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Voluntary Delisting of Russian Companies at Different Stages of Corporate Life Cycle

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Abstract

Nowadays, the number of companies leaving the stock exchange is steadily increasing. Researchers and practitioners continue to actively discuss the reasons for voluntary delisting and explore the factors that influence the probability of it. However, the results of existing studies are heterogeneous and inconclusive, indicating the need for further research. This paper continues the line of research on the determinants of voluntary delisting by studying the delisting of Russian companies. Unlike previous studies, we identify and compare the factors that influence the decision to delist at different stages of the organization's life cycle. We argue that delisting factors, although specific to each company, should remain similar for firms at the same stage of development. The company-related factors that we test include investment expenditures, profitability, stock volatility and book-to-market ratio. The study is based on a sample of 162 public Russian companies traded on the Moscow Exchange, of which 75 delisted between 2011 and 2019. The Bloomberg database was used to generate the sample of companies. Using the panel probit regression model, we found that firms with greater investment expenditures are less likely to delist at the Introduction and more likely at the Maturity and Decline stages. The results of our research also show that firm stock volatility had a positive effect on the delisting probability of Russian firms at all stages of their life cycle, except for the Introduction stage. Finally, we demonstrate that companies at the Introduction and Growth stages are more likely to leave the stock exchange if they have a greater book-to-market ratio. The results of our study can be used by financial analysts and academics to analyze the probability of delisting of public companies at different life cycle stages.

Keywords: delisting probability, delisting factors, Russian market

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Introduction

Delisting is the termination of the listing of a public company's shares on a stock exchange. This phenomenon has become both a popular topic on the academic agenda and a frequent financial practice. Delistings are now more common than initial public offerings: between 2010 and 2020, for every IPO, there were 2.5 delistings in the EU and 1.4 in the US. Large global corporations such as Dell, Hilton, Burger King are also resorting to this solution.

Leaving the stock exchange leads to significant changes in the life of a company. It simplifies the requirements for the composition of the board of directors and corporate governance, facilitates internal control, and reduces or eliminates the influence of minority shareholders on decision-making. Companies tend to change their capital structure, adopt new payment policies and simplify their accounting. The reaction of a company's customers to a delisting usually results in changes in sales and market share. Typically, this decision is made to either save financially distressed companies or to eliminate restrictions and costs for the firms which do not obtain the expected benefits from being public. In times of recession and economic decline, the idea of cutting costs through delisting is of significant interest to large companies.

The topic of delisting is currently gaining popularity on the academic agenda, as to this day no recognized theory describing the reasons why companies tend to make this decision has been developed. Delisting is usually studied by assessing the influence of different factors on the probability of leaving the stock exchange. Usually, the authors identify these factors using logistic regression and separately examine firm-level financial factors [1], industry and geographic factors [2; 3], and external factors, such as the adoption of new laws, SOX, etc. [4–6]. Despite the large number of papers on the determinants of firm delisting, there is a strong heterogeneity in the obtained results, which suggests their volatility and inability of observing similar effects for identical markets and timelines.

The aim of this paper is to investigate the factors affecting the probability of voluntary delisting of companies in Russia. Currently, there are very few publications devoted to the topic of delisting that use Russian data. Russian authors P. Andrukovich [7], E. Rogova and M. Belousova [8], E. Dreving and L. Khrustova [9], S. Klyev and A. Sorokina [10] mainly discuss such delisting-related questions as the reasons for delisting, the dynamics of stock prices during delisting, the reaction of the stock market to delisting announcements and questions about the delisting of companies in the technology sector, but do not touch upon the issue of factors affecting the probability of company delisting. Thus, we expand the discussion of this topic and provide a deeper understanding of it in the Russian market, which is characterized by a specific market, institutional and legal environment.

We also contribute to the existing literature by revealing the determinants of company delisting at different corporate life cycle stages. We presume that while every delisting is

unique, companies sharing a similar life cycle stage should have common reasons to delist that can be explained by their changing needs in sources of finance and economic nature. Additionally, we are using the objective advantage of logistic analysis – the ability to define the determinants for compared samples.

The results of our study can be used by financial analysts and academics to analyze the probability of delisting of public companies at different life cycle stages.

