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Studying strategic behaviour of small industrial enterprises in the context of the organizational and industry life cycle concepts

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Abstract. Unlike large corporations whose business patterns have been extensively studied and categorized, there is a lack of research on small business strategies, leaving them largely unexplored. The article explores the strategic behaviour of small industrial enterprises in Russia within the organizational and industry life cycle concept. The research methodology is based on strategic management theory and the concept of the life cycle. The research methods include panel data analysis, the Beta coefficient calculation, and the matrix method. The information base is the reporting data of 134 small enterprises from industries at different stages of the life cycle: metal casting (growth) and newspaper printing (maturity). Statistics for analysis were obtained from the SPARK Interfax database for the period of 1999–2021. We identified three types of strategic behaviour ('aggressive', 'defender', and 'counterstrategy') and assessed their prevalence among small enterprises in the two industries under consideration. The results showed that mature small enterprises with an 'aggressive' intuitively strategic behaviour are the predominant type of business in a mature industry, while for small enterprises in a growing industry 'defender' and 'counterstrategy' are the prevalent strategies at all the life cycle stages. This paradox additionally proves the validity of our idea of the intuitively strategic behaviour of small businesses. Our findings contribute to the development of the SME life cycle theory and strategic management, can be used to adjust industry policy and government support measures, and can also be of interest to managers of small enterprises.

Keywords: organizational life cycle; industry life cycle; strategic behaviour; small and medium-sized enterprises (SMEs); industry.

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Исследование стратегического поведения малых промышленных предприятий в контексте концепций жизненного цикла организации и отрасли

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Аннотация. В отличие от бизнес-моделей крупных корпораций, которые уже тщательно изучены и классифицированы, стратегии малого бизнеса остаются в значительной степени неисследованными. Статья посвящена изучению стратегического поведения малых промышленных предприятий в России в рамках концепций жизненного цикла организации и отрасли. Методологический каркас работы включает теорию стратегического менеджмента и концепцию жизненного цикла. Методы исследования – анализ панельных данных, расчет бета-коэффициента, матричный метод. Информационная база охватывает данные отчетности 134 малых предприятий из отраслей, находящихся на разных стадиях жизненного цикла: литье металлов (стадия роста) и печатание газет (стадия зрелости). Статистика для анализа извлечена из базы СПАРК Интерфакс за период 1999–2021 гг. Авторами выделены три типа стратегического поведения малых предприятий – «агрессор», «защитник» и «контрстратегия», – а также выполнена оценка их распространенности в изучаемых отраслях. Исследование показало, что зрелые малые предприятия с «агрессивным» интуитивно стратегическим поведением – преобладающий тип бизнеса в зрелой отрасли, в то время как для предприятий в растущей отрасли «защита» и «контрстратегия» являются ключевыми на всех этапах жизненного цикла. Этот парадокс дополнительно подтверждает валидность авторской идеи об интуитивном стратегическом поведении малого бизнеса. Полученные результаты вносят вклад в развитие теории жизненного цикла малого и среднего бизнеса и стратегического менеджмента, могут быть использованы для корректировки отраслевой политики и мер государственной поддержки, а также могут быть полезны руководителям малых предприятий.

Ключевые слова: жизненный цикл организации; жизненный цикл отрасли; стратегическое поведение; малые и средние предприятия (МСП); промышленность.

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INTRODUCTION

Developed and developing countries are almost equally interested in the sustainable development of small business. The interest of developed nations is due to the significant contribution of small enterprises to the economic development of the country, while in developing economies, on the contrary, small businesses make an insufficient contribution. According to the Institute of Economic Growth¹, micro, small, and medium-sized enterprises in developed countries provide 70% of jobs and make up 50–66%² of the GDP [Delgado, Kim, Mills, 2022]. In developing economies, 7 out of 10 workers are either self-employed or employed at small enterprises. At the same time, the contribution of small enterprises to the GDP of developing nations makes up at best 40% (Vietnam), and just 21.9% in Russia, while providing 27% of jobs (according to Rosstat for 2021)³.

Researchers (see, e.g., [Birch, 1979; Birch, 1987; Storey, Johnson, 1987; D'Imperio, 2012]) have long established the significant role of small businesses in achieving sustainable economic development goals, including through the promotion of innovative solutions and creative methods, as well as job placement. The International Labour Office also recognized the decisive role of small business in implementing the sustainable development goals in industrialized economies by 2030⁴. Moreover, only SMEs have been able to fully use the opportunities of digital technologies so far [Mills, 2019].

