DOI: 10.17323/j.jcfr.2073-0438.15.3.2021.14-27.
JEL classification: G14, G32, D52

Testing Market Reaction on Stock Market Delisting in Russia

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Abstract

This paper expands the available information on the effects of delisting in Russia, and represents a rare empirical analysis of the impact of external events on securities prices in this major global market. We seek to evaluate how stock prices of competing companies fluctuate around the dates of stock market delisting announcements and completion.

We analyse stock prices as correlated with company delisting events from 2004 to 2019 on 552 companies on the Russian MOEX Exchange. The event study methodology is used to evaluate the abnormal returns of rival companies close to relevant delisting dates. These data were checked for statistical significance using the standardised Patell residual test.

The results indicate a significant competitive effect on stock prices both on the dates of delisting announcement and on completion, with more significant returns close to announcement dates. These effects were found to influence the prospects not just of individual groups of companies, but of all market participants.

We may conclude from our results that delisting is not an event limited in effect to only one company, but impacts the industry as a whole, temporarily changing its value. As such, it will interest both shareholders and managers of public companies, and any participants of industries in which delisting occurs.

Keywords: delisting, delisting intra-industry effects, competitive effects, information effects, delisting abnormal returns

For citation: Rogova, E. and Belousova, M. (2021) "Testing Market Reaction On Stock Market Delisting In Russia", *Journal of Corporate Finance Research* | ISSN: 2073-0438, 15(3), pp. 14-27. doi: 10.17323/j.jcfr.2073-0438.15.3.2021.14-27.

Introduction

Companies issue their shares on the stock market in order to attract major new investments. To implement a successful IPO and stock listing, managers must consider many factors, both external and internal. In this regard, many researchers and economists study stock markets around the world as well as companies' movements towards stock markets [1]. However, most articles do not focus on the factors and variables not provided for by general asset pricing models. Very few studies have been published based on an empirical analysis of the impact of external events on securities prices.

Studying the range of factors that can affect the value of securities is especially important for both corporations and ordinary investors [2]. Corporations are interested in studying this topic for the successful circulation of their shares on the stock exchange, while potential investors are interested in a reasonable investment of their assets. Several articles published by major Russian financial resources [3; 4; 5] raise concerns for investors who may face an unexpected delisting of companies in Russia. This indicates the importance and relevance of this topic for investors, in order to expand available information on the effects of delisting in Russia. In addition to the fundamental internal indicators of the company, which underlie most pricing models, an external circumstance – in other words, an event mainly originating in other corporations – may affect the value of assets [6]. These events include IPOs and delisting from the market.

In Russia, according to the website of the Moscow Exchange, 20 companies were delisted from the stock exchange in 2019, while an average of 26 companies per year were delisted from the stock exchange from 2010 to 2019, which is 7.4% of the total amount of listed companies. This suggests that delisting is an ongoing problem for stock market players and is not becoming less valuable. Moreover, according to Bloomberg, companies spent 26 billion dollars on buying stock from their shareholders for a 9-month period in 2020. This amount exceeds the comparable period of 2019 by 25 times [7].

In general, listing as a phenomenon has received much more attention in the literature than the reverse process – delisting. This is especially true of literature based on the Russian market. Of course, many articles have focused on delisting research, but the effects of delisting on other companies in the industry have not been investigated. Most of the existing studies consider the abnormal return of a specific company before and after delisting, without spreading the effect on the industry [8]. A limited number of works investigate events more widely, believing that delisting is not an event of one firm but to some degree affects the entire industry.

Considering the possible consequences of some events for the industry, in most cases, researchers note informational effects [9; 10]. In the case of delisting, they have a negative effect on the stock prices of other companies. The expected stock exclusion of one company from the quotation list may signal adverse market conditions, in other words, that the demand for company capital in this sector is low, and investors are pessimistic [11]. On this basis, there is a likelihood that other firms may also delist, and the value of shares in this market will fall. It is possible to observe such effects both at the time of announcement of the delisting decision of a company, and after the completion of this event.

This paper aims to expand the existing concept of delisting by examining the competitive effects that can strengthen (or weaken) the industry when announcing and (or) completing the stock exclusion of publicly traded competitors. To be more precise, this work primarily seeks the answer to the following question: do investors and managers of competing firms face changing stock prices in response to delisting in the industry? To answer this question, we use the event study method.

The main objectives of this study are to find out whether delisting has a significant impact on competitive firms in the industry, and if the result is positive, to determine which set of effects caused it. We base our study on two theories that perceive opposite effects of delisting. Delisting can affect an industry in two possible ways. On the one hand, the exclusion of the company's shares from the stock exchange quotation list can lead to a negative effect, scaring off existing and potential investors from the industry. On the other hand, a reduction in the number of companies in an industry can have a positive effect on stock prices. That is, due to weakening competition in the industry, firms can increase their market share and obtain growth in the value of assets.

The other novel contribution of this study is that it provides empirical evidence from the Russian market, which is poorly studied, but has an interest for investors because of its size. We suppose that the results of the study will also be interesting for company managers. Firstly, they will get more information that will help them manage their capital, considering the possible risks and market mechanisms described in the work. At the same time, company managers will be able to adjust their market behaviours in response to the delisting announcement to mitigate possible price fluctuations.

This paper is structured as follows. We start with a literature review that connects our study with existing literature on the delisting phenomenon and its impact on the competitive environment. Then, we present the main hypotheses of our study. The next section describes the research methodology and explains the data collection process. The following section reports and discusses the empirical results of the study. In the final section, conclusions are presented.