Literature Review and Hypotheses Development

Voluntary Delisting

J. Macey et al. [11] first identified two types of delisting: voluntary (when company leaves stock exchange by its own decision) and forced (caused by financial distress). H. DeAngelo et al. [12] and K. Lehn and A. Poulsen [13] note that the key motive for delisting is the desire to reduce costs of being public. These include exchange service fees and regulatory payments (direct costs) and the price of standardized disclosure (indirect costs). The authors show that companies with low operating performance and low growth rates relative to the industry as a whole may decide to delist in order to reduce costs. W.S. Kim and E.O. Lyn [14], P. Halpern et al. [15] point out a negative relationship between company size and the likelihood of exiting the exchange: large businesses are less sensitive to fixed listing costs and also often benefit from it.

R.J. Maupin et al. [16] found that companies that do not remain public tend to be undervalued, while the management of such firms is a major shareholder. The positive impact of firm undervaluation on delisting probability is explained by the owners' desire to obtain additional benefits.

It seems objective that one of the key motives for delisting may be the owner's awareness of low public status efficiency, expressed in illiquidity of shares, high stock price volatility and excessive required rate of return. For example, A.K. Achleitner et al. [17] note that low stock liquidity increases the likelihood of delisting, while W.S. Kim and E.O. Lyn [14] and I. Martinez and S. Serve [18] show that owners often prefer to keep the company private when they think that market sets the risk premium unfairly. C.I. Lee et al. [19] note that there is a positive relationship between a company's chance of delisting and poor coverage of financial analysts.

The listing costs factor, which is expressed in the cost of regulatory requirements execution for corporate governance and accounting standards is also considered significant. B. Becker and J.M. Pollet [20], I. Martinez and S. Serve [18] note the impact of regulatory bills (SOX and FSL respectively) on companies' delisting decisions, while G. Pownall and M. Wiczynska [6] explains the delisting decisions of some European companies in 2005 by the adoption of mandatory IFRS standards.

The study by E.K. Pour and M. Lasfer [21] examines the financial position of UK companies from 1995 to 2009 from

IPO to delisting: they show that these companies did not aim to raise capital for growth, but went public to change their capital structure. However, as the cost of equity capital increased, these companies only destroyed their value and left the stock exchange. The authors conclude that the delisting was caused by the initial wrong purpose of the share offering.

Another study by G. Hu et al. [4] demonstrates the delisting of companies listed on foreign exchanges as a method of returning to home jurisdiction, using the example of Chinese companies. The key factor discovered is the changing political and social environment, which leads to an increase in listing costs. The study of H. Agyei-Boapeah et al. [3] shows

that firms with a large amount of intangible assets are more likely to delist – the author justifies this by the industry specifics of IT companies, which are believed to prefer retained earnings as the main source of capital for development. As shown in the study by M. Kokoreva et al. [22], such policies can be caused, among other, by additional financing limitations set for these firms and by the motive of management entrenchment. As these factors are based on the nature of high-tech firms' governance and asset structure (and ergo applies not only to debt financing), we assume that it can also be a sufficient factor in causing them to delist.

We summarize main motives for companies to delist in Table 1.

Table 1. Delisting Motives Presented in the Literature

Delisting motive	Description	Articles
Cost reduction by low-performing companies	Companies with lower operating performance seek to eliminate listing costs	Lehn and Polusen, 1989 [13]; Kim and Lyn, 1991 [14]; Weir, Laing, 2006 [30]; Thomsen, Vinten, 2014 [32]
Undervalued companies	Owners of such companies want to obtain additional benefits	Maupin et al., 1984 [16]; Weir et al., 2006 [30]; Bharat and Ditmar, 2010 [31]
Low effectiveness of public status	Companies with an excessive required return abolish expensive public capital	Martinez and Serve, 2011 [18]
Application of new compliance requirements	Companies delist due to higher listing costs caused by new standards	Pownall, Wieczynska, 2018 [6]
Agency hypothesis	Increasing debt reduces free cash flow, which motivates management to reject projects with a negative NPV	Halpern et al., 1999 [15]
Change of jurisdiction	Companies of certain countries can leave foreign exchanges in case of conflicts	Agyei-Boapeah et al., 2019 [3]

Source: Authors' review.

To identify factors that affect the probability of companies to delist, researchers mainly use logistic regressions and test three groups of hypotheses, concerning (1) company-related factors; (2) industry, geographic and other local factors, and (3) external factors. We present the examples of these hypotheses in Table A1 in the Appendix.

The results obtained by researchers when testing these hypotheses are characterised by significant heterogeneity. In order to demonstrate this effect, we provide the results of the main papers that examine company related factors in explaining the probability of a firm delisting in Table 2.

Table 2. Test Results for Internal Factors Hypothesis

Article	Sample	Operating performance	Undervaluation	Efficiency of public status	Agency costs
Weir et al., 2006 [30]	354 UK delistings, 1998–2000	Low growth rate increases the likelihood	Undervaluation increases the likelihood	Factors are not significant	Hypothesis rejected
Bharat and Ditmar, 2010 [31]	1023 US delistings, 1980–2004	Delisting companies are financially distressed	Undervaluation increases the likelihood	High debt and poor financial coverage increase the likelihood	Concentration of ownership reduces the likelihood
Thomsen and Vinten, 2014 [32]	3577 delistings in 21 European countries, 1995–2005	Poor operating performance increases the likelihood	Factors are not significant	Factors are not significant	Concentration of ownership increases the likelihood
Pour, Lasfer, 2013 [21]	380 UK delistings, 1995–2009	Poor operating performance increases the likelihood	Factors are not significant	High debt and poor financial coverage increase the likelihood	Factors are not significant
Balios et al., 2015 [1]	239 companies of the Athens Stock Exchange (Greece), 2002–2012	Delisting companies are financially distressed	Factors are not significant	High debt and poor financial coverage increase the likelihood	Factors are not significant
Bortolon and Junior, 2015 [33]	227 delistings from 2001 to 2015 in Brazil	Factors are not significant	Factors are not significant	Low liquidity of stocks increases the likelihood	Concentration of ownership increases the likelihood

Source: Authors' review.

As can be observed from Table 2, even for samples with comparable geography (1 and 3), study period (5 and 6) and type of the market (2 and 4 for developed, 6 and 7 for developing), the results of hypotheses testing are often incoherent and even oppositely directed. For example, for studies 2 and 4, which review the delisting of companies in developed markets, only the positive impact of high level of debt coincides. In papers 3 and 5, which study European markets, none of the observed effects are similar. All these point to the contradictory results, which does not allow us to draw unambiguous conclusions about the reasons for the delisting of companies (I. Martínez and S. Serve [18]). Analyzing the papers presented in Table 2, we can also notice that almost all the papers are based on the assumption that companies delist in order to reduce their public costs (both direct and indirect), which is not always true, since the company may be more motivated by increasing cash inflows than by reducing cash outflows. In addition, the previous papers do not assess the consequences of delisting in any way and can be used only for a theoretical analysis of

the reasons for a given decision, demonstrating consistent results only when evaluating the distinctive determinants of delisting in the analysis of samples in comparison.

Life Cycle and Delisting

In this paper, we identify the determinants of the company's delisting at different stages of the life cycle. The life cycle concept is based on the notion that a company goes through several stages in its development, each of which has its own distinctive features, including the peculiarities of the choice of the company's capital structure. Although the influence of the life cycle on the delisting phenomenon is not well understood, the capital structure theories and organization's life cycle concept suggest that the capital structure of a company depends on the stage of the life cycle, as the financing needs may change depending on the company's changing circumstances.

According to V. Goyal and M. Frank [23] companies tend to use internal funds first when choosing sources of capi-

tal, while larger and more mature firms preferring higher financial leverage and follow the concept of Pecking order of financing, but this is not confirmed for small companies.

As shown in Diamond's study [24], a firm's financing policy depends on age and public reputation. Companies accumulate credit history at early life cycle stages and utilise this resource later on, adjusting their capital structure. A.N. Berger and G.F. Udell [25] demonstrate that it is common for small firms with a short history to attract venture capital financing and use internal funds. The authors note that debt financing becomes more efficient and affordable with an increase in asset volume, since the latter can act as collateral.

The study by J. Blomquist and S. Waldo [26] shows that firms are most active in raising debt in the *Growth* and *Maturity* stages, which motivates them to pursue credit ratings, while in the *Decline* stage the level of financial coverage by analysts for the firm often decreases and credit rating becomes less relevant. The authors conclude that management is more interested in actively managing the financing policy at the *Growth* and *Maturity* stages than at the other stages.

The study by M. La Rocca et al. [27], in particular, shows that the pattern of the financial cycle of small and medium-sized firms is homogeneous over time and very similar for different institutional settings and industries, i.e., firms from different industries and institutional context behave similarly at the same stage of the life cycle in terms of capital structure choices.

In this study, we introduce the life cycle of an organization when studying delisting. Since delisting affects the choice of sources of capital raising and the capital structure itself is affected by the company's life cycle, it seems appropriate to examine the determinants of firm delisting at different stages of their life cycle. Despite the individual firm specificity, we expect that at each stage of the life cycle, the factors influencing delisting should be similar, as the principles of behavior within a single stage remain largely unchanged. Using the V. Dickinson [28] approach, we will consider the following stages: *Introduction*, *Growth*, *Maturity* and *Decline*.

Hypotheses Development

Based on capital structure theories, an organization's life cycle concept and previous empirical findings outlined above, we intend to test four hypotheses about the influence of company-related factors on delisting probability on the sample of Russian firms. The factors chosen were investment expenditures, stock volatility, profitability, and book-to-market value ratio, which are among the most discussed determinants of delisting in the empirical literature. Unlike previous authors, we compared the effects of these factors on the probability of delisting at different stages of a company's life cycle.

H1. Capital expenditures decrease the probability of delisting at all stages of the life cycle

Companies characterized by more substantial investment volumes expect to receive additional economic benefits

from the assets being formed, for which they attract all available sources of financing [21]. We assume that companies with high level of investment expenditures are less likely to leave the stock exchange, as it seems logical to expand the list of sources of financing rather than reduce it.

H2. Stock volatility increases the probability of delisting at all stages of the life cycle

Share price volatility is one of the key factors in the delisting decision. According to E.K. Poor and M. Lasfer [21], firms with high stock volatility and low stock turnover will have low financial visibility and investor recognition, and hence a higher probability of delisting. Such firms often face an overestimation of their risk level by investors, leading to a higher required rate of return and eventually forcing them to leave the stock exchange and turn to debt financing. We assume that companies with more volatile shares are more likely to leave the stock exchange on the Russian market as well.

H3. Profitability decreases the probability of delisting at the Maturity and Decline stages of the life cycle

This hypothesis is traditional for delisting studies [18], as it is based on the classical assumption that firms leave the stock exchange in order to eliminate listing costs. It is generally believed that firms with low net profit will delist more frequently because the listing burden is more tangible for them. Unlike firms at other stages, the low profitability of firms at the *Maturity* and *Decline* stages has a longer-term effect because their operations are stable, the core assets and markets are already established, and their growth is intensive rather than extensive - that is, these firms are focused on maintaining profits by optimizing processes rather than by increasing revenues [29]. We suggest that such firms may view leaving the exchange as an opportunity to reduce listing costs and improve profitability, as public equity capital does not represent a source of additional growth for them.

H4. Book-to-market ratio increases the likelihood of delisting at Growth and Introduction stages of the life cycle

According to C. Weir et al. [30], S. Bharat and A. Ditmar [31], companies may delist from the stock exchange if their owners believe that the market undervalues such firms. The motivation to delist is to extract additional value by buying back the shares from minority shareholders at a lower price. *Introduction* and *Growth* stage firms are, in our view, the most susceptible to delist for this reason, as their value is largely based on expectations of future cash flows rather than on the book value of disposable assets, and thus the difference between 'expectations' for such companies will be objectively higher than for companies in other stages. Therefore, we believe that the higher the book-to-market ratio, the higher the likelihood of a company leaving the stock exchange.

Methodology

Our empirical analysis includes two steps. The first step is the identification of companies' life cycle stages. We used the V. Dickinson [28] methodology because unlike other instru-

ments, it does not compare firms in the sample with each other and ergo does not provide relative estimates. This approach assumes that all companies' important activities are captured in three different types of cash flows – operating, investing and financing. Thus, a company's lifecycle stage is

identified based on the signs of its cash flows in correspondence with Table 3. The number of stages was reduced to four: *Introduction*, *Growth*, *Maturity*, *Decline*, as also shown in Table 3. *Transition* stage companies were assigned to *Maturity* and *Decline* according to the operating cash flow sign.

Table 3. Cash Flow Signs Used to Define Life Cycle Stages

	Introduction	Growth	Maturity	Decline
Operating cash flow	-	+	+	-
Investing cash flow	-	-	-	+
Financing cash flow	+	+	-	+/-

Source: [28].

Table 4. Variable Descriptions (the values of all variables) are considered for the calendar year)

Name	Description	Source
<i>CapEx</i>	Capital Expenditures to Sales Ratio	Pour and Lasfer, 2013 [21]
<i>Volatility</i>	Average Share Price Volatility	
<i>Profitability</i>	Net Income to Book Value of Total Assets Ratio (ROA)	Pour and Lasfer, 2013 [21]
<i>BM</i>	Book value over market value of equity	Pour and Lasfer, 2013 [21]
<i>Liquidity</i>	Current Assets to Current Liabilities Ratio (<i>control variable</i>)	Martinez and Serve, 2011 [18]
<i>Listing Years</i>	Number of Full Years Since IPO (<i>control variable</i>)	Agyei-Boapeah et al., 2019 [3]
<i>Leverage</i>	Total Debt/Total Assets (<i>control variable</i>)	Pour and Lasfer, 2013 [21]

Source: Authors' review.

At the second step, similarly to previous studies (e.g. E.K. Pour and M. Lasfer [21], H. Agyei-Boapeah [3]), we use panel probit regression with population averaged effect and the probability of firm delisting as dependent variable:

$$Delisting = \begin{cases} 1, Y_{i,t}^* \geq 0 \\ 0, Y_{i,t}^* < 0 \end{cases}, \quad (1)$$

$$P(Delisting = 1) = P(Y_{i,t}^* \geq 0), \quad (2)$$

In this case, the latent variable is as follows:

$$Y_{i,t}^* = \beta_1 + \beta_2 CapEx_{i,t} + \beta_3 Volatility_{i,t} + \beta_4 Profitability_{i,t} + \beta_5 BM_{i,t} + \beta_7 Liquidity_{i,t} + \beta_8 ListingYears_{i,t} + \beta_8 Leverage_{i,t} + \varepsilon_i. \quad (3)$$

The description of our independent and control variables is presented in Table 4¹.

Data

Our sample contains 162 Russian companies, including 75 that delisted between 2011 and 2019 calendar years. The total number of firm-and-year observations is 1458.

The distribution of companies by industry is presented in Figure 1.

We generated our sample by collecting available data on all Russian listed and voluntarily delisted public firms in the described period of time. No additional filters were set because the number of such firms is initially very small, and otherwise there would not be enough observations in our sample for meaningful analysis.

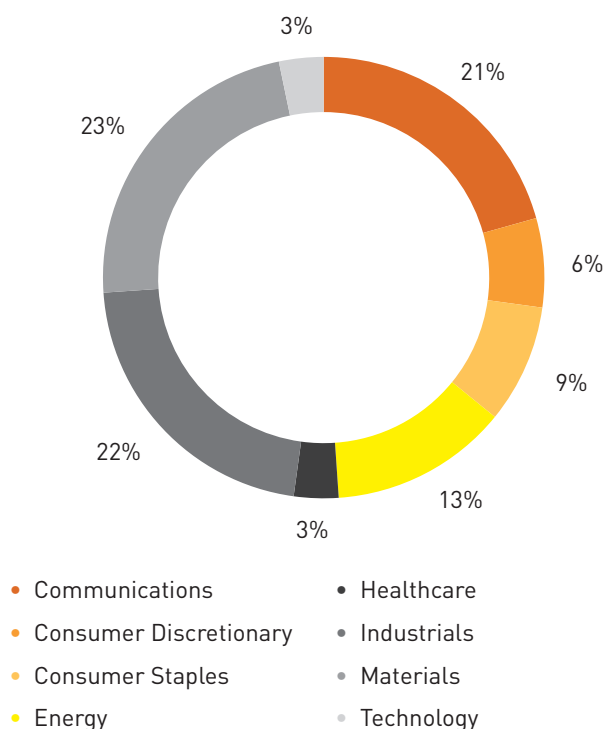
We exclude the companies from financial and utilities sectors from our sample. As can be seen from Figure 1, the majority of companies in our sample belong to industrials and materials sectors according to Bloomberg classification system. 44% of the companies belong to high-tech industries according to OECD classification.

¹ Before testing our hypotheses, we checked our model for multicollinearity. The correlation between the variables does not exceed the critical value for any pairs of variables, from which we can conclude that there is no problem of multicollinearity in our model.

Table 5. Identification of Life Cycle Stages

Year	Introduction	Growth	Maturity	Decline
2011	15	48	50	13
2012	24	49	73	18
2013	25	38	73	19
2014	10	57	72	17
2015	15	48	76	21
2016	8	28	45	82
2017	8	24	51	82
2018	7	26	48	84
2019	8	23	50	82

Source: Authors' calculations.

Figure 1. Distribution of Companies by Industry

Source: Authors' calculations.

Table 6. Test Results

Variables	Introduction	Growth	Maturity	Decline
Observations	120	341	574	457
CapEx	-2.231*** (0.569)	-0.153 (0.293)	0.689* (0.402)	1.057** (0.435)
Volatility	0.000419 (0.000345)	0.00246*** (0.000400)	0.000571* (0.000302)	0.000611** (0.000241)

Applying the Dickinson [28] methodology, we have categorized the companies in our sample by life cycle stages and present this distribution in Table 5.

As Table 6 shows, there is a rather small number of companies at *Introduction* stage. This result seems understandable, as such firms are rarely listed. Another interesting observation is the one-stage forward “shift” observed for a large number of companies in 2015–2016. Since reporting data is presented at the beginning of calendar year, the effect of the 2015 crisis in Russia is reflected in observations for 2016. We suggest that this effect is mainly caused by the 2014–2015 economic crisis in Russia.

Results

In Table 6, we present the results for each stage of the life cycle respectively. The marginal effects shown demonstrate the local effect of each financial factor on delisting probability [21]. For example, at *Maturity* stage a unit growth in profitability increases delisting likelihood by 0.337%. For each model, we also indicated our results for hit ratio tests and calculated pseudo R2 (or McFadden's R2), which are considered standard for such probit regressions [3]. Pseudo R2 of 0.15 and above is considered a good fit.

Variables	Introduction	Growth	Maturity	Decline
Profitability	-0.0298 (0.532)	0.230 (0.209)	0.337** (0.162)	0.219*** (0.0848)
BM	0.0787 * (0.0516)	0.0287** (0.0122)	-0.0480 (0.0328)	0.0310 (0.0216)
Liquidity	-0.476*** (0.137)	0.160*** (0.0405)	0.110*** (0.0329)	0.00390 * (0.0249)
Listing Years	0.0550*** (0.0100)	0.00136 (0.00597)	0.00388 (0.00487)	-0.00733 (0.00449)
Leverage	-0.139* (0.0843)	0.153*** (0.0252)	-0.0157 (0.0426)	-0.0246 (0.0269)
Pseudo R ²	0.155	0.201	0.215	0.182
Hit Ratio, %	95	78	80	82

Robust standard errors in parentheses. *** p< 0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations.

As can be observed, a unit increase in CapEx reduces the probability of delisting by 2.231% for the *Introduction* stage and has a positive impact of 0.689% for *Maturity* and 1.057% for *Decline*, while the variable is not significant for *Growth* stage. Thus, we cannot reject hypothesis H1 at 1% level of significance only for *Introduction*. For the rest of the stages, the hypothesis is rejected.

The negative impact of investment on delisting at *Introduction*, in our view, is observed due to the fact that companies at this stage are just forming their assets and are financially immature, thus public status is atypical for them and represents a very significant burden due to listing costs. Accordingly, when funds that form the main sources of future revenues decrease, such firms will seek to drastically reduce costs that are not critical, including listing costs. This way, the observed effect, although it has the same sign as formulated in hypothesis H1, still has a different cause than we initially hypothesized.

Looking at the other stages, we believe that the observed positive effect from CapEx is due to the fact that quite a large number of firms in our sample delisted due to their participation in M&As, which means they tried to reflect higher CapEx values before delisting in order to increase their attractiveness as a target.

Share price volatility is significant for all stages except *Introduction*, increases the probability of delisting and has the largest modulus for companies in the *Growth* stage. However, despite this, the value of the average marginal effect itself is very small, indicating in fact that this factor has no influence on the probability of delisting. We believe that one of the possible reasons for this effect is that we did not additionally filter companies by the liquidity of their shares, since there was initially a small number of compa-

nies on the Russian market. If the sample had been larger and was additionally filtered by this principle, we assume that the results of testing this hypothesis would have been more significant.

A unit increase in firm profitability increases the probability of delisting by 0.377% for *Maturity* and 0.219% for *Decline*. This effect is opposite to the one we formulated in hypothesis H3, this is why we reject it. The motive of “delist to cut costs if profitability is low” is not observed in this case, which we can probably also explain by the presence of companies that participated in M&A transactions and delisted after the transaction – being the target of a merger, they were also likely to reflect higher profitability in their reports.

A 1% increase in book-to-market increases the probability of delisting at *Introduction* and *Growth* stages by 0.0787% and 0.0287%, respectively. Thus, hypothesis H4 is not rejected at a 10% significance level for *Introduction* and 5% for *Growth*, indicating that firms at these stages are more likely to delist, as they are able to extract additional value by buying back shares from minority shareholders at a lower price when the market undervalues them.

Conclusion

In our research we focus mainly on revealing the factors influencing delisting probability for Russian companies. Unlike previous research, we decided to adjust the widely used probit regression model by introducing the corporate life cycle. This allows us to analyze samples in comparison, and to point out stage-specific financial determinants of delisting likelihood based on the premise that the firms belonging to the same life cycle stage delist due to similar factors.

Based on the sample of 162 Russian companies, including 75 delisted firms, over 2011–2019 and using the panel probit regression model we found that in the *Introduction* and *Growth* stages, the main financial factor affecting the probability of delisting is the undervaluation of the business. In the early stages, companies are very attentive to the market's valuation of their business when deciding whether to delist and when looking for alternative sources of financing. At the *Maturity* and *Decline* stages, companies no longer react to this indicator, as in order to be competitive and continue their long-term market presence, they need to implement other strategies, such as diversification, M&A transactions, etc. Therefore, at the *Maturity* and *Decline* stages, the main indicators affecting the probability of delisting are high operating efficiency and investment expenditures necessary for the realization of future strategy. The obtained results can be used to predict the relative probability of delisting depending on the stage of a company's life cycle.

One limitation of our study is that we did not account for delistings resulting from M&As as a separate phenomenon; however, our results suggest that such delistings have a significant impact on the observed effects, indicating the need to account for these transactions in further research. Another limitation is that the observed effects can only be assessed "in comparison" - this means that we cannot draw independent conclusions about the factors that led to the delisting of a firm, but can only analyze the situation in the market as a whole. In addition, due to the small number of delisted firms, we did not set the filters for size, value, stock liquidity and other characteristics for the firms in our sample, which may have resulted in some distortion of the results.

Each delisting decision is unique, and the approach used to study delisting produces very simplified and averaged results that can only provide a general idea of the overall relationships that occur in a particular sample. In addition, this approach tends to assume that the delisting of a firm is due to some factors or events that have occurred previously, while the delisting may represent some prediction of the firm's future development, its strategy, justifying the decision to delist. We believe that the future of the study of the delisting phenomenon lies in finding ways to assess what happens to firms after this decision is made, and the answer to this research question could help to understand why firms do it in the first place.

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Appendix

Table A1. Hypothesis Classification on Delisting

Hypothesis type	Examples of hypotheses	Articles
Hypotheses testing the impact of company-related factors	Delisted companies have low operating performance Delisted companies are undervalued Delisted companies have a high stock price volatility Delisted companies have a poor analytical coverage Delisting is done by companies with higher FCF Delisted companies have a higher level of financial leverage	Pour, Lasfer, 2013 [21] Thomsen et al., 2014 [32] Martinez and Serve, 2011 [18]; Bharat and Ditmar, 2010 [31]; Balios et al., 2015 [1]
Hypotheses testing the influence of industrial, geographical and other local factors	High-tech companies delist more often than low-tech companies The volume of investment affects the likelihood of delisting construction companies (compared to real estate)	Agyei-Boapeah et al., 2019 [3] Konno and Itoh, 2018 [2]
Hypotheses testing the impact of changing external realities	Introduction of SOX influenced the growth in the number of delistings Adoption of IFRS increases the likelihood of delisting Industry deregulation increases the likelihood of delisting The economic conflict between China and the United States has affected the growth in the number of delistings of Chinese companies	Pownall and Wieczynska, 2012 [6] Loveland et al., 2021 [5]

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