Small enterprises are quite a popular, but complicated and even controversial area of study. They are popular due to their importance for national economies. The complexity of this subject is related to the high vulnerability of this economic sector [Doern, 2009; Cressy, 2006; Hamilton, 2010; Rauch, Rijkskik, 2013; Coad, Tamvada, 2012], especially in the context of various crises [Bartik et al., 2020; Freeman, Perez, 1988; Barnett et al., 2014], which shorten the life cycle of such enterprises (for example, in the Russian Federation, most of them do not live up to 5 years⁵). Considerable advantages and disadvantages of small business lead to certain controversies. Among the advantages are the ability to increase sales without hiring additional employees [Delmar, Wiklund, 2008; Rauch,

Rijkskik, 2013]; the ability of innovative SMEs to grow faster than large non-innovative companies [Daunfeldt, Elert, 2013]; less dependence of SMEs on third-party experts and reliance on their own experience [Reid, Xu, 2012; Teruel-Carrizosa, 2010]; efficiency and ability to optimize business processes [Reid, Xu, 2012]; high rate of decision-making, flexibility, and adaptability [Schumpeter, 2017]; the ability to take risks [Lindegaard, 2011]; and management flexibility [Reid, Xu, 2012; Trzeciński, 2016; Pylaeva et al., 2022], which helps small businesses reach sustainable development despite their high vulnerability.

Researchers also note several significant drawbacks of small businesses: in mature industries, they have less chance of growth due to limited opportunities [Brito, Brito, Vasconcelos, 2007]; the successful development of a small enterprise depends significantly on its location [Hoogstra, Dijk, 2004; Porto, Brito, 2010; Reid, Xu, 2012] and the positive attitude of the entrepreneur [Davidsson, Achtenhagen, Naldi, 2010; Wakkee, Veen, Eurlings, 2015]; and extreme resource constraints [Lindegaard, 2011; Pylaeva et al., 2022]. These factors pose dilemmas for managers at small enterprises: how can a small company with limited resources best ensure sustainable development—by developing its own strengths, or focusing on levelling weaknesses?

We believe that large companies, against the backdrop of fierce competition and market saturation, can increase their competitiveness using well-thought-out development strategies, while small companies in most cases act intuitively, neither grasping the noted dilemma, nor developing appropriate sustainable development strategies. Salles [2006] surveyed SME managers and confirmed that their companies usually did not follow any formal or planned process to develop their strategy. Therefore, we believe it is useful to investigate the strategic reality of small enterprises by identifying their characteristic behaviour types ("intuitively strategic"). Notably, our study interprets the type of strategic behaviour of small companies differently than the classical management theory [Miles et al., 1978]. Miles et al. identified four types of strategic behaviours (prospector, defender, analyser, and reactor) according to three key business aspects: the entrepreneurial, the technological, and the administrative. This approach is primarily focused on strategic *choice* and management in organizations of any scale. Instead, we focus on the economic specifics of *real behaviour*, i.e., on the consequences of making such choices for small companies in an industry. Hereinafter, we will use the term "type of intuitively strategic behaviour" instead of the terms "strategy" and "strategic behaviour" to emphasize that managers of small companies generally act intuitively when making strategic decisions. To this end, in this paper, we interpret the term "*type of intuitively strategic behaviour of a small enterprise*" as an intuitive response to the market/industry, on the one hand, and as managerial

¹ UN. Resilience and Rebuilding. <https://www.un.org/ru/observances/micro-small-medium-businesses-day>.

² Open Journal. <https://journal.open-broker.ru/economy/malyj-biznes-i-ego-rol-v-ekonomike-rossii>.

³ Efficiency of the Russian Economy: Federal State Statistics Service (Rosstat). http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/efficiency/#.

⁴ Small goes digital - How digitalization can bring about productive growth for micro and small enterprises. International Labour Office – Geneva: ILO, 2021. https://www.ilo.org/empent/units/boosting-employment-through-small-enterprise-development/WCMS_808632/lang--en/index.htm.

⁵ Sberbank. 2019. Long-living SIEs of Russia. <https://www.sberbank.com/ru/news-and-media/press-releases/article?newsID=aaa674f1-9153-461f-a6da-15e44fa9ebf2&blockID=7®ionID=77&lang=ru&type=NEWS>.

decision-making without profound and thorough analysis, on the other.