Literature Review

Main reasons for companies to delist

The main goal of most companies in the modern world is to increase the wealth of shareholders [12]. Thus, investors

enter the stock market and choose companies that care about increasing their wealth. Therefore, there is a need to study the factors that make it possible to achieve success on the stock exchange. This study considers delisting as a tool for influencing stock quotes, and therefore the welfare of investors.

Delisting is scarcely covered in the scientific literature [13]. Delisting is viewed as the phenomenon opposite to the decision to become a public company [14]. It is the process of excluding company shares from the stock market quotation list [15; 16].

The study of the reasons leading to delisting is a particularly relevant topic since this event affects not only the economy of the company itself but can also harm investors who own shares. In addition, the frequency of this event can damage the reputation of the exchange on which it occurred, which is why some traders are afraid to engage with it [17]. Considering the possible global implications, it is necessary to better study the nature of delisting.

Delisting is divided into two types: voluntary and involuntary [15]. According to Macey et al. [17], involuntary delisting appears due to non-compliance with regulatory requirements, or due to the bankruptcy or liquidation of a company. In such cases, companies are forced to delist. On the other hand, voluntary delisting is a consequence of managerial choice.

Involuntary or forced delisting of shares is the most unpleasant option for both the issuer and its investors. In this case, the stock exchange excludes financial instruments from its list due to the issuer's inconsistency with listing parameters. Involuntary delisting may have the following reasons: bankruptcy of the issuing company, liquidation or reorganisation of the issuing company, suspension of the issue of securities due to violations of the issuing rules, the issuer's inaccurate financial statements, the decrease in the value of the net assets of the mutual fund below the minimum, expiration of the listing agreement, and non-payment by the issuer of the listing services.

The difference between voluntary and involuntary delisting is that in case of involuntary delisting, it is the management of the issuing company who decides to leave the exchange. The most common reasons for voluntary delisting include the following: financial problems of the company, the choice of a different strategy for attracting investments, the desire to become a private company, and company consolidation. For example, in 2018, Russian operator Megafon delisted both from the London and Moscow stock exchanges, following a new strategy to pursue new opportunities away from its core telecoms business with the aim of becoming a leader in Russia's digital ecosystem. As the new CEO, Gevork Vermishyan, has stated, the new strategy would require "broader partnerships with state-owned corporations, transactions with higher risks and investments with lower returns". The operator warned it would also need to use its free cash to make investments, likely eliminating the payment of dividends [18]. So, the status of a public company was no longer a priority of Megafon management.

The regulation framework for delisting in Russia is formed by laws 39-FZ "On the securities market" and 208-FZ "On joint stock companies". The Moscow Exchange imposes additional restrictions on the issuer, which are reflected in the 'Listing Rules' document.

The delisting procedure in Russia is as follows: the issuer or the exchange sends an application to the 'Listing Department', after which the application is considered within a month and an expert opinion is given. If the delisting is approved, the main shareholders notify the other investors about it and publish the offer to buy back the shares. Sometimes, share buybacks may begin before the delisting is publicly announced.

According to findings by Pour and Lasfer [19] voluntarily delisting is most likely to occur about four years after the IPO date. In addition, leverage on the IPO date is much higher for willingly delisted companies than for control groups (non-delisted companies). Companies voluntarily go private when their leverage is relatively high because they have a low growth opportunity and profitability; in addition, they are incapable of raising equity and might wish to cut the costs associated with being listed. These firms are less likely to achieve the goals like rebalance of the account or raise funding to finance the growth opportunities. As a result, the motivation to voluntary delisting is a lack of financial opportunities, which occurs in case of costs of listing exceed the benefits of it.

A firm may decide to remove its shares from public access for several reasons. The main ones include mergers and acquisitions. In this case, delisting is rather nominal in nature since the company usually excludes its shares for a while in order to rename them [17]. In other words, the company reissues shares after a while with a different name. Another reason for voluntary delisting is the decision of firms to become private or to reorganise a corporation into a closed joint-stock company, as an alternative way to profit [20; 21]. Often, such a decision is made by the company in order to reduce the costs required for circulation on the exchange. Some studies on this topic have concluded that the decision to become a private company is made if the company is underestimated by the market [22]. Managers of firms see no reason to incur listing losses because they expect a higher market valuation of the company.

A number of similar studies have a different conclusion: the decision to stop the public circulation of shares in favour of privatisation is made by small firms for which the first does not pay back the costs of maintaining the listing [22]. Another option is possible, and the costs that the exchange requires, compared to other expenses, are more significant for small companies, in contrast to large companies. As a result, the firm decides that a private status is more profitable [23; 24].

Pour and Lasfer [19] revealed that firms with higher intangible assets, but relatively lower market value of equity are more likely to be voluntarily delisted. The main reason for delisting is high leverage. In other words, shares of firms with relatively high debt do not pay for themselves

in the stock market or no longer need additional capital to finance their investments.

Research by Bharath and Dittmar [20] suggests that firms have a higher probability of delisting if they have lower stock liquidity. This paper also shows that the lack of visibility, together with the uncertainty of stock prices, stock returns and analysts' forecasts, leads to low interest of investors in a company, which is positively associated with the probability of delisting.

Firms delist when the net expected benefits of listing are negative. In this trade-off framework, regulatory changes increase compliance costs, and the implementation of the SOX Act in 2002 in the USA is often cited as a major driver of delisting.

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Firms also delist when unfavourable regulatory changes increase compliance costs [25] or decrease benefits for investors. The implementation of the Sarbanes-Oxley Act (SOX) in the USA is an illustration of such changes and is often named as one of the major drivers of delisting for the foreign companies from US market [26; 27]. Sudden change of regulation also drives cross-delisting. Many Russian issuers voluntarily delisted in 2015–2019 from foreign exchanges while remaining at Moscow Exchange because of the unfavourable regulation that downgraded the attractiveness of international exchanges. For example, in 2018 MTS withdrew its depository receipts from NYSE after the new agreement on offshore taxation had been imposed [28].

In addition to the reasons considered, there is another assumption that might explain the decision on privacy: the problem of agent-principal [29]. Some public operations cause conflicts in the management of the company, and privacy can be a solution to the problem, i.e., a compromise [30]. Thus, delisting can bring benefits to shareholders, increasing their well-being. In summary, the phenomenon of voluntary delisting is due to two groups of factors – a compromise between costs and benefits, and agency costs. Liao [31] studied the delisting behaviour of firms from emerging markets, including Russia, and concluded that the likelihood of delisting on these markets is inversely related with the level of corporate governance and investors protection: the better are the institutions that protect shareholders, the higher is the probability that the companies stay publicly listed. The firms from countries with weaker corporate governance may tend to delist in order to soften their agency problems.

Involuntary delisting usually occurs at the legislative level due to violation of strict exchange rules or fraud. Any exchange has a strict set of rules that every public company must follow. Typically, the minimum requirements for extending a listing of a company's shares include the agreed minimum number of shareholders, a certain number of shares, a certain average monthly trading size, and a minimum market capitalisation of the company. Involuntary delisting also can be caused by the economic insolvency of the company, that is, bankruptcy. However, it is worth noting that in any case, the final decision on the exclusion of shares from the quotation list is made by the exchange. Thus, inappropriate behavior for the exchange may cause the delisting of the company's shares from the market in question.

The impact of delisting on the industry

A small number of articles were published on the effects of delisting on the stock prices of competing firms. Most of the literature studies isolated asset pricing, or the causes of certain market events, such as IPOs, delisting, bankruptcy, and so on [13]. Two goals dominate in such works: to determine the most significant factor that increases the likelihood of an event, and to analyse the impact of this event on the company [19; 21; 32].

Other studies focus on assessing the effects of an event such as delisting, on the industry in which it occurred. The main idea is that the event is not limited to the company in which it occurred but is able to influence competitors. Thus, there are two main effects on stock prices of companies: information and competitive effects [33]. If the influence exerted by information that some company has disclosed on the market is similar for the announcing company and for the industry, then it is called the information effect, or infection effect. In this paper, it is assumed that delisting can exert an information effect causing negative consequences and underestimation of competing companies in the market.

The second type of effect operates on the industry differently. If the disclosed information has a contrary effect on competitors in comparison with the announcing company, this effect is called a competitive effect [34]. This study suggests that it is positive. When shares are removed from the exchange lists, the concentration of companies in the industry decreases, thereby opening new opportunities for competitors [35]. The hypothesis is that this phenomenon leads to higher stock prices of competing firms. However, there is no unequivocal opinion on what effect dominates the market.

Studies aimed at determining the prevailing effect include the work of Lang and Stulz [11]. The article focuses on the study of intra-industry effects in response to a company bankruptcy announcement. As a result, the authors distinguish the information effect as dominant. The reason is that the bankruptcy announcement reveals negative financial information that may apply to the entire industry, which reduces market expectations about the profitability of other firms. They also concluded that high leverage enhances the negative information effect for firms but does not affect the competitive effect. Thus, with an increase in the Her-

findahl-Hirschman index, the competitive effect increases when the information effect does not change. Shumway [16] came up with similar results, which documents the backlash for companies delisting due to bankruptcy and other negative reasons.

Laux et al. [36] investigated the price changes of competing companies in response to announcements of a change in dividend policy and obtained opposite results. In this case, the information effect has an impact on the industry if the announcer has a high degree of market power, with high competition within the industry. However, the overall reaction of companies within the industry is close to zero. This shows that competitive effects offset information effects and vice versa. Thus, unlike the above authors, Laux et al. [36] believe that the effect may vary within the industry and depends on the individual performance of firms. The key differences are the relative effect on the firm if the income of this firm is determined by industry-wide factors. In other words, if a firm uses common resources and has similar production processes and a similar labour market to other firms, then a review of the dividends of an industry competitor will entail a review of the dividend policy in that company. However, if a company does not have extensive market power and a growth rate higher than that of the declaring company, then the event will not affect it and vice versa.

Other authors also support this conclusion about balancing informational and competitive effects. Slovin et al. [37] believe that the event does not have a significant impact, and it all depends on the specificity of individual industries and the saturation of companies in it.

Cai et al. [38] studied the information environment and its effect on stock prices of delisting firms. The results showed the importance of the information effect for both voluntary and forced delisting. Sanger and Peterson [8] came to a similar conclusion.

Park et al. [15] also studied the information effect, with a focus on involuntary delisting. However, it cannot be fully compared with the works of Lang and Stulz [11] and Shumway [16] because the informational effects within companies are investigated, and not their intra-industry impact. The authors evaluate the existence of trade in classified information until the company is excluded from the quotation list. The assumption is since large shareholders take part in the management of the company, they can use their information advantage and participate in information trading. In addition to cases of bankruptcy, the authors add to the sample firms those excluded due to failure to provide an audit opinion, write-off of all capital or suspension of a banking operation. As a result, the stock prices of such companies sharply decline one year before the official announcement of delisting due to the information effect. In parallel, Park et al. [15] called the increase in liquidity the main reason for the delisting of a company's shares. Such findings are consistent with the conclusions by Liu et al. [39], who also call liquidity the main reason for the exclusion of shares.

Andrukovich [40] obtained similar results for his investigation of the causes of delisting and stock returns on the US stock market. He notes that both with pre-announced delisting and with delisting without prior notice, stock prices are rapidly falling. The main reason for the price reduction is the company's liquidity. Beaver et al. [41] found that the firm receives their main income from delisting in the first month after the event.

Separately, it is worth noting that Beaver et al. [41] pay much attention to the description of the methodology of such studies. Considerable attention was paid to the method of collecting data from the CRSP and the errors that most researchers make when working with information about delisting. The authors note that, firstly, the net income from delisting is incorrectly estimated, since this value depends on the day of the month on which the delisting occurred. They indicate that approximately half of the delisting occurs outside the date range provided by the CRSP, and two thirds of companies are excluded due to zero post-event earnings.

However, none of the above researchers described the data collection process. Only Park et al. [15] indicate that they collected data manually, presumably from the personal websites of companies. The effectiveness of the data collected by other authors remains in question.

In addition, a small number of authors shared the final sample by the size of the delisting. The exclusion of a company with a small number of shares in the market may have a weaker effect on the industry than a company with a large turnover. However, this is difficult work, since by excluding small volumes from the database, the results may be contaminated, and the studies may lose their accuracy and quality of assessment.

Another detail relates to the study area. Only the data of Beaver et al. [41], as well as Andrukovich [40] from the above articles are based on markets where there is a circulation of shares after delisting, outside the main exchange. In other words, after removing shares from quotes, shareholders can still obtain some profit from them, which cannot be said about the rest of the research. This point could also affect the purity of the results.

Hypotheses development

This paper is aimed at studying the competitiveness of firms in various sectors of the market, based on indicators of their share prices. Few works have examined the delisting effect on the market, and as a result there is not a large amount of literature that could predetermine the results of this study. However, referring to existing similar works, it is worth saying that they do not agree in conclusions and cannot accurately name the dominant effect. The main question of this study is as follows: does delisting affect competitors in the same industry? The main hypothesis is that competitors' stock prices respond to delisting in the industry where these firms are located. Thus, it is formulated as follows:

Announcement / completion of delisting by a company leads to an increase in stock prices of publicly traded competing firms in the industry.

Since the purpose of the study is not only to discover the company's reaction to changes in the industry, but also to determine the specific direction of the reaction, i.e., whether it relates to competitive or information sensitivity, the main hypothesis is divided as follows:

Hypothesis 1a: Announcement / completion of delisting results in higher share prices for publicly traded competitors in the industry.

Hypothesis 1b: Announcement / completion of delisting results in lower share prices for publicly traded competitors in the industry.

The most obvious way to test the hypothesis is to evaluate the stock returns of industry competitors around the dates of the announcement and the completion of delisting [34]. Abnormal returns will be calculated, that is, returns that differ from the normal returns of a particular company in the industry, then their average value will be evaluated before and after the announcement / completion of the delisting. If the exclusion of shares from quotation lists leads to a positive price effect on other firms in the industry, that is, abnormal returns are greater than zero, then the competitive effect is dominant. The predominant effect will be tested for significance with a residual Patell test. Both the competitive and information effects have some influences on firms, but the former prevails over the latter [35; 42]. Thus, this statement helps us determine which effect is likely to cause a significant impact on company prices.

In general, the presented hypothesis reflects the conclusions that were drawn in existing studies. We expand them for statistical analysis of industry effects. The lack of an unambiguous opinion about the nature of delisting, its impact on competing companies, prompt us to carefully study these points in order to come to our own definite conclusions. Accurate and effective methods are needed to achieve the set goals, and they will be described in the next section.

Methodology and data

The empirical analysis of this study is based on the event study methodology. The choice of this method is justified by its application in all sources described in the literature review. The event study method suggests a way to assess the contribution of an event to a firm's value by analysing its financial characteristics.

The effectiveness of event study methodology is supported by numerous studies. MacKinlay [43] discusses advantages and limitations of this methodology, including examining the issue of contamination of the results. MacKinlay recommends using daily stock returns for clearer results and non-parametric tests. We considered these issues when conducting this study.

Another reason for mistrust in the event study methodology is possible errors because of an inaccurate event date. However, in our case, the delisting date is documented, so the probability of such errors is close to zero.

In addition to the above, researchers [42; 44; 45] proved the robustness of the methodology, which is supported by the use of special nonparametric tests that take into account cross-sectional variance, as well as the compilation of the results into cumulative average abnormal returns (CAAR). CAAR is the sum of abnormal returns divided by their number. This is how we determine the overall average impact of delisting on competitors' stock prices, but we will discuss this in more detail below.

We obtained the values of dependent variables, such as abnormal returns for competing firms by using this approach. The expected returns for each firm are obtained by applying the least squares regression model using actual stock returns for daily stock market index returns.

Abnormal performance indicators

The study uses the aggregate abnormal returns of directly and indirectly competing firms in response to the announcement and completion of delisting in an industry. Like the excluded firms, each competing firm has its own OKVED code1. Separation of companies by industry is necessary to adjust the valuation and consider potential correlations of income. The event study methodology is used to assess their deviation of returns. Returns are estimated both on the date of the announcement of delisting by the company and on the date of its completion [46].

The abnormal return ($AR_{i,t}$) of firm i at the time of event t is calculated as the difference between the actual return and the expected return ($ER_{i,t}$)if there is no event:

$$AR_{i,t} = R_{i,t} - ER_{i,t}, \quad (1)$$

where is the actual return, and is the expected return of firm i at the time t of the event.

The expected return is unconditional for the event but depends on a specific information set. It is estimated using the usual least squares regression with the actual profitability of the companies. The evaluation period is 180 days from 220 to 40 days before the date of announcement / completion of delisting, which is defined as $t = 0$. In addition, the parameters are individual for each competing company. Thus, the following market equation is evaluated:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + e_{i,t}, \quad (2)$$

where is the actual return of firm i at the time t; is the stock market index return, and are special assessment parameters for each company. The index of Moscow Exchange (IMOEX) is taken as the market index. The use of the Moscow Exchange Index complies with the recommendations of the event study methodology [44].

[1] OKVED – All-Russian classification of types of economic activity includes all classified types of economic activity in the country and relates each company with specific sector of economy as SIC in the USA does.

The event window covers 10 days before and after the event. Hsu et al. [34] came to similar conclusions and determined that up to 20 days before / after the event, the firm's return does not differ from the expected one, but within 10 days this value becomes significant.

The expected return is estimated using the least squares model, that is, by evaluating the parameters and the daily return of the IMOEX market index:

$$ER_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt}, \quad (3)$$

where is the expected return, which we substitute in equation (1) and find the abnormal return of competing firms.

This model is a one-factor capital asset pricing model (CAPM). The CAPM model is one of the most common ways to calculate the expected profitability of companies, especially in the event study methodology. Fernandez [47] confirmed the feasibility of using the model especially for short-term runs. Some authors have questioned the use of CAPM in favor of more advanced versions of the model such as consumption based CAPM (CCAPM). However, Chen [48] proved otherwise by confirming the performance of a standard CAPM versus a CCAPM. In addition, the use of CAPM is also justified for estimating the expected return on stocks in emerging markets [49].

The event study methodology proposes to calculate the cumulative abnormal returns (*CAR*) for all results. This is how we determine the overall impact of delisting on competitors stock prices. This value simply sums up the abnormal return of a competing company for a certain period before and after the event announcement / completion:

$$CAR_{iT_1}^{T_2} = \sum_{t=T_1}^{T_2} AR_{it}. \quad (4)$$

However, the use of this variable cannot objectively show the results; therefore, the use of cumulative average abnormal returns is recommended. It is based on average abnormal returns (*AAR*). *AAR* is the average of each company's abnormal returns in the event window close to the event announcement / completion date:

$$AAR_0 = \frac{1}{N}\sum_{i=1}^{N} AR_{i0}, \quad (5)$$

$$CAAR_{T_1}^{T_2} = \sum_{i=1}^{N} CAR_{it=T_1}^{T_2}, \quad (6)$$

where N is the number of firms.

Researchers often criticise *CAAR* because this tool is short-term and should not be used in studies of long periods [51]. A performance indicator that can reflect stock price reactions in the long run is better. However, this study focuses on a short-term analysis of stock prices, so it looks reasonable to use *CAAR*.

After that, the results must be checked using statistical tests.

Statistical significance tests

It is necessary to check the null hypothesis that the average abnormal yield at time t is zero. In the study, there is a risk of cross-sectional correlation, so the usual Student criterion cannot be applied. Thus, the standardised residual test developed by Pattel [52] is applied.

Cross-correlation in abnormal returns

The dependence of variables in the cross section is an important problem that can affect the correctness of the result, and the null hypothesis would be rejected more often than it is required by the data [53; 54; 55].

The main reason for the correlation is the same macroeconomic and industry factors affecting all stock prices. As a result, the dynamics of price changes may coincide. However, a similar problem is attributed mainly to studies that are based on a long observation period. The reason is the large horizon of events that can affect data. Thus, cross-correlation is almost not related to short-term studies [56]. However, if delisting occurred close to the considered moment of assessment, then cross-dependence takes place.

Since the assumption of independent data is rejected, the use of the standard Student criterion is impossible. Brown and Warner [57] proposed another criterion, adjusted for the standard deviation of residues, and standardised by the *t*-criterion:

$$t = \frac{AAR_0}{S(AAR_0)}, \quad (7)$$

where AAR_0 is defined in (5) and $S(AAR_0)$ is an estimate of the standard deviation of the average abnormal return $\sigma(AAR_0)$. Let T be the evaluation period, measured in weeks, then $S(AR_i)$ is calculated as follows:

$$S(AR_i) = \sqrt{\frac{\sum_{t=1}^{T}\left(AR_{it} - \frac{\sum_t AR_{it}}{T}\right)^2}{T-2}}. \quad (8)$$

Patell [52] developed a standardised residual test for use in event analysis. The null hypothesis is that the average abnormal yield is zero. For testing, the standard deviation of abnormal returns must be corrected for the standard error. The latter must be adjusted by the prediction error obtained from the time series of abnormal returns in estimated window.

$$SAR_{it} = \frac{AR_{it}}{S(AR_{it})}, \quad (9)$$

where $S(AR_i)$ is the forecast error, adjusted by the standard deviation, which is calculated as follows:

$$S^2(AR_{it}) = S^2(AR_i) * \left(1 + \frac{1}{M_i} + \frac{(R_{mt} - \bar{R}_m)^2}{\sum_{t=T_0}^{T_1}(R_{mt} - \bar{R}_m)^2}\right), (10)$$

where $\bar{R}_m$ is the average market return, SAR_{it} has a student distribution with $M_i$minus2 degrees of freedom.

M_i is the number of missed returns.

The statistical test to verify *CAAR* against the null hypothesis that its value is zero is:

$$z_{Patell} = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \frac{\sum_{t=T_1}^{T_2} SAR_{it}}{S(CSAR_i)}. \quad (11)$$

Here *CSAR* is the sum of series of abnormal returns. A standardised residual test is more accurate for cross-correlated data. Boehmer et al. [53] reported that this method can perfectly test the null hypothesis in all cases except when the event causes an increase in variance.

Data collection and sampling

The main part of the dataset was collected from several sources. The official Moscow Exchange contains stock delisting information of companies, their announcement and completion dates and the corresponding company names. In addition, the information on all listed stocks was taken from this website. However, the Moscow exchange website does not allow obtaining historical stock quotes necessary for calculating returns; therefore, the online resource 'www.investing.com' was used.

Also, the Moscow Exchange does not indicate the company's industry, so we addressed the list-org resource. This database provides OKVED codes (indicators for economic activities that mark the industry) for each company.

Thus, the database is formed from the following variables: dates of delisting announcement / completion, stock quotes of industry competitors, OKVED codes that reflect the industry and, accordingly, its competitors.

The data sampling was implemented as follows. First, we collected data on companies whose shares were delisted from the stock exchange from 2004 to 2019. This paper uses information about operations performed on the Russian MOEX exchange. The Moscow exchange website contains information on 552 companies that completed delisting within the study period.

After obtaining the initial database, we identified industries in which each company operated. The list-org resource that provides OKVED codes for each registered company was used for this purpose.

To obtain high-quality results, the available data must be filtered. To begin with, we deleted the companies with missing values. As a result, the sample was reduced by 12 positions.

The next step was to delete small operations, i.e., those with transaction amounts not exceeding 8,000,000 rubles. Such delisting is knocked out of the general distribution, which may cause inaccurate results. Another reason for removing these values is that a little delisting will not affect competing firms and only pollute the estimate [34].

In addition, it makes sense to exclude the delisting of companies in the financial sector from the sample. The structure of the banking industry is different from the rest; therefore, the reaction of their stock prices will not follow the general rule and would interfere with the study [37]. Thus, 80 companies associated with the financial sector were removed from the observations.

Finally, we controlled the dates of delisting announcements and completing at their closeness to other events that could happen and affect share prices. Luckily, this step did not require excluding events from the sample.

The total research sample, after applying all filters, has 376 delisting observations. Table 1 demonstrates the effect of each filter on the available data.

Table 1. Sample selection for completed delisting from 2004 to 2019 on MOEX stock exchange

	Number of observations
Total delisting companies	552
Missing values	12
Deal value less than 8 mln ₽	84
Companies in financial industry	80
Total sample	376

Careful processing of observations is an extremely important part of the study and necessary for their effective use, obtaining high-quality results and getting rid of extraneous noise. Filtering criteria are not too strict; however, they help in keeping the main sample size to avoid unwanted contamination of the results [57].

After receiving the final sample with all completion and announcement dates and OKVED codes, the dataset needs a list of competing firms for each industry. The MOEX website provides data on the names of companies whose shares are listed on the Russian stock exchange. A company is considered a direct competitor of an excluded company if all the numbers of the OKVED code are the same. Otherwise, competition is considered indirect. Thus, after deleting all the missing values, the dataset consists of 351 rival companies.

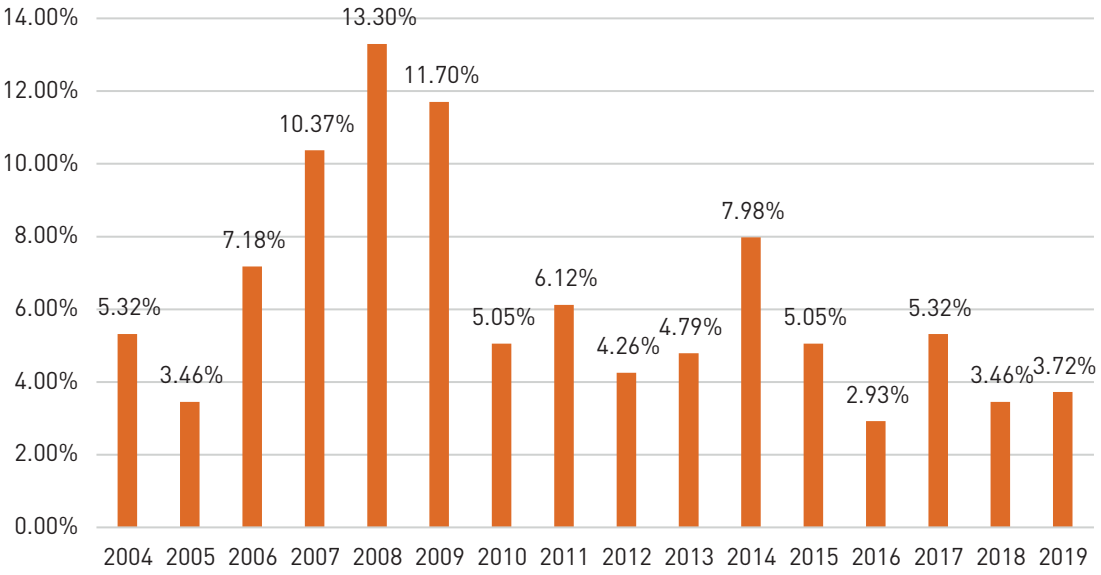
In order to get daily returns for competing firms, we used the www.investing.com database. In addition, information on the IMOEX market index was obtained from this source. After deleting the missing values, the companies whose shares were delisted from the Moscow stock exchange were compared with industry competitors using four-digit OKVED codes. Thus, 376 delisting events from 2004 to 2019 affected competitors in each of their respective industries. Competitors are companies that are listed on the Moscow Stock Exchange before and after the date of delisting announcement / completion and whose OKVED codes coincide with ones of delisted companies. The final sample of competing companies was 6080 observations, in other words, each delisting event affected 16 competitors in the industry, in average.

Descriptive Statistics

This paper primarily uses the list of companies whose shares were removed from the Moscow stock exchange to analyse the price response of competing companies to delisting in the industry from 2004 to 2019. As noted above, the main sample contains 376 observations.

Figure 1 illustrates the delisting distribution during the study period. The graph shows the percentage of delisting from 2004 to 2019 relative to the total delisting during this period. The largest number of stock market exceptions occurred in the period 2007–2009, which is a consequence of the global financial crisis. In addition, a major delisting event was noted in 2014 that is also connected to the crisis in Russia.

Figure 1. Distribution of delisting events by year



Source: authors' own calculations; Moscow Exchange.

Table 2. Descriptive statistics of rival firms

Industry code	Numder of delisted companies	Medium number of rivals	Total rivals
35.11	60	58	3480
35.12	33	28	924
61.1	28	7	196
35.16	22	28	616
70.10	14	5	70
24.45	14	6	84
20.15	12	6	72
51.52	9	5	45
49.50	8	5	40
30.30.3	8	5	40
24.20	8	5	40
64.20	6	5	30
72.19	5	2	10
Others	160	186	433
Total	387	351	6080

Source: authors' calculations; list-org database.

The second sample consists of 351 competing firms. According to Table 2, the largest number of firms is concentrated in the industry with OKVED codes of 35.1* and 61.1*. Firms in the industry 35.1* are engaged in the production and transmission of electricity. Code 61.1* defines companies operating in the field of telecommunications. In Russia, a huge number of companies engaged in these industries, so it is not surprising that they occupy the first lines of the table. The least concentrated sectors are 64.2* and 72.1*. 64.2* characterises the activities of holding companies, and the OKVED code 72.1* includes research companies in the field of natural and technical sciences. Speaking of industries not included in this table, the smallest ones included clay mining, diamond mining and salt mining.

Table 2 also illustrates how many industry competitors are present in the sample for each industry. The concentration of competing firms generally coincides with the concentration of delisting by industry. In general, the study is based on 376 cases of delisting, which are evaluated based on 6080 competing firms in 89 industries described by OKVED codes. The number of competing companies varies over time, but its average value per event is 4 firms, and the median is 3.

Research results analysis and discussion

After obtaining information about the available sample, it is necessary to proceed to testing existing hypotheses. The intermediate stages of the calculations and the results obtained will be provided one by one in each of the following subsections.

The price reaction assessment within the general delisting sample

This study mainly concentrates two event analyses: close to the delisting announcement dates and near the exclusion completion dates from the Russian stock market. Two sets of abnormal returns were obtained. Figure 2 illustrates the dynamics of the resulting values across the 21-days event window.

Figure 2. Average abnormal returns of rival companies around the announcement / completion dates of delisting

Source: authors' own calculations.

The cumulative average abnormal returns vary strongly throughout the evaluation period. In general, there is a positive price reaction from rival firms on the announcement and the completion dates. It is assumed that informational effects in the delisting case lead to negative effects, and competitive effects, on the contrary, lead to positive ones, so the results obtained indicate the dominance of the latter in all industries. These results contradict those obtained by Lang and Stulz [11], and Laux et al. [36]. The reason for this contradiction may be explained by the different market structure, and more severe competitive environment among public companies within the prevailing industries in the Russian market. However, our results support those by McGilvery et al. [35] that reflect the changes in the market structure.

It is interesting to note that both price reactions close to the dates of the announcement and completion of delisting are characterised by sharp changes, alternating ups and downs. However, abnormal returns linger on positive values around zero. But the CAAR falls again on the fourth day after delisting around the completion date, while the return close to the announcement date remains positive. This may indicate a more significant price response to delisting around its announcement date.

Thus, in Figure 2, it is observed that competitive effects are stronger in all industries than information effects in the delisting case in the industry. This conclusion is confirmed by the CAAR values in Table 3, reflecting different evaluation windows.

The table below illustrates the average positive abnormal returns in different periods of assessment. However, there are several exceptions in the form of negative values: in the event windows [–10; 5] and [–10; 3] in the case of delisting announcement and in the windows [–10; 10], [–3; 10] and [–1; 10] in case of completion of the event. Negative abnormal returns signal a prevailing informational effect. However, according to the standardised residual test, these values are insignificant, so it cannot be argued that the results indicate the presence of an informational effect.
It is interesting to note that in the case of the delisting announcement, negative abnormal returns prevail before the event (in other words, before zero), while in the case of the delisting completion, they prevail after the event. That is, positive price changes begin from the announcement date and end in completion date.

Table 3. Cumulative average abnormal returns around the announcement and completion dates

Event window	Announcement		Completion	
	CAAR, %	Patell Z	CAAR, %	Patell Z
[–10; 10]	0.92	2.743941	–0.04	–0.36835
[–5; 5]	0.57	2.360821	0.06	0.414582
[–3; 3]	0.43	3.936387	0.45	2.590517
[–1; 1]	0.56	2.820624	0.86	2.492173
[–10; 5]	–0.84	0.062014	0.04	0.311122
[–10; 3]	–0.27	1.376843	0.24	3.013184
[–10; 1]	0.43	1.783105	0.22	2.295232
[–5; 3]	0.22	2.696167	0.39	4.138445
[–5; 1]	0.15	0.83912	0.39	3.140381
[–3; 1]	0.43	3.381732	0.47	2.679012
[–3; 5]	0.50	0.265965	0.03	0.168528
[–3; 10]	0.56	2.36279	–0.07	–0.54659
[–5; 10]	0.02	2.13961	–0.04	–0.35455
[–1; 3]	0.52	1.927559	0.68	4.635993
[–1; 5]	0.18	2.000704	0.08	0.330221
[–1; 10]	0.27	2.157483	–0.07	–0.44161

Source: authors' own calculations.

Also, most of the CAAR values close to the delisting announcement dates are statistically significant at the 1%, 5% or 10% level with a few exceptions in the windows [–10; 5], [–10; 3], [–5; 1] and [–3; 5]. The results on the delisting completion dates are mostly insignificant. Basically, the reaction is significant from –10 days before the delisting completion to +3 days after completion. In other words, rival firms do not show a price reaction after the official completion of the event. However, these results confirm our hypothesis about the dominance of a competitive effect, especially on the announcement dates.

Nevertheless, the conclusions of the analysis are quite interesting. Companies experience a positive effect after the announcement of delisting information of a major competitor. Initial industry prospects are instantly reflected in investor sentiment, which increases profit in the industry. However, the conclusion that the delisting completion dates are less significant for company returns is unexpected. Perhaps because information about the event has long been known at the estimated time, it does not have a visible effect.

Nevertheless, the prevalence of the competitive effect is confirmed for both dates. These findings partially coincide with Andrukovich [40] – the reaction is the same for the companies who had announced delisting and those who did not previously notify the market.

Conclusion

This paper is devoted to a delisting study and its consequences for stock prices of industry competitors from 2004 to 2019. The hypothesis of the research is checked using the event study methodology, which analyses the abnormal stock returns of competing firms close to the delisting announcement and completion dates, after which the resulting indicators were evaluated in various event windows. As the next step, cumulative abnormal returns were necessarily checked for statistical significance using the standardised Patell residual test, which considers possible cross-correlation within the samples.

The results of event analysis show that competitors' stock prices begin to rise significantly after the date of announcement of information on delisting in the industry. As for the completion date of the process of exclusion from the stock market quotation lists, the abnormal returns also show positive but less significant values only until the completion date. Thus, the positive reactions of competitors are more pronounced at the time of announcement of the information. This means that new development prospects are immediately revealed for the industry due to weakening competition, and this is not unnoticed by investors; hence, their shares grow in value. These results indicate that competitive effects dominate over informational ones both close to the delisting announcement and completion dates.

As a limitation of the study, the real competitive situation within the industries was not studied. It could be done on the base of Herfindahl–Hirschman index as it is recommended by several studies of involuntary delisting intra-industry effects [9].

It is also worth pointing out that the event study methodology cannot guarantee that the event window is clean. In other words, if the delisting at some point in time bordered on some other major event – the company's IPO, crisis, or other event that could affect the company's share price – the methodology used is not able to separate the effect of the delisting from another event. Thus, the resulting abnormal reruns and the corresponding results may contain injections. But the use of the cumulative average abnormal return CAAR smooths out the errors of other events that can affect prices at a particular moment in time. Since CAAR is considered for the entire sample period, individual influences become insignificant. We also checked the occurrence of such events in our sample

However, there is still a chance of cross-correlation of the data, as some delisting occurred at a close point in time. However, to solve this problem, Patell's standardised residual test was applied, designed specifically to test data with this problem. Thus, every effort has been made to obtain the most correct results.

In general, we can conclude that delisting is not an event limited in effect to only one company. It really has an impact on the industry in which it occurs, temporarily changing its value. The result obtained is important for company managers, shareholders and potential investors. Based on the study, managers will be able to better adjust company policy, knowing for sure what to expect from delisting in the industry. Shareholders will be aware of the rise in prices during the exclusion of industry competitors from the market, which will allow them to manage better their existing securities. At the same time, delisting in the industry becomes a factor increasing the prospects of the industry, which is an important marker for all market participants.

It will be interesting to evaluate other factors in future studies that are theoretically capable of influencing the reaction to the announcement and completion of delisting. These include the degree of monopolisation in the industry, profitability, book value and other indicators of financial and accounting statements. It would also be interesting to evaluate which factors are responsible for the development of information and competitive effects and how they change over time. However, much longer periods of research are needed for such an analysis.

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Contribution of the authors: the authors contributed equally to this article.
The authors declare no conflicts of interests.

The article **was submitted** 06.07.2021; **approved after reviewing** 08.08.2021; **accepted for publication** 14.08.2021.