

The Likelihood of Exit for Russian Insiders: Initial Public Offerings Versus Mergers and Acquisitions*

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Abstract

The study explores the determinants of insiders' exit strategy (the choice between going public or being acquired by a strategic investor) for companies based in Russia. Our main goal is to address the lack of research evidence on what factors impact this choice and therefore, to create a model that predicts the likelihood of going public. The methodology is based on regression analysis. The final sample contains 6556 merger and acquisition (M&A) deals and 352 initial public offering (IPO) corporate events over the period of 2000-2021. Findings can be summarized as follows. The likelihood of an IPO over an acquisition is greater for less risky companies from a financial standpoint. Firms of higher size are more likely to go public rather than to be acquired. The information asymmetry, measured by company's age, has an inverted U-shaped relationship with the likelihood of public offering. Companies' profitability provided mixed results concerning the probability of IPO. The findings of our study may have value for private investors, institutional investors, researchers, consultants, external analysts, and internal company analysts who can use them for predicting the strategic choice related to insiders' exit. The exit decision is one of the most important corporate events in the lifecycle of the firm, which dramatically changes the future of its operations and corporate life. Hence, prediction of this decision helps to improve companies' corporate governance and sustainability. Although the study focuses on Russia, its findings can be adjusted to other emerging markets with similar institutional settings.

Keywords: initial public offerings; mergers and acquisitions; exit mechanism; Russian companies.

Introduction

The choice of an exit mechanism is an important decision for any growing company. The exit could be done either by the initial public offering (hereinafter - IPO) or through the acquisition by another company (hereinafter – M&A) (Lee, Lee, 2015; Parastuty et al, 2016). The first way of exit relates to less uncertainty and information asymmetry. Moreover, the values of IPO are public and for researchers, it is much easier to use these values for their analyses. However, acquisitions are much more common than IPOs (Kohn, 2018). Our paper studies the determinants of an exit strategy and the choice between IPO and M&A within Russian geographical boundaries. Beforehand prediction of an exit choice can be beneficial for potential private investors, institutional investors, and acquirers. The study focuses on Russia because the market in the country is young, and all corporate governance practices were developing with a high speed. In addition, many authors do not pay decent attention to Russia in terms of conducting country-specific analysis and predicting the likelihood of an exit strategy. From one side, the main advantage of such research approach is that it permits to omit differences in countries' institutional environment.

Institutional peculiarities and aspects pertaining to each specific system can potentially bias the results in cross-country analysis. From another perspective, the major disadvantage of country-specific framework is the limitation of external validity of the results. Put it another way, it means that the findings derived from the research may not be suitable for other institutional settings, i.e., other countries. These specifics must be identified using data from particular regions or groups of countries that have related economic and financial institutional environments.

In accordance with literature analysis and findings of other scientists, several research questions and research hypotheses were formulated. To contribute to existing literature, research questions were developed in the following way:

1. What is the effect of profitability on the likelihood of public offering as an exit strategy?
2. What is the impact of financial risk on the likelihood of public offering as an exit strategy?
3. What is the effect of information asymmetry on the likelihood of public offering as an exit strategy?
4. What is the impact of size on the likelihood of public offering as an exit strategy?

In accordance with product market competition theory (Bayar, Chemmanur, 2011; Brau et al., 2003), on average, more established firms with business models already viable against product market competition possess higher likelihood to go public rather than to be acquired. Therefore, we expect the following results:

1. Profitability has a positive effect on the likelihood of public offering as an exit strategy.
2. Financial risk has a negative impact on the likelihood of public offerings as an exit strategy.
3. Information asymmetry, measured by company's age, has an inverted U-shaped effect on the likelihood of public offering as an exit strategy.
4. Size has a positive impact on the likelihood of public offering as an exit strategy.

The remaining paper is organized as follows. The next section presents a literature analysis that investigates main theoretical concepts and empirical findings relevant to our study; it helps to justify the research questions and develop the hypotheses of the study. In the third section, we discuss the data and the methods adopted in the work, followed by the testing of the research hypotheses. After that, we get and discuss the empirical results of the study. In the final section, we draw conclusions and provide possible implications of the research.

Theoretical Background and Hypotheses Development

Determining the exit strategy for a private firm is a fundamental step in the life cycle of each company (Bayar, Chemmanur, 2011). In the process of exit strategy implementation, original owners of the company try to sell private firm either in part or in whole. By selling partially the business ownership entrepreneurs and venture capitalists also attract external financing which could be used as an investment tool for the growth of the private firm (Bayar, Chemmanur, 2012).

Although there are many studies concerning the topic, there is a lack of knowledge related to exit mechanisms in the Russian environment. Hence, the primary contribution of the paper is to fill the gap concerning the identification of the likelihood of IPO and M&A exit mechanisms in Russia.

IPO Phenomenon in the Context of Exit Modes

In accordance with literature and empirical findings, IPO is one of the most popular exit mechanisms for private companies that is used by its owners. Through an IPO private firms transform into publicly listed entities; such corporate events change the capital structure and governance of the firm. In most cases, entrepreneurs and venture capitalists sell some of their equity holdings to raise the required funding (Ritter, Welch, 2002).

Ritter and Welch (2002) claim that an IPO is the best way for venture capitalists and entrepreneurs to raise equity capital. In addition, the authors found evidence that the "going public" decision is supported due to favorable market conditions and a certain stage of company's life cycle. In contrast to Ritter and Welch (2002), Bayar and Chemmanur (2011) postulate that an IPO is not always the best way to raise external financing. Therefore, the authors developed a theoretical analysis which sheds light on the determinants of a company's choice between IPO and M&A. Authors highlight that such factors as the level of competition in the product market, the difference in information asymmetry nature of one or another exit, the private benefits of control pertaining to entrepreneurs and venture capitalists after exit and bargaining power of outside investors in comparison with private firm insiders are the crucial factors driving company's exit choice mechanism. That is why it is still unclear whether an IPO is the best exit option or not for a private company.

Equity capital raised from an IPO could be used for different purposes such as new operations, debt repayments, new projects, geographic expansion, or product development. After an IPO, the ownership and control rights of entrepreneurs and venture capitalists decrease or even withdraw. In most cases, the founding entrepreneur remains operating and managing the company, while venture capitalists sell all their stakes during or after an IPO to gain a return on their investments (Smith, 2005).

Researchers have identified three benefits of an IPO exit mode. Firstly, the authors posit that IPOs as an exit mechanism allow private companies to increase the liquidity level (Bodnaruk et al., 2008). Secondly, authors emphasize the availability of strategic moves that IPOs can provide. Strategic moves can vary significantly from improving corporate image to strengthening product market competitiveness (Chemmanur et al., 2010). Thirdly, the cost of capital and valuation of the company can make an IPO as a funding source more attractive in comparison with other sources of raising capital (Aggarwal and Hsu, 2012).

Signaling theory plays an important role in explaining a company's exit decision to go public. Signaling is used to indicate the inherent quality of a firm. Moreover, signaling acts like a natural mechanism for the reduction of information asymmetry between two parties, in our case, namely, firm's insiders (entrepreneurs and venture capitalists) and potential outside investors (Spence, 2002; Certo, 2003; Arthurs et al., 2009; Connelly et al., 2011). A decent part of signaling theory is dedicated to entrepreneurship studies where IPOs and young firms are perceived as signalers. In most cases receivers are potential investors who perceive different signals from signalers. Signals that originate from young firms making IPOs to potential investors are the following: board structure, insider ownership, board diversity, board prestige, venture capital financing events, management quality, retained ownership, etc.

Stoughton et al. (2001) claim that the exit decision of a private firm to go public may be treated as a signal of high quality of the product market. Leland and Pyle (1977) posit that the percentage of retained ownership by entrepreneurs after IPO indicates the level of undiversified risk. In accordance with theory, the higher the percentage of retained ownership indicates greater idiosyncratic risk perceived by entrepreneur. Therefore, it could be a signal to the public that private companies have projects of higher value or less risk. The presence of venture capitalists in the ownership structure of a private firm is another signal that can determine and predict the exit mode as IPO. Megginson and Weiss (1991) claim that VC-backed companies tend to be certified by the most prestigious underwriters. More importantly, being certified by the most established underwriters is an evident signal of quality to potential outside investors in the IPO (Carter and Manaster, 1990) and seasoned public offering (Helou, Park, 2001).

M&A Phenomenon in the Context of Exit Modes

The sale of a private company to a strategic buyer is another popular mechanism for exit (Bayar, Chemmanur, 2012; Lemley, McCreary, 2019). In accordance with Lemley and McCreary (2019), M&A deals as an exit mode have a growing popularity among private venture capital-backed firms in the USA. The authors highlight that venture capitalists want to get paid for fostering a private firm and that is why they desire startups to be acquired rather than to be listed on the stock exchange. Mergers and acquisitions are used by strategic buyers with the purpose to grow quickly, to increase incumbent's market power, to access technology, to employ economies of scale and to gain synergy effect from combining two entities with different business lines (Wang, Xie, 2009; Lemley, McCreary, 2019). The presence of asymmetric information and incentives can also influence the likelihood of the choice preference towards M&A rather than an IPO. Incumbents understand the market opportunities of entrepreneurial startups better than anyone else and therefore will be willing to pay the full price for them. Market leaders may have an incentive to acquire a private firm for a full price since the startup can threaten the future of an incumbent. The presence of patents, contract laws, trade secrets can even facilitate the M&A exit strategy (Lemley, McCreary, 2019). Another prominent reason for the choice in favor of M&A is the intention to avoid IPO-related transaction costs. Such transaction costs of an IPO as management time, regulatory compliance, and underwriting might be a crucial factor why startups try to avoid being listed on the stock exchange.

Despite the variability of reasons in favor of M&A, different reasons are dependent on the types of relationships between a private company and an acquirer in the industry value chain. Each M&A type addresses the initial reason of the choice of M&A. M&A deals can be threefold: horizontal, vertical and conglomerate. When an acquisition is performed the ownership rights for a private firm are entirely transferred to the acquirer. Venture capitalists and/or entrepreneur(s) tend to leave the company and transfer control rights to a strategic buyer.

Both exit mechanisms have their own advantages and disadvantages that can induce either success or failure of the exit process. Choosing the exit option is an important step for the company's future. Therefore, it is vital to determine which factors influence the likelihood of the choice between IPO and M&A as an exit strategy mechanism and what valuation premium exists for them.

Agency Conflicts Between Entrepreneurs and Venture Capitalists

Exiting from a private company is an important step in venture capitalists' business model. Exit strategy allows them to transfer initially invested funds, gained profit and non-financial assets to other investment opportunities (Smith, 2005). On the other hand, entrepreneurs may not have such incentives to exit from company's ownership and control. The conflict of interest can arise between entrepreneurs and venture capitalists in the strategy of exit and its relevancy. For instance, an entrepreneur may pursue to retain ownership of the company with the purpose to obtain private benefits despite the company's value (Smith, 2005; Bayar, Chemmanur, 2011). Entrepreneurs can even intend to continue and expand their private company although contraction or termination is more efficient (Triantis, 2001). In opposition to this idea, venture capitalists might plan to exit earlier than is expected in terms of favorable market conditions and the current stage of company's life cycle. Early exits can be incentivized because of liquidity and publicity needs. If only one party, either entrepreneur or venture capitalists, is liable to decide concerning the exit mechanism and its details, then the conflict of interest can also arise. The agency problem can take place since this party can plan the exit strategy when it will be more beneficial for that party to derive a benefit.

Determinants of Exit Modes

As it was mentioned earlier, different factors of private companies can form the choice of an exit strategy. Looking at Italian firm-specific data, Pagano et al. (1998) highlight several determinants of an IPO such as firm size and market-to-book ratio. Authors report that Italian IPOs have higher likelihood to be larger firms and to have higher valuations. It means that firm size and market-to-book ratio are positively related to IPO exit mechanism. In addition, authors found that the cost of debt is reduced for companies who chose public offering. Moreover, Pagano et al. (1998) found that control changes hands in public offerings more often than in private companies.

Brau et al. (2003) determined several groups of factors that influence the preference of IPO over M&A. Authors posit that industry-related factors, market-timing factors, deal-specific factors, and funding demand factors have an impact on the likelihood of IPO. More specifically, scientists found that industry concentration, high-tech industry status of the company, hotness of the IPO market, cost of debt financing, percentage of insider ownership in a private firm and firm size have a positive impact on the likelihood that a company will conduct a public offering. In addition, authors determined several factors that negatively related to the probability that a firm will conduct an IPO. Companies that are associated with high market-to-book industries, firms that offer financial services, companies working in high debt sectors, and deals that involve higher liquidity are those that have a negative impact on the likelihood that company's insiders will exit through IPO.

Schweinbacher (2008) partly supports Brau et al. (2003) that high-tech industry status of the company is of vital importance in exits through public offering. Innovation-driven entrepreneurs tend to value control over private firms. Therefore, entrepreneurs tend to pursue IPO exit strategy mode as it gives them more control rights over a company after being listed in comparison with M&A.

Poulsen and Stegemoller (2008) considered several determinants that can influence the choice between public offering and sell-out. Authors highlight such factors as liquidity, growth opportunities, financial constraints, and asymmetric information in firm valuation. The results obtained from the study support the significance of growth opportunities in the insiders' choice to exit through IPO. Growth opportunities were proxied by employing sales growth, growth in assets, growth in capital expenditures, VC-backing, and valuation multiples. In addition, Poulsen and Stegemoller (2008) found that acquisitions are associated with significantly less insider ownership both before and after the deal in comparison with public offerings. It means that insiders of M&A exit companies dramatically reduce the ownership and control of the firm in comparison with public offering exit. Moreover, asymmetric information in a firm's valuation has a positive impact on the likelihood of M&A exit compared to public offering. Asymmetric information was proxied by employing R&D intensity, the value of R&D, intangibility of assets, age of the firm, pre-transaction profitability and abnormal profitability. Results also suggest that acquisitions are associated with higher liquidity constraints in comparison with public offerings. Liquidity and financial constraints are measured by employing leverage, liquidity, and financial distress.

In support of Poulsen and Stegemoller (2008) arguments concerning the usage of age as a proxy for information asymmetry, Cumming and MacIntosh (2003) earlier claimed that older firms tend to operate on more established market, possess already established management team and a longer operating history. Hence, age reduces informational asymmetries between the insiders such as entrepreneurs and venture capitalists and potential investors.

In accordance with the IPO valuation puzzle theory, Bayar and Chemmanur (2011) highlight that competition in the product market is the most crucial factor that determines the choice of a private company between IPO and M&A. The authors hypothesize that an IPO as an exit mechanism is chosen when the company is accounted as one of the strongest players in the market where market leader is not established yet. In such emerging markets the competition is rather strong. To the contrary, M&A as an exit mode is chosen when the target company is not accounted as one of the dominant players in the market. Such a market is usually characterized by the already established market leader and rather weak product competition. In addition to the contributions, Bayar and Chemmanur (2012) in their empirical study reported that many private companies choose M&A rather than IPO because of the several reasons. First, companies operating in industries without a market leader are more likely to be listed on the stock exchange. Secondly, IPO is likely to be associated with firms that are harder to value by investors, more capital-intensive companies, and those operating in sectors with greater private benefits of control. Thirdly, the probability of an IPO is greater for venture financed companies.

To sum up, there are many factors that can have an impact on the choice of exit strategy mechanism depending on author. Different authors highlight various determinants of being listed rather than acquired, but they see eye to eye with the following parameters: venture capital backing, size, capital constraints, market-to-book ratio, R&D intensity, and sectors characteristics.

Russian Context

Russian academia did not pay a decent attention to the exit strategy mechanisms. Only few papers overviewed this phenomenon and none of them is empirical research. One of them is the work written by Fiyaksel and Gasanov (2018) that accumulates literature findings regarding exit strategies. Authors studied the current state of scientific knowledge in the research area dedicated to exit mechanisms and offered further strand of research. In addition, authors offered their own definition of an exit strategy, described key exit strategies for entrepreneurs and venture capitalists and analyzed fundamental Russian and foreign articles in this research area. Authors conclude with the absence of robust methodological procedure how to mitigate exit strategy mechanism. Hence, they propose the development of such a procedure as a way for further research.

Another prominent Russian paper dedicated to this research area is the work written by Pinkovetskaia (2020). The author analyzed key reasons and mechanisms of cessation of entrepreneurial businesses. In addition, the author offered a new classification of reasons why entrepreneurs exit from their companies. Classification offered by author has 4 classes of reasons: exogenous, endogenous, risk avoidance and personal reasons. Moreover, the author found that endogenous and personal reasons have the highest priority why entrepreneurs tend to exit. The main reason for entrepreneurial exit strategy is the financial incentive.

To conclude, the topic of exit strategy mechanisms for entrepreneurs and venture capitalists attracts the attention of academia. Under this research area, the main problem is the absence of Russian empirical studies dedicated to the identification and prediction procedure of exit strategy either through M&A or IPO. Russian literature cannot provide such solutions both for venture capitalists and entrepreneurs. In accordance with foreign literature, various authors have different determinants and methods for exit strategy prediction. While determinants and methodological procedures of foreign studies are mixed, this study aims to make such predictive procedure that is applicable for Russian institutional environment and hence solve the research problem.

Given that exit choice has a great importance for companies' development, as well as the fact that this choice can be driven by different factors, we develop following hypotheses:

Hypothesis 1: For Russian companies, their profitability is positively associated with the likelihood of public offering as an exit strategy.

Hypothesis 2: For Russian companies, financial risk has a negative impact on the likelihood of public offerings as an exit strategy.

Hypothesis 3: For Russian companies, information asymmetry, measured by company's age, has an inverted U-shaped effect on the likelihood of public offering as an exit strategy.

Hypothesis 4: For Russian companies, size is positively related with the likelihood of public offering as an exit strategy.

Methodology

To test the hypotheses, we use regression analysis. Binary choice models and classification tools are convenient methods for answering the main research question and predicting the probability of public offering as an exit mechanism. Probit regression model is one of the most widespread tools used to predict the likelihood of one or another outcome. Therefore, this method is employed in the current analysis. Probit regression is stemming from the cumulative normal probability function,

$$Z_i = F^{-1}(P_i) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \epsilon_i, \quad (1)$$

and

$$P_i = F(Z_i) = \int_{-\infty}^{Z_i} \frac{1}{\sqrt{2\pi}} e^{-\frac{s^2}{2}} ds, \quad (2)$$

where P_i is the likelihood that IPO_t is going to be completed; F^{-1} is the inverse of the cumulative normal probability function; X_j is the j^{th} explanatory variable; β_j is the slope coefficient of the j^{th} explanatory variable; ϵ_i is the error term or disturbance for observation i .

The interpretation of probit regression coefficients is not straightforward. Marginal effects are one of the ways used for probit regression model how to interpret the effect of explanatory variables on the likelihood of an IPO exit. Marginal effects are local derivatives of the probability that the regressand is equal to “1”. If x_j is a continuous regressor, its marginal effect on $p(x) = P(y = 1|x)$, holding other regressors constant, is derived from the partial derivative:

$$\frac{dp(x)}{dx_j} = f(\beta_0 + X\beta)\beta_j, \quad (3)$$

where $f(\beta_0 + x\beta)$ is the standard normal probability density function evaluated at $\beta_0 + x\beta$.

If x_j is a binary regressor, its partial marginal effect, holding other regressors constant, is:

$$G(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_j X_j + \dots + \beta_n X_n) - G(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n), \quad (4)$$

where G is a cumulative distribution function.

The list of variables and their description is provided in Table 1. The only one dependent variable is the binary variable which indicates the exit choice preference (either IPO or M&A). The following regressors are used as potential predictors of an exit mechanism: return on assets (ROA), logarithm of total assets, age of the company prior to exit, debt to assets, year, and sector dummies. ROA is used as a proxy to control a company’s profitability level. Logarithm of total assets is used as a proxy to control target’s size. The age of the target company is used as a proxy to control the information asymmetry. Debt to assets is used as a proxy to control the financial leverage level or capital constraints. In general, firm size, profitability level, age and leverage are grouped as a proxy for firm viability. Year dummies are used to control time-fixed effects. Sector dummies are used to control industry-specific effects.

Table 1. Variables used in probit regression model

| Variables | Description |
|-------------------|--|
| Deal | Dependent binary variable (‘1’ – if the exit was through IPO, ‘0’ – if the exit was through M&A) |
| ROA | Return on assets for the last financial year prior to exit (proxy for company’s profitability level) |
| Ln (total assets) | Logarithm of company’s total assets for the last financial year prior to exit (proxy for company’s size) |

| | |
|----------------|--|
| Age | Number of years for company's existence prior to exit (proxy for the information asymmetry) |
| Debt to assets | Percentage share of debt financing (proxy for financial leverage level) |
| Year dummies | 2000-2021 years (proxy for time-fixed effects) |
| Sector dummies | 'Utilities', 'Information Services', 'Construction Machinery, Moving & Handling Equipment', 'Business Services', 'Transport, Freight & Storage', 'Construction', 'Property Services', 'Food & Tobacco Manufacturing', 'Industrial, Electric & Electronic Machinery', 'Wholesale', 'Banking, Insurance & Financial Services', 'Mining & Extraction', 'Communications', 'Retail', 'Metal Products', 'Chemicals, Petroleum, Rubber & Plastic', 'Computer Hardware & Software', 'Travel, Personal & Leisure', 'Leather, Stone, Clay & Glass products', 'Wood, Furniture & Paper Manufacturing' and 'Transport Manufacturing' |

Based on the research hypotheses, the probability of an IPO over M&A is estimated using the following probit regression model on a pooled cross-sectional dataset which covers both IPOs and M&As:

$$\Pr(IPO_i = 1) = F(\beta_0 + \beta_1 SIZE_i + \beta_2 ROA_i + \beta_3 AGE_i + \beta_4 AGE_i^2 + \beta_5 LEVER_i + \beta_6 YEAR_i + \beta_7 SECTOR_i + \varepsilon_i) \quad (5)$$

where i is the index for individual company, β is the slope coefficient for each regressor, IPO_i is a binary regressand equal to 1 if the company i goes through public offering, or 0 if the company i is merged or acquired, F is a cumulative normal probability function.

To evaluate the quality of predictions based on probit regression model, classification tables are used. Classification table is a two-by-two table of data which consists of observed positive and negative events, in other words, IPO and M&A corporate events, and predicted positive and negative events, in other words, IPOs and M&As, classified by a cutoff value (Table 2).

Table 2. Example of a classification table

| | Observed positive (IPO) | Observed negative (M&A) |
|--------------------------|-------------------------|-------------------------|
| Predicted positive (IPO) | a | b |
| Predicted negative (M&A) | c | d |

Sensitivity and specificity are used to measure the fit of the probit regression model. Higher sensitivity and specificity values indicate better fit of the model (see Formulae 6 and 7). In addition, f-score as an accuracy indicator is also employed to assess probit classification system. Higher f-score is the illustration of higher accuracy of the model (see Formula 8). In addition to these metrics, ROC curve and AUC indicator are essential for threshold identification.

$$Sensitivity = \frac{a}{a+c} \quad (6)$$

$$Specificity = \frac{d}{d+h} \quad (7)$$

$$F - score = 2 * \frac{Specificity * Sensitivity}{Specificity + Sensitivity} \quad (8)$$

To be successful in defining the target population, one should detect all boundary considerations to provide inclusiveness of the data used in the study (Casteel, Bridier, 2021). Therefore, several boundary specifications were considered with the purpose of fully describe the population of the interest. Firstly, under the general specification of the population all completed M&A deals and IPOs are considered. Secondly, geographic boundaries are of vital importance in the determination of population. Under current research all completed Russian M&A deals and IPOs were chosen. Thirdly, the time frame of the population is all completed Russian M&A deals and IPOs for the last 22 years, i.e., from 2000 to 2021.

The total population sampling technique is employed in the study. In accordance with Etikan et al. (2016), “[t]otal population sampling is a technique where the entire population that meet the criteria (e.g., specific attributes/traits, experience, knowledge, skills, exposure to an event, etc.) are included in the research being conducted”. In the current research several criteria were established for M&A deals and IPOs such as geographical boundaries and time frame. The primary reason for choosing such sampling technique is the presence of these three criteria which significantly restrict the population size. Leaving out certain observations from the highly restricted population can lead to biased and inconsistent results. For example, Hackshaw (2008) highlights that “if the sampling frame is not

large enough, the researcher runs the risk of not obtaining sufficient data, resulting in imprecise measures of effect size for quantitative studies". Therefore, the usage of total population sampling is more convenient in the case when the restricted population has a small size.

We consider Russian private companies as units of analysis. In terms of quantitative analysis, each Russian private company in the current study has its own characteristics that vary depending on each company's nature. The main one is the dependent variable, the exit mechanism through which insiders exit from private companies. It will be coded as a binary variable indicating IPO as '1' and M&A as '0'. Other variables which apply directly to the unit of analysis as well are used in the study such as time-specific effects, industry-specific effects, firm size, age, capital constraints and operating performance. These firm-specific characteristics vary between companies dramatically and they could potentially explain the variation in probability of the choice between exit mechanisms.

A step-by-step plan of sample selection procedure is established. First, we collected the data from Zephyr Bureau van Dijk database, with geographical and time restrictions. Initial sample size of the dataset consists of 15287 observations. This sample includes all completed M&A and IPO deals in Russia between 2000 and 2021.

We omitted all extreme values for regressors. Another aspect is the drop of missing values, outliers, and unrealistic values for each of the control variables. Data were preprocessed in Python: missing values and outliers were deleted from the main sample, total assets were transformed by the usage of logarithms, several variables were recoded, dummy variables for years and sectors were created. The final sample consists of 6556 M&A deals and 352 IPO corporate events.

Results

Table 3 reports the means, medians, standard deviations, minimums, maximums, skewness and kurtosis of the key variables used in regression analysis. In accordance with table results, it could be concluded that debt to assets and logarithm of total assets approximately follow normal distribution, however, age and return on assets possess high kurtosis due to data peculiarities connected with total population sampling.

Table 3. Table of summary statistics

| Variables | Mean | Median | Standard Deviation | Minimum | Maximum | Skewness | Kurtosis |
|-------------------|--------|--------|--------------------|---------|---------|----------|----------|
| Age | 20.224 | 14.529 | 25.436 | 0.203 | 281.978 | 3.931 | 25.012 |
| Debt to assets | 0.487 | 0.484 | 0.319 | 0 | 1 | 0.041 | 1.681 |
| ROA | 0.049 | 0.025 | 0.166 | -0.998 | 0.975 | 0.115 | 10.738 |
| Ln (Total Assets) | 2.364 | 1.985 | 1.973 | 0.001 | 11.822 | 1.112 | 4.399 |
| Observations | 6908 | | | | | | |

Table 4 reports the distribution of M&A deals and public offerings throughout the period of 22 years used in the study. In accordance with retrieved data, the highest number of M&A deals is equal to 759 and occurred in 2010, while the lowest number of M&A deals is equal to 1 and occurred in 2000. In addition, the highest number of public offerings is equal to 90, which occurred in 2006, while the lowest number is equal to 0 occurred in 2001.

Table 4. Frequencies for exit type and years of transaction

| Year | M&A | IPO | Row Total |
|------|-----|-----|-----------|
| 2000 | 1 | 1 | 2 |
| 2001 | 8 | 0 | 8 |
| 2002 | 28 | 4 | 32 |
| 2003 | 45 | 4 | 49 |
| 2004 | 122 | 28 | 150 |
| 2005 | 127 | 22 | 149 |
| 2006 | 245 | 90 | 335 |
| 2007 | 465 | 58 | 523 |
| 2008 | 621 | 45 | 666 |

| | | | |
|--------------|------|-----|------|
| 2009 | 545 | 9 | 554 |
| 2010 | 759 | 15 | 774 |
| 2011 | 537 | 4 | 541 |
| 2012 | 500 | 8 | 508 |
| 2013 | 435 | 9 | 444 |
| 2014 | 477 | 7 | 484 |
| 2015 | 259 | 8 | 267 |
| 2016 | 248 | 9 | 257 |
| 2017 | 287 | 14 | 301 |
| 2018 | 265 | 5 | 270 |
| 2019 | 201 | 5 | 206 |
| 2020 | 180 | 2 | 182 |
| 2021 | 201 | 5 | 206 |
| Column Total | 6556 | 352 | 6908 |

Table 5 reports the frequency distribution of M&A and IPO exits among various sectors of Russian economy. In general, 21 sectors were highlighted and used in the current analysis. It could be concluded that the highest number of M&A deals occurred in 'Business Services' sector, and it equals to 614, while the lowest number of M&A exits occurred in 'Information Services', and it is equal to 3. Moreover, the largest number of public offerings occurred in 'Utilities' sector (112), while the lowest number of IPOs occurred in 'Travel, Personal & Leisure' sector (2). In addition, the lowest proportion of public offerings is observed in 'Business Services', and it accounts for 0.81% of all deals occurred in 'Business Services'. The highest proportion of IPOs is in the 'Information Services', and it is equal to 57.14%. 'Other sectors' consist of 860 M&A deals and 4 IPO exits. These sectors were not highlighted in the study because of the low number of public offerings, i.e., less than or equal to 1 in each sector.

Table 5. Frequencies for exit type and sector of economy

| Target sector | M&A | IPO | Row Total | IPO share (in percent) |
|---|------|-----|-----------|------------------------|
| Banking, Insurance & Financial Services | 324 | 6 | 330 | 1.82 |
| Business Services | 614 | 5 | 619 | 0.81 |
| Chemicals, Petroleum, Rubber & Plastic | 201 | 17 | 218 | 7.8 |
| Communications | 245 | 12 | 257 | 4.67 |
| Computer Hardware & Software | 180 | 6 | 186 | 3.23 |
| Construction | 429 | 23 | 452 | 5.09 |
| Machinery, Moving & Handling Equipment | 26 | 8 | 34 | 23.53 |
| Food & Tobacco Manufacturing | 424 | 17 | 441 | 3.85 |
| Industrial, Electric & Electronic Machinery | 388 | 18 | 406 | 4.43 |
| Information Services | 3 | 4 | 7 | 57.14 |
| Leather, Stone, Clay & Glass products | 117 | 5 | 122 | 4.1 |
| Metal Products | 195 | 23 | 218 | 10.55 |
| Mining & Extraction | 305 | 22 | 327 | 6.73 |
| Property Services | 438 | 5 | 443 | 1.13 |
| Retail | 235 | 14 | 249 | 5.62 |
| Transport Manufacturing | 212 | 28 | 240 | 11.67 |
| Transport, Freight & Storage | 527 | 12 | 539 | 2.23 |
| Travel, Personal & Leisure | 177 | 2 | 179 | 1.12 |
| Utilities | 249 | 112 | 361 | 31.02 |
| Wholesale | 345 | 6 | 351 | 1.71 |
| Wood, Furniture & Paper Manufacturing | 62 | 3 | 65 | 4.62 |
| Other sectors | 860 | 4 | 864 | 0.46 |
| Column Total | 6556 | 352 | 6908 | 5.1 |

In accordance with correlation analysis, it could be concluded that size and time-fixed effects possess the strongest correlation with dependent variable, they are equal to 0.28 and -0.17, correspondingly. The most prominent correlation among regressors is the correlation coefficient between company's size and financial leverage, which is

equal to 0.12. According to the results of correlation matrix, strong correlation among regressors that can potentially cause the problems of multicollinearity is not detected.

Appendix 1 reports the results of probit regression analysis for six model specifications. The first model includes only firm viability regressors such as age, profitability, financial leverage, and size. The second model includes all regressors and squared age to control inverted U-shaped relationship. The third model consists of both firm viability variables and the year of a deal. The fourth model is the same as the third one, but it also includes squared age. The fifth model includes firm viability characteristics, sectors, and years. The sixth model considers firm viability regressors, sectors, years, and squared age. In accordance with AIC, BIC and Pseudo R-squared statistics, the last model is the most appropriate model that fits a dataset. Therefore, this model is considered as a main one and is used for interpretation.

Appendix 2 depicts the results of average marginal effects retrieved from the last probit regression model. In accordance with regression results, age has a statistically significant inverted U-shaped relationship with the public offering. Moreover, the average marginal effect of age on the probability of an IPO is 0.0007. This coefficient suggests that companies with higher maturity on average have a 0.07% higher probability of IPO occurrence, holding other variables fixed. Return on assets as a proxy for profitability level is not statistically significant in any of probit regression specifications. Therefore, this variable does not have any pronounced impact on public offering choice. Debt to assets as a proxy for financial leverage effect is statistically significant in all regression specifications. This regressor has a negative effect on IPO occurrence. The logarithm of total assets as a proxy for company's size has a statistically significant effect on the likelihood of IPO in all probit regression specifications. The coefficient of 0.018 suggests that companies with bigger size have a 1.8% higher probability of public offering than M&A.

As for the years of deal occurrence, exits that were completed after 2009 do not have any statistically significant effect on the likelihood of public offering. Deals that occurred in the period between 2000 and 2008 show statistically significant effect on IPO. The effect is positive and varies from 8.3% in 2008 to 25.8% in 2006 holding 2021 as a base year.

Considering the sectors of economy, we do not observe sectors that have statistically significant negative effect on IPO occurrence. Some sectors do not have any statistically significant impact, while others have pronounced statistically significant positive effect on IPO. The following sectors are not statistically significant at 5% significance level and hence do not have any systematic impact on IPO choice in Russia: 'Business Services', 'Transport, Freight & Storage', 'Property Services', 'Food & Tobacco Manufacturing', 'Wholesale', 'Banking, Insurance & Financial Services', 'Mining & Extraction', 'Communications' and 'Chemicals, Petroleum & Rubber Products'.

As for statistically significant sectors, 'Information Services' has the most striking effect on IPO equal to 0.457. However, due to the high number of missing values and other data peculiarities, this sector codifies only 7 deals in total. Another variable that has a statistically positive effect on IPO exit is 'Utilities' sector. In accordance with marginal effects, if the deal occurs in utilities sector, then the likelihood of IPO deal increases on average by 21.9% holding other regressors constant. 'Machinery, Moving & Handling Equipment' also has statistically significant effect on IPO. If the deal occurs in this sector of Russian economy, then the probability of IPO exits increases on average by 24.1% holding other variables constant. Other sectors – 'Construction', 'Industrial, Electric & Electronic Machinery', 'Retail', 'Metals and Metal Products', 'Computer Hardware and Software' also have statistically significant impact on the likelihood of public offerings, however, less pronounced.

To assess the predictive power and quality of the model, classification tables were produced. The accuracy of the probit regression model is maximized with threshold equal to 47.5%. The overall rate of correctly classified deals is estimated to be 95.9, with 99.36% of the normal weight group (M&A deals) correctly classified (specificity) and only 30.97% of the low weight group (public offerings) correctly classified (sensitivity). Classification is rather sensitive to the relative sizes of each component group, and always prefers classification to the larger group. This phenomenon is clearly observed in our case. The accuracy of naïve forecast of predicting all M&A deals instead of public offerings is equal to 94.9%. Therefore, thanks to the probit regression analysis the accuracy of the forecast was increased by 1%. Due to imbalanced class distribution, accuracy as a metric is not good at model prediction evaluation. Hence, F1-score is implemented. F1-score is maximized and equal to 54.49% when the threshold equal to 29%. For threshold equal to 29%, the share of predicted IPO deals among predicted IPOs and observed ones (sensitivity) is equal to 52.56% and the share of predicted M&A deals among observed ones (specificity) is equal to 97.34%.

In addition, we used ROC curve as another method of model evaluation. In accordance with the ROC curve, the current probit regression specification using 29% threshold is of quite good performance of the model and class separation capacity.

The Hosmer-Lemeshow test was implemented for the model to check model's goodness-of-fit. Under this test, the chi-squared statistic with 8 degrees of freedom is equal to 30.52 and p-value is equal to 0.0002. Considering these indicators, the model could be rejected at the 1% significance level. However, we can accept the model at the 0.01% significance level. In other words, the model used to predict public offerings is of mediocre fit.

Discussion

Drawing on contemporary studies devoted to intersection of IPO and M&A phenomena, this study develops a framework that predicts the probability of insiders' exit strategy mode within Russian institutional system. The current study is based on a sample of acquisitions and public offerings in Russian Federation over 22 years. Four hypotheses were tested regarding a company's exit choice between IPOs and acquisitions.

The first hypothesis was not accepted and hence could be rejected because mixed results were observed. ROA as a measure of profitability is statistically insignificant in accordance with probit regression analysis. Bayar and Chemmanur (2012) reported the same findings in their paper. It means that profitability level as a firm viability indicator has mixed effects on the likelihood of public offering as an exit strategy. In addition, Poulsen and Stegemoller (2008) did not observe statistically significant effect of abnormal return on assets on the probability of public offering.

As for the second hypothesis, it was accepted, financial risk has a negative impact on the likelihood of IPO as an exit strategy. The same finding was observed by Brau et al. (2003). More leveraged companies tend to be acquired rather than go public through IPO. However, Bayar and Chemmanur (2012) and Poulsen and Stegemoller (2008) got opposite results. Poulsen and Stegemoller (2008) observed that financial leverage has a positive effect on the likelihood of public offering. Bayar and Chemmanur (2012) observed mixed effects, in other words, financial leverage is not statistically significant in their study. Observed debatable finding regarding financial leverage could be explained in the following way: as higher financial leverage serves as a proxy for financial risk, then private firms with higher debt financing and hence higher risk perception tend to take the more conservative restructuring path through a M&A rather than public offering.

The third hypothesis regarding information asymmetry is accepted. In accordance with the results, age showed a statistically significant inverted U-shaped effect on the likelihood of IPO. It means that an increase in company's age decreases information asymmetry of company's nature, hence the likelihood of public offering as an exit strategy tends to be increasing as well. However, when a company theoretically achieves a turning point in its age, the likelihood of IPO as exit strategy tends to decrease dramatically. From a theoretical perspective, the effect of turning point could be explained in terms of the company's achievement in growth potential expressed in established market, operations, and management team. At the turning point company's insiders have the highest probability to exit. After turning point company tends to gradually lose its growth potential at maturity or declining stage of life cycle as all public information becomes available to the potential investors and all market competitors are established.

Finally, the fourth hypothesis could be accepted. In accordance with probit regression analysis, company's size has a statistically significant positive impact on the likelihood of public offering as an exit choice. Brau et al. (2003) and Bayar and Chemmanur (2012) also observed this finding in their empirical research. In contrast, Poulsen and Stegemoller (2008) found an opposite result. They found that size has a negative effect on the probability of IPO. We believe it could be explained by the implementation of another proxy for company's size, namely logarithm of sales, which gives different results in comparison with logarithm of assets. A company's size as a deal-specific factor which tracks a company's viability shows that larger transactions are more likely to be public offerings. Positive statistically significant result of size obtained from probit regression supports the usage of company's size as a signal of the private firm's ability to stand alone as an independent company.

Conclusion

Using IPO and M&A datasets from Zephyr Bureau van Dijk, this research paper developed an empirical analysis of determinants for exit strategy choice in Russian institutional environment. Current empirical analysis in Russian institutional settings and probit regression specifications are the main research contributions of the paper to the theory. Further research in Russian institutional environment could be extended to the analysis of the IPO valuation premium puzzle and the inclusion of other determinants into the current predictive model.

While the results of our research contribute to the existing literature about IPO and M&A initiated by the companies in emerging economies, it has limitations that leave some questions unanswered. The main limitation of the study is the absence of the historical public data concerning industry-specific competition measures in each sector of Russian economy before transaction completion. Herfindahl-Hirschman index of concentration, presence of a dominant player in the industry, markets shares, price-cost margin could be considered as proxies for industry-specific competition. In addition, the private benefits of company executives could be used to control industry specifics. Moreover, sales growth could be added as another proxy for the company's viability. Another group of variables that could explain the probability in favor of public offerings is the difficulty of IPO market investors in valuing private firms. Tangibility of assets, average industry analysts' forecast error, capital intensity and the presence of venture capitalists in ownership of the company are the factors that can proxy the difficulty of IPO investors in valuing private firms. The market-to-book ratio and R&D ratio in assets could also be used to control the growth prospects of the company. Employing these determinants in probit regression analysis can significantly improve future research in Russian institutional environment. In addition, market conditions can be added to the model to predict IPO or M&A waves as an external factor that may impact insiders' choice (Ball et al., 2011).

From a practical standpoint, methodological procedures, probit specifications and the main findings could be employed by many professionals. The primary usage of the paper is focused on private investors, institutional investors, researchers, consultants, external analysts and internal company analysts as well. More specifically, they can use proposed methodology and predictive models in the strategic and investment analyses of Russian startups or private companies. Based on available private company's characteristics analysts and researchers can predict the likelihood of an exit either through IPO or M&A. From M&A perspective, for example, prediction of exit mechanism could be beneficial for investment analysts who sort out potential targets for acquirers. From an IPO perspective, for instance, this paper could be relevant for IPO consultants who offer advisory services for potential targets. Moreover, this research is important for venture capitalists who seek investment opportunities in private companies.

References

- Aggarwal, VA. and Hsu, DH. (2014), 'Entrepreneurial exits and innovation', *Management Science*, 60 (4), 867-887.
- Arthurs, JD., Busenitz, LW., Hoskisson, RE. and Johnson, RA. (2008), 'Signaling and initial public offerings: The use and impact of the lockup period', *Journal of Business Venturing*, 24, 360-372
- Ball, E., Chiu, HH. and Smith, R. (2011), 'Can VCs Time the Market? An Analysis of Exit Choice for Venture-backed Firms', *The Review of Financial Studies*, 24 (9), 3105-3138
- Bayar, O. and Chemmanur, TJ. (2011), 'IPOs versus acquisitions and the valuation premium puzzle: A theory of exit choice by entrepreneurs and venture capitalists', *Journal of Financial and Quantitative Analysis*, 46 (6), 1755-1793.
- Bayar, O. and Chemmanur, TJ. (2012), 'What drives the valuation premium in IPOs versus acquisitions? An empirical analysis', *Journal of Corporate Finance*, 18 (3), 451-475.
- Bodnaruk, A., Kandel, E., Massa, M. and Simonov, A. (2008), 'Shareholder diversification and the decision to go public', *Review of Financial Studies*, 21 (6), 2779-2824.
- Brau, J., Francis, F. and Kohers, N. (2003), 'The choice of IPO versus takeover: empirical evidence', *The Journal of Business*, 76 (4), 583-612.
- Carter, R. and Manaster, S. (1990), 'Initial public offerings and underwriter reputation', *Journal of Finance*, 45, 1045-1067.
- Casteel, A. and Bridier, NL. (2021), 'Describing populations and samples in doctoral student research', *International Journal of Doctoral Studies*, 16 (1), 339-362.
- Certo, ST. (2003), 'Influencing initial public offering investors with prestige: signaling with board structures', *Academy of Management Review*, 28 (3), 432-446.
- Chemmanur, TJ., He, S. and Nandy, DK. (2010), 'The going-public decision and the product market', *Review of Financial Studies*, 23 (5), 1855-1908.
- Connelly, BL., Certo, ST., Ireland, RD., and Reutzel, CR. (2011), 'Signaling theory: A review and assessment', *Journal of Management*, 37 (1), 39-67.
- Cummings, DJ. and MacIntosh, JG. (2003), 'Venture-capital exits in Canada and the United States', *University of Toronto Law Journal*, 53 (2), 101-200.
- Etikan, I., Musa, SA. and Alkassim, R.S. (2016), 'Comparison of convenience sampling and purposive sampling', *American Journal of Theoretical and Applied Statistics*, 5 (1), 1-4.
- Fiyaksel, E. A. and Gasanov, R. (2018), 'Venture investors' and entrepreneurs' exit strategies from innovative companies', *Innovations*, 5 (235), 49-53. (In Russian).
- Hackshaw, A. (2008), 'Small studies: Strengths and limitations', *European Respiratory Journal*, 32 (5), 1141-1143.

- Helou, A. and Park, G. (2001), 'Is there a signaling effect of underwriter reputation?' *Journal of Financial Research*, 24 (1), 27–43.
- Köhn, A. (2018), 'The determinants of startup valuation in the venture capital context: a systematic review and avenues for future research', *Management Review Quarterly*, 68 (1), 3-36.
- Lee, SM. and Lee, D. (2015), 'Entrepreneur characteristics and the success of venture exit: an analysis of single-founder start-ups in the US', *International Entrepreneurship and Management Journal*, 11 (4), 891-905.
- Leland, H. and Pyle, D. (1977), 'Informational asymmetries, financial structure, and financial intermediation', *Journal of Finance*, 32, 371–387.
- Lemley, MA. and McCreary, A. (2019), 'Exit strategy', Stanford Law and Economics Olin Working Paper #542, Available at SSRN: <https://ssrn.com/abstract=3506919>; accessed 28 December 2022.
- Megginson, W. and Weiss, K. (1991), 'Venture capitalist certification in initial public offerings', *Journal of Finance*, 46 (3), 879–903.
- Pagano, M., Panetta, F. and Zingales, L. (1998), 'Why do companies go public? An empirical analysis', *Journal of Finance*, 53 (1), 27-64.
- Parastuty, Z., Breiteneker, R.J., Schwarz, E.J. and Harms, R. (2016), Exploring the reasons and ways to exit: The entrepreneur perspective, Contemporary entrepreneurship: Multidisciplinary Perspectives on Innovation and Growth, In Bogenhold D., Bonnet J., Dejardin M. and Garcia Perez de Lema, D. (eds.), Cham: Springer, 159-172.
- Pinkovetskaia, I.S. (2020), 'Termination of entrepreneurial activity: causes and strategies', *Scientific Journal NRU ITMO. Series 'Economics and Environmental Management'*, 1, 19-26. (In Russian).
- Poulsen, A. and Stegemoller, M. (2008), 'Moving firms from private to public ownership: selling out to public firms vs. initial public offerings', *Financial Management*, 37 (1), 81–101.
- Ritter, JR. and Welch, I. (2002), 'A review of IPO activity, pricing, and allocations', *The Journal of Finance*, 57 (4), 1795-1828.
- Schwienbacher, A. (2008), 'Innovation and venture capital exits', *Economic Journal*, 118 (533), 1888-1916.
- Smith, DG. (2005), 'The exit structure of venture capital', *UCLA Law Review*, 53 (2), 315-356.
- Spence, M. (2002), 'Signaling in retrospect and the informational structure of markets', *American Economic Review*, 92 (3), 434-459
- Stoughton, NM., Wong, KP. and Zechner, J. (2001), 'IPOs and Product Quality', *Journal of Business*, 74 (3), 375–408.
- Triantis, GG. (2001), 'Financial Contract Design in the World of Venture Capital', *The University of Chicago Law Review*, 68 (1), 305–322.
- Wang, C. and Xie, F. (2009), 'Corporate governance transfer and synergistic gains from mergers and acquisitions', *The Review of Financial Studies*, 22 (2), 829-858.

Appendix 1. Probit regression results

| Variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|-------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|------------------------|
| age | 0.0035*** (0.0009) | 0.0067*** (0.0020) | 0.0047*** (0.0009) | 0.0099*** (0.0021) | 0.0050*** (0.0010) | 0.0131*** (0.0024) |
| ROA | 0.228 (0.180) | 0.209 (0.182) | -0.0310 (0.238) | -0.0738 (0.242) | 0.0912 (0.235) | 0.0376 (0.237) |
| leverage | -0.599*** (0.0940) | -0.609*** (0.0945) | -0.656*** (0.112) | -0.679*** (0.113) | -0.684*** (0.119) | -0.709*** (0.121) |
| Ln (total assets) | 0.254*** (0.0131) | 0.255*** (0.0132) | 0.302*** (0.0153) | 0.302*** (0.0154) | 0.275*** (0.0161) | 0.275*** (0.0163) |
| Age^2 | | -0.0001** (0.0000) | | -0.0001*** (0.0000) | | -0.0001*** (0.0000) |
| year_2000-2003 | | | 0.899*** (0.303) | 0.911*** (0.302) | 1.059*** (0.317) | 1.107*** (0.322) |
| year_2004 | | | 1.454*** (0.264) | 1.457*** (0.261) | 1.527*** (0.274) | 1.560*** (0.278) |
| year_2005 | | | 1.265*** (0.271) | 1.273*** (0.269) | 1.316*** (0.278) | 1.354*** (0.282) |
| year_2006 | | | 1.767*** | 1.776*** | 1.750*** | 1.778*** |

| | | | | | | |
|---|--|--|----------|----------|----------|----------|
| | | | (0.247) | (0.245) | (0.252) | (0.256) |
| year_2007 | | | 1.032*** | 1.039*** | 1.063*** | 1.096*** |
| | | | (0.248) | (0.245) | (0.253) | (0.257) |
| year_2008 | | | 0.869*** | 0.870*** | 0.870*** | 0.887*** |
| | | | (0.249) | (0.246) | (0.256) | (0.259) |
| year_2009 | | | 0.206 | 0.196 | 0.287 | 0.291 |
| | | | (0.281) | (0.279) | (0.295) | (0.298) |
| year_2010 | | | 0.212 | 0.208 | 0.294 | 0.313 |
| | | | (0.267) | (0.264) | (0.277) | (0.280) |
| year_2011 | | | -0.361 | -0.362 | -0.193 | -0.178 |
| | | | (0.329) | (0.327) | (0.332) | (0.335) |
| year_2012 | | | -0.0946 | -0.0879 | 0.0453 | 0.0730 |
| | | | (0.297) | (0.294) | (0.300) | (0.302) |
| year_2013 | | | -0.0926 | -0.0808 | 0.107 | 0.145 |
| | | | (0.295) | (0.292) | (0.297) | (0.299) |
| year_2014 | | | -0.361 | -0.348 | -0.295 | -0.258 |
| | | | (0.308) | (0.302) | (0.317) | (0.313) |
| year_2015 | | | 0.211 | 0.208 | 0.321 | 0.330 |
| | | | (0.306) | (0.304) | (0.304) | (0.308) |
| year_2016 | | | 0.280 | 0.276 | 0.331 | 0.345 |
| | | | (0.287) | (0.286) | (0.289) | (0.293) |
| year_2017 | | | 0.208 | 0.198 | 0.302 | 0.310 |
| | | | (0.283) | (0.280) | (0.283) | (0.286) |
| year_2018 | | | -0.128 | -0.134 | -0.135 | -0.121 |
| | | | (0.321) | (0.319) | (0.323) | (0.325) |
| year_2019 | | | -0.00542 | -0.0316 | 0.0776 | 0.0535 |
| | | | (0.320) | (0.318) | (0.325) | (0.328) |
| year_2020 | | | -0.129 | -0.143 | -0.0245 | -0.0307 |
| | | | (0.393) | (0.392) | (0.401) | (0.404) |
| Utilities | | | | | 1.553*** | 1.598*** |
| | | | | | (0.226) | (0.227) |
| Information Services | | | | | 2.407*** | 2.441*** |
| | | | | | (0.422) | (0.424) |
| Machinery, Moving & Handling Equipment | | | | | 1.672*** | 1.660*** |
| | | | | | (0.329) | (0.336) |
| Business Services | | | | | 0.142 | 0.157 |
| | | | | | (0.278) | (0.278) |
| Transport, Freight & Storage | | | | | 0.156 | 0.166 |
| | | | | | (0.276) | (0.275) |
| Construction | | | | | 0.738*** | 0.728*** |
| | | | | | (0.245) | (0.246) |
| Property Services | | | | | 0.367 | 0.393 |
| | | | | | (0.303) | (0.304) |
| Food & Tobacco Manufacturing | | | | | 0.472* | 0.458* |
| | | | | | (0.246) | (0.246) |
| Industrial, Electric & Electrical Machinery | | | | | 0.715*** | 0.678*** |
| | | | | | (0.248) | (0.246) |
| Wholesale | | | | | 0.520* | 0.552* |
| | | | | | (0.295) | (0.297) |
| Banking, Insurance & Financial Services | | | | | 0.460 | 0.509* |
| | | | | | (0.303) | (0.304) |