We cannot study the types of strategic behaviour of small enterprises without also analysing the life cycle of the organization (OLC) and the entire industry, since small enterprises significantly depend on the economic environment [Cressy, 2006; Hamilton, 2010]. At the same time, we believe that the degree of this dependence can vary significantly, including at various stages of the enterprise life cycle.

Consequently, managers of small companies attempt (consciously or intuitively) to take into account the life cycle stages of the company itself and the relevant industry when making strategic decisions. Accordingly, decisions are coordinated with the state of the internal environment, which is largely determined by the stage of the enterprise life cycle, and the external environment, which is mainly determined by the stage of the industry life cycle. We proceed from the fact that the life cycle of a company and an industry may not coincide because, among other things, the former is always shorter than the latter.

Despite the popularity of SMEs as an object of study, publications on strategic behaviour of small companies in developing countries in the industrial sector from the standpoint of the life cycle concept were not found. Unlike large publicly traded manufacturing companies, for which strategic management technologies are quite standard, strategic decisions in small companies are often specific, and in many cases unique. These aspects predetermined the object of our study.

The purpose of our research is to identify empirically-observed types of intuitively strategic behaviour at small industrial companies in the Russian Federation within the concept of the life cycle of industries and enterprises. Thus, this paper contributes to the existing body of knowledge in two dimensions: 1) this is the first quantitative analysis of strategic reality for Russian small industrial companies, which 2) proposes a new method based on quantitative data for identifying the types of intuitively strategic behaviour of small industrial companies in developing economies.

To achieve our goals, we first completed a critical literature review and formulated the initial assumptions and prerequisites of our study and the main provisions of our proprietary method to identify the type of intuitively strategic behaviour of small industrial enterprises (SIEs). Then, we justified a sample of small companies in two traditional industries (metallurgy and printing). In the Results section, we present the results of our test using the proposed method and reveal the influence of the industry's volatility and life cycle on strategic reality of enterprises at different life cycle stages. In Conclusion, we outline our interpretation of the findings and their contribution to the existing body of knowledge, as well as the practical value of our work.

LITERATURE REVIEW

The sustainable development of small industrial enterprises is being studied quite actively, but it is generally not linked to the stages of the life cycle of the industry and the company itself. For example, Fadahunsi [2012] examined the growth patterns of high-tech SMEs, while Nunes, Serrasqueiro and Leitão [2012] investigated the relationship between the intensity of SME growth and R&D spending. Silin et al. [2013] investigated the regional aspects of the state, potential, and prospects for small business development. Zakirova et al. [2012] attempted to analyse the relationship between small business growth and macro-economic cycles.

However, we believe that in the context of changing duration of the life cycle of various industries, rapid shifts in the external environment, and increased competition, the strategic behaviour of small enterprises cannot be isolated from the stage of the life cycle of both the enterprise itself and its industry.

A literature review showed that the degree of research interest in the life cycle of different objects varies. Researchers mostly focus on the cyclical development of the organization. When describing the key patterns of the life cycles of national and international economies and goods, analysts do not so much offer new ideas as refer back to texts written by the founders of these theories; the industry life cycle, therefore, remains the least studied. There are a few possible explanations for this. First, although an industry is 'above' its constituent enterprises, the identification of an industry's life cycle stage is subordinate to the interests of an organization's strategic development. In other words, generally the stage of the industry life cycle is analysed when choosing an enterprise development strategy. Second, strategic analysis of an enterprise is generally focused not so much on the analysis of its industry as on the assessment of the market life cycle stage, while in modern conditions the market can either be part of one industry or combine several industries. Third, barriers to entry are breaking down due to the development of hypercompetition and digital economy, blurring industry boundaries.

The concept of the industry life cycle is an attempt to determine the mutual influence of the total revenue, profit, and cash flows of the industry and such factors as enterprise performance [Harris, Moffat, 2013], technologies and assets used, and the innovative activity of companies [Schuh et al., 2011; Gort, Klepper, 1982; Klepper, Graddy, 1990; Karlsson, Nyström, 2003; Baron, Tang, 2011]; cost structure [Baron, Hmieleski, Henry, 2012; Fomina, Alekseev, 2018], concentration of companies in the industry [Faulkner, Bowman, 1995; Borner, 2006; Fomina, Alekseev, 2018] