
F (RE: chi2)	0.000	0.000	0.001	0.000	0.000	0.000
R2	0.133	0.133		0.197	0.197	
R2_adj	0.128			0.185		

Legend: * p < 0.05, ** p < 0.01, *** p < 0.001.
Source: author's calculations.

In every regression model the dividend yield variable is not statistically significant.

The second prediction of clientele theory is related to trading activity patterns, and it consists of two parts. Overall for the window starting 5 days before the cum-day and ending 5 days after the ex-day, average relative trading volume is 1.37 (i.e., 37% higher than the historic average), higher than 1 at a 0.05 level of confidence (p-value = 0.027). Yet, the results differ by countries. For the subsample of Indian companies' stocks, the total event window average RTV is not statistically different from 1, whereas for the Russia, Brazil and China subsamples RTV is significantly higher than 1. The corresponding average relative trading volume estimates are presented in Table 5.

For the cum-day and the ex-day, RTV is significantly higher than 1 across all countries, supporting the clientele theory. However, the average RTV for the event window days except the ex-day and the cum-day is either equal to or significantly higher than 1 across the countries studied, contradicting the prediction about negative RTV on surrounding days.

Table 5

Average relative trading volume estimates

Timeframe	Total sample	Russia	Brazil	India	China
Complete event window [-5;5]	1.37	1.96	1.15	1.09	1.12
Cum-day	1.41	1.87	1.21	1.29	1.21
Ex-day	1.42	1.68	1.27	1.32	1.33
Event window except cum-day and ex-day	1.36	2.01	1.13	1.04	1.09

Source: author's calculations.

To summarize, there is no evidence in support of the prediction about the relationship between dividend yield and ex-day return, and the prediction about trading volume patterns has only partial supporting evidence. We conclude that clientele theory is unlikely to have explanatory power for our sample.

Dividend capturing theory

In order to test the first prediction within dividend-capturing theory, we constructed regression models where the dependent variable is ex-day market- and dividend-adjusted abnormal return, and the key independent variables are stock return historic volatility and bid-ask spread (obtained from Bloomberg). The regression models estimation results are presented in Table 6.

Table 6

Regression models to test the first prediction for dividend capturing theory

Variable	Short model			Long models		
	OLS	RE	FE	OLS	RE	FE
Bidask	0.203**	0.184**	0.094	0.046	0.043	-0.003
Vol	0.0002*	0.0002*	0.0002*	0.0002**	0.0002**	0.0002*
Ru	0.022***	0.022***		0.025*	0.024*	
Br	-0.001	-0.001		-0.003	-0.002	
Ind	0.010**	0.010**		0.005	0.006	
Crisis	0.007*	0.007*	0.005	0.006	0.006	0.005
Dvdtax				-0.108	-0.105	-0.114
Dvdyld				-0.004	0.002	0.021
Mcap				-6.1e-08**	-5.8e-08*	-4.6e-08
Cgoh				-0.012	-0.012	-0.011
To				-0.008***	-0.008***	-0.006
Arb				-0.059**	-0.058*	-0.060*
Cons	-0.012***	-0.012***	-0.005	-0.016***	-0.016***	-0.007
F (RE: chi2)	0.000	0.000	0.000	0.000	0.000	0.000
R2	0.153	0.153		0.197	0.197	
R2_adj	0.147			0.185		

*Legend: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.*

Source: author's calculations.

Based on specification tests, the OLS specification is most appropriate for both the long and short models. Both short and long OLS models demonstrate a statistically significant positive relationship between stock return volatility and ex-day abnormal return, supporting the first prediction within dividend-capturing theory. Bid-ask spread has a positive relationship with ex-day abnormal return in the short OLS model, in line with the first prediction.

To check the second prediction within the dividend-capturing theory, we split the total sample into two subsamples above and below the average dividend yield of 3.5% and constructed regression models similar to those in the first prediction. Based on the first prediction test results, we concentrate on the OLS model specification. The results for the subsamples by dividend yield are presented in Table 7 and provide supportive evidence for the second prediction.

Table 7

Regression models to test the second prediction for dividend capturing theory

Variable	OLS for subsample with dividend yield not less than 3.5%	OLS for subsample with dividend yield less than 3.5%
Bidask	0.278**	0.172*
Vol	0.0002*	0.000
Ru	0.026***	0.016***
Br	-0.004	0.002
Ind	0.016*	0.008*
Crisis	0.008	0.007
Cons	-0.016**	-0.008*
Observations	359	498
F (RE: chi2)	0.000	0.000
R2	0.235	0.077
R2_adj	0.221	0.066

Legend: * p < 0.05, ** p < 0.01, *** p < 0.001.