| | | | | | | |
|--|-----------|-----------|-----------|-----------|-----------|-----------|
| Mining & Extraction | | | | | 0.511** | 0.504** |
| | | | | | (0.245) | (0.244) |
| Communications | | | | | 0.448* | 0.460* |
| | | | | | (0.265) | (0.264) |
| Retail | | | | | 1.022*** | 1.048*** |
| | | | | | (0.258) | (0.259) |
| Metal Products | | | | | 0.807*** | 0.762*** |
| | | | | | (0.254) | (0.256) |
| Chemicals, Petroleum & Rubber Products | | | | | 0.548** | 0.510** |
| | | | | | (0.252) | (0.254) |
| Computer Hardware & Software | | | | | 1.107*** | 1.152*** |
| | | | | | (0.302) | (0.304) |
| Travel, Personal & Leisure | | | | | 0.455 | 0.471 |
| | | | | | (0.384) | (0.385) |
| Leather, Stone, Clay & Glass Products | | | | | 0.555* | 0.559* |
| | | | | | (0.304) | (0.301) |
| Wood, Furniture & Paper Manufacturing | | | | | 0.367 | 0.310 |
| | | | | | (0.371) | (0.382) |
| Transport Manufacturing | | | | | 1.008*** | 0.970*** |
| | | | | | (0.243) | (0.242) |
| Constant | -2.274*** | -2.315*** | -3.018*** | -3.078*** | -3.681*** | -3.806*** |
| | (0.0700) | (0.0784) | (0.246) | (0.246) | (0.326) | (0.333) |
| Pseudo R2 | 0.180 | 0.181 | 0.342 | 0.344 | 0.407 | 0.412 |
| AIC | 2290.0 | 2288.8 | 1877.2 | 1872.6 | 1737.0 | 1726.6 |
| BIC | 2324.2 | 2329.8 | 2034.5 | 2036.8 | 2038.0 | 2034.4 |
| Observations | 6908 | 6908 | 6908 | 6908 | 6908 | 6908 |

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Appendix 2. Average Marginal Effects

| Variables | dy/dx | Standard Error | z | P>z | [95% Confidence Interval] | |
|-------------------|--------|----------------|--------|-------|---------------------------|--------|
| Age | 0.0007 | 0.0001 | 6.000 | 0.000 | 0.0004 | 0.0009 |
| ROA | 0.002 | 0.015 | 0.160 | 0.874 | -0.027 | 0.032 |
| Debt to assets | -0.045 | 0.008 | -5.690 | 0.000 | -0.061 | -0.030 |
| Ln (total assets) | 0.018 | 0.001 | 16.370 | 0.000 | 0.015 | 0.020 |
| year_2000_2003 | 0.124 | 0.055 | 2.260 | 0.024 | 0.016 | 0.232 |
| year_2004 | 0.213 | 0.062 | 3.430 | 0.001 | 0.091 | 0.334 |
| year_2005 | 0.169 | 0.056 | 3.020 | 0.003 | 0.059 | 0.278 |
| year_2006 | 0.258 | 0.062 | 4.190 | 0.000 | 0.137 | 0.380 |
| year_2007 | 0.115 | 0.040 | 2.870 | 0.004 | 0.037 | 0.193 |
| year_2008 | 0.083 | 0.034 | 2.460 | 0.014 | 0.017 | 0.149 |
| year_2009 | 0.021 | 0.025 | 0.850 | 0.393 | -0.028 | 0.071 |
| year_2010 | 0.023 | 0.024 | 0.980 | 0.329 | -0.023 | 0.069 |
| year_2011 | -0.010 | 0.018 | -0.580 | 0.560 | -0.045 | 0.024 |
| year_2012 | 0.005 | 0.021 | 0.230 | 0.816 | -0.036 | 0.046 |
| year_2013 | 0.010 | 0.022 | 0.450 | 0.651 | -0.033 | 0.053 |
| year_2014 | -0.014 | 0.015 | -0.950 | 0.344 | -0.044 | 0.016 |
| year_2015 | 0.025 | 0.027 | 0.920 | 0.359 | -0.028 | 0.078 |
| year_2016 | 0.026 | 0.026 | 1.000 | 0.317 | -0.025 | 0.078 |
| year_2017 | 0.023 | 0.025 | 0.940 | 0.350 | -0.025 | 0.072 |
| year_2018 | -0.007 | 0.018 | -0.400 | 0.692 | -0.043 | 0.029 |

| | | | | | | |
|---|--------|-------|--------|-------|--------|-------|
| year_2019 | 0.004 | 0.022 | 0.160 | 0.874 | -0.040 | 0.047 |
| year_2020 | -0.002 | 0.025 | -0.080 | 0.938 | -0.051 | 0.047 |
| Utilities | 0.219 | 0.049 | 4.490 | 0.000 | 0.124 | 0.315 |
| Information Services | 0.457 | 0.122 | 3.750 | 0.000 | 0.218 | 0.696 |
| Machinery, Moving & Handling Equipment | 0.241 | 0.079 | 3.050 | 0.002 | 0.086 | 0.396 |
| Business Services | 0.011 | 0.021 | 0.520 | 0.600 | -0.030 | 0.051 |
| Transport, Freight & Storage | 0.012 | 0.021 | 0.560 | 0.577 | -0.029 | 0.052 |
| Construction | 0.066 | 0.030 | 2.220 | 0.026 | 0.008 | 0.124 |
| Property Services | 0.031 | 0.028 | 1.080 | 0.280 | -0.025 | 0.086 |
| Food & Tobacco Manufacturing | 0.036 | 0.024 | 1.530 | 0.125 | -0.010 | 0.083 |
| Industrial, Electric & Electrical Machinery | 0.060 | 0.028 | 2.110 | 0.035 | 0.004 | 0.116 |
| Wholesale | 0.047 | 0.032 | 1.460 | 0.144 | -0.016 | 0.109 |
| Banking, Insurance & Financial Services | 0.042 | 0.031 | 1.340 | 0.181 | -0.020 | 0.104 |
| Mining & Extraction | 0.041 | 0.025 | 1.670 | 0.095 | -0.007 | 0.089 |
| Communications | 0.037 | 0.026 | 1.420 | 0.154 | -0.014 | 0.088 |
| Retail | 0.112 | 0.040 | 2.780 | 0.005 | 0.033 | 0.191 |
| Metal Products | 0.071 | 0.033 | 2.180 | 0.029 | 0.007 | 0.135 |
| Chemicals, Petroleum & Rubber Products | 0.042 | 0.026 | 1.610 | 0.107 | -0.009 | 0.093 |
| Computer Hardware & Software | 0.132 | 0.052 | 2.520 | 0.012 | 0.029 | 0.234 |
| Travel, Personal & Leisure | 0.039 | 0.039 | 0.980 | 0.326 | -0.038 | 0.115 |
| Leather, Stone, Clay & Glass Products | 0.048 | 0.033 | 1.450 | 0.146 | -0.017 | 0.113 |
| Wood, Furniture & Paper Manufacturing | 0.023 | 0.034 | 0.700 | 0.486 | -0.042 | 0.089 |
| Transport Manufacturing | 0.099 | 0.036 | 2.790 | 0.005 | 0.030 | 0.169 |