Source: author's calculations.

For the subsample with high dividend yield, the coefficients for historic return volatility and bid-ask spread variables are higher and are significant at better confidence levels. Also, the explanatory power of the regression model is better for the high dividend yield subsample. We see evidence in support of the second prediction within dividend capturing theory.

To test the third prediction within dividend capturing theory, we constructed two types of similar regression models: one type has ex-day RTV as a dependent variable, while the other considers the whole [-5;5] event window's RTV. The results are presented in Table 8.

Table 8

Regression models with ex-day relative trading volume to test the third prediction for dividend capturing theory

Variable	Short models			Long models		
	OLS	RE	FE	OLS	RE	FE
Dvdyld	9.245*	9.244*	11.526*	6.969	7.230	9.903
Bidask	-0.881	-11.866	-42.791**	-10.381	-19.215*	-42.007**
Vol	0.005	0.010	0.014	0.011	0.015	0.015
Ru	0.148	0.233		0.083	-0.159	
Br	-0.079	-0.058		-0.177	-0.162	
Ind	0.021	-0.016		-0.226	-0.302	
Crisis	-0.308	-0.677	-0.905*	-0.418	-0.722	-0.933*
Dvdtax				-5.117	-2.872	0.574
Mcap				-1.3e-06	-2.0e-06	-1.9e-06
Cgoh				0.244	0.670	1.011

Variable	Short models			Long models		
	OLS	RE	FE	OLS	RE	FE
To				-0.538**	-0.602*	-0.178
Rtvc				0.175***	0.154**	0.146**
Cons	0.889*	0.790	0.823*	0.298	0.275	0.486
F (RE: chi2)	0.360	0.175	0.001	0.004	0.006	0.001
R2	0.009	0.007		0.033	0.031	
R2_adj	0.001			0.020		

*Legend: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.*
Source: author's calculations.

Among short models, the fixed effects specification is most appropriate, based on specification tests. Within this specification, a bid-ask spread variable is significant and negatively related to ex-day RTV, while the dividend yield variable is also significant and positively related to ex-day RTV, confirming the third prediction of dividend capturing theory. Yet, the historic volatility variable is not significant. It is worth noting that a crisis dummy is significant and negatively related to ex-day RTV, implying that during the crisis investors were more risk-averse and reluctant to take part in short-term opportunities.

Among the long models, either the FE or RE model is most appropriate. Both FE and RE long models indicate a negative significant relationship between bid-ask spread and ex-day RTV. In the case of the FE model, there is a positive relationship between dividend yield and RTV, significant at the 0.1 confidence level (p-value = 0.07). Both for the FE and RE long regression models, cum-day RTV is positively related to ex-day RTV, which may imply the short-term nature of trades related to ex-dividend events.

Table 9 shows the results of these regression model estimates for event-window relative trading volume.

Table 9

Regression models with event window relative trading volume to test the third prediction for dividendcapturing theory

Variable	Short models			Long models		
	OLS	RE	FE	OLS	RE	FE
Dvdyld	-3.779	-3.779	4.635	-5.158	-5.158	3.885
Bidask	6.526	6.526	-55.044*	-19.612	-19.612	-52.587
Vol	-0.003	-0.003	0.002	0.0004	0.0004	-0.007
Ru	0.890	0.890		-8.384***	-8.384***	
Br	0.025	0.025		-0.321	-0.321	
Ind	0.002	0.002		-0.611	-0.611	
Crisis	-0.020	-0.020	0.066	0.181	0.181	0.492
Dvdtax				80.891***	80.891***	106.795***
Mcap				-1.2e-06	-1.2e-06	1.3e-06
Cgoh				0.166	0.166	1.543
To				-1.621***	-1.621***	-1.602
Cons	1.318*	1.318*	1.446	0.469	0.469	-2.813
F (RE: chi2)	0.719	0.720	0.315	0.000	0.000	0.001
R2	0.005	0.005		0.048	0.048	
R2_adj	-0.003			0.035		

*Legend: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.*
Source: author's calculations.

Among short regression model specifications, neither of the models looks statistically significant. Among long regression model specifications with event window RTV as a dependent variable, we see no evidence in support of the third prediction within dividend capturing theory.

Finally, to test the fourth prediction within dividend-capturing theory we apply a sample mean to abnormal returns before and after the ex-day for the total sample and for country-specific samples. The results are presented in Table 10. For all countries except India there is positive abnormal return during the days preceding ex-day, significant at a 0.01 confidence level, in line with dividend-capturing theory. For India, there is also positive abnormal return before ex-day, but significant at a 0.05 level of confidence.

For the days following ex-day, there is weak evidence in support of negative abnormal return for Russian and Indian stocks, having an abnormal return of -0.69% and -0.57%, which are not statistically different from 0 due to return volatility. For Chinese stocks, the abnormal return after the ex-day is also not statistically different from 0. Brazilian stocks show a positive abnormal return of 0.87% after the ex-day, significant at a 0.01 confidence level. Overall, there is no evidence of negative abnormal return after the ex-day. We conclude that only the part regarding positive abnormal return before the ex-day is confirmed for the fourth prediction within dividend-capturing theory.

Table 10

Average abnormal returns for the days preceding and following ex-day

Variable	Total sample	Russia	Brazil	India	China
Abnormal return 5 days before ex-day	0.95%	0.84%	1.07%	0.99%	0.96%
Abnormal return 5 days after ex-day	-0.15%	-0.69%	0.87%	-0.57%	-0.14%

Source: author's calculations.

To summarize, the first and the second predictions within dividend capturing theory find empirical support. With the third prediction, we see supportive evidence for ex-day RTV, but not for [-5;5] event window RTV. This may imply that most of short-term trading is concentrated very close to the ex-day. For the fourth prediction, we find supportive evidence for positive abnormal return preceding the ex-day, but no support for negative abnormal return following ex-day. Overall, dividend capturing theory may really be one of the explanations for the ex-dividend day phenomenon for our BRIC zone sample.

Disposition effect theory

In order to test the first prediction within disposition effect theory, we constructed regression models with ex-day market- and dividend-adjusted return as a dependent variable, while the key independent variable is the capital gains overhang measure. The results are presented in Table 11.

Table 11

Regression models to test the first prediction within disposition effect theory

Variable	Short model			Long models		
	OLS	RE	FE	OLS	RE	FE
Cgoh	-0.018**	-0.018**	-0.015*	-0.012	-0.012	-0.011
Ru	0.023***	0.024***		0.025*	0.024*	
Br	-0.000	-0.000		-0.003	-0.002	
Ind	0.008**	0.009*		0.005	0.006	
Crisis	0.011***	0.011***	0.011***	0.006	0.006	0.005
Dvdtax				-0.108	-0.105	-0.114

Variable	Short model			Long models		
	OLS	RE	FE	OLS	RE	FE
Dvdyld				-0.004	0.002	0.021
Vol				0.0002**	0.0002**	0.0002*
Bidask				0.046	0.043	-0.003
Mcap				-6.1e-08**	-5.8e-08*	-4.6e-08
To				-0.008***	-0.008***	-0.006
Arb				-0.059**	-0.058*	-0.060*
Cons	-0.006***	-0.005**	0.002*	-0.016***	-0.016***	-0.007
F (RE: chi2)	0.000	0.000	0.000	0.000	0.000	0.000
R2	0.141	0.141		0.197	0.197	
R2_adj	0.136			0.185		

*Legend: * p < 0.05, ** p < 0.01, *** p < 0.001.*
Source: author's calculations.

Among short models, each specification reveals a negative statistically significant relationship between CGOH and ex-day market- and dividend-adjusted return, supporting the disposition effect theory. Among short models, the RE specification is the most appropriate, based on specification tests. Among long model specifications, the CGOH variable is significant at a 0.1 confidence level and negatively related to the ex-day market- and dividend-adjusted return, in line with disposition effect theory. OLS is the most appropriate specification among long models, based on specification tests. It is worth noting that market capitalization, historic turnover measure and abnormal return preceding the ex-day are negatively related to ex-day excess return. The first two of these control variables indicate that liquidity is an important factor within the ex-day phenomenon. The third one is in line with both excess buying and selling activity coming from short-term dividend capturing trades and the disposition effect concept.

To distinguish the capital gains overhang effect from other effects, we tested the second prediction within disposition effect theory, testing the average ex-day price drop ratio in cases where the capital gains overhang measure is positive and negative for the subsamples by turnover and dividend yield. The estimates are presented in Table 12. The criteria for splitting the sample are based on average values of observed dividend yield and the turnover measure, which is -0.91.

Table 12

Average ex-day price drop ratio for subsamples by capital gains overhang, dividend yield and turnover

Subsamples by criteria	CGOH > 0	CGOH < 0
Dividend yield > 3.5% and Turnover measure > -0.91	1.064	1.018
Dividend yield > 3.5% and Turnover measure < -0.91	0.714	0.743
Dividend yield < 3.5% and Turnover measure > -0.91	1.091	1.053
Dividend yield < 3.5% and Turnover measure < -0.91	0.894	0.510

Source: author's calculations.

The second prediction within disposition effect theory is confirmed for three out of four subsamples by dividend yield and turnover, as they show that the ex-day price drop ratio is higher (i.e., adjusted return is lower) in the cases when capital gains overhang is positive. The only exception is the case where dividend yield is above average while the turnover measure is below average. On a separate note, less liquid stocks have a lower ex-day price drop ratio, implying additional evidence in support of dividend-capturing theory.

Both predictions of disposition effect theory find some empirical support, even though it is not perfectly complete. We conclude that disposition effect theory may be one of the explanations of the ex-dividend date phenomenon for our sample.

Conclusion

The results of the testing of the four explanatory theories are summarized in Table 13. We see only partial weak support for some of the predictions within tax theory and clientele theory. However, each prediction regarding dividend capturing theory and disposition effect theory finds at least partial empirical support. It is more likely that the latter two theories explain the ex-day phenomenon for the studied sample of BRIC zone companies. Yet, there may be additional explanatory factors and theories that have not been revealed in existing research, given that existing studies still have not come to a consensus about a single explanatory theory.

Table 13

Summary of explanatory theories testing

Theory	Prediction testing results	Overall conclusion
Tax theory	1. For non-taxable dividends an ex-day share price drop should equal or be higher than dividend – *confirmed* 2. There should be a positive relationship between ex-day return and dividend tax rate – *rejected* 3. The relationship between ex-day return and tax rates should be stronger for high dividend yield stocks – *rejected*	Rejected
Dividend clientele	1. An ex-day price drop should be higher for high dividend yield shares – *rejected* 2. A. No abnormal trading volume at the event window around ex-day should be observed – *confirmed for India* 3. B. There should be positive abnormal trading volume on the ex-day and the day before, and negative relative trading volume on surrounding days – *mixed evidence*	Rejected
Dividend capturing	1. Higher stock return volatility and/or transaction costs lead to higher ex-day return – *confirmed* 2. For higher dividend yield shares, the relationship between volume/transaction costs and ex-day return is stronger – *confirmed* 3. Relative trading volume around ex-day should be positively related to dividend yield and negatively related to transaction costs/return volatility – *partial support* 4. There is an abnormal price increase before the ex-day and an abnormal price decrease afterwards within the event window – *partial support*	Confirmed
Disposition effect	1. Capital gain overhang should be positively related to the ex-day price drop ratio (negatively related to ex-day return) – *confirmed* 2. The relationship between capital gain overhang and the ex-day price drop ratio should hold within separate subsamples that correspond to different clientele groups defined by dividend yield and turnover measures – *mostly confirmed*	Confirmed

The ex-dividend day phenomenon states that, according to existing evidence, on average the share price drop on ex-div-

idend date has a smaller magnitude than the size of the dividend. Scientists have been investigating the reasons behind such a phenomenon for several decades, but they still have not come to a single conclusion. Different studies propose four key explanatory theories: tax theory, clientele theory, dividend-capturing theory and disposition effect theory. However, existing studies mostly concentrate on a couple of theories rather than on all of them and focus mostly on developed markets, whereas among emerging markets there is sufficient evidence only for Asian countries, namely China and Taiwan.

We tested these four explanatory theories together for the sample of BRIC zone companies for the period 2005-2015. We have found out that tax theory and clientele theory are not likely to explain the ex-day phenomenon on BRIC zone markets. However, dividend-capturing theory and disposition effect theory are likely to have explanatory power for our sample. The results of our study may be used by practitioners who make investment decisions regarding stocks that go ex-dividend. Yet, it is important to note that most of identified relationships work only for the events with a dividend yield of at least 2.0%. For the events with smaller dividend yield, the ex-day price drop ratios and excess returns may easily be distorted.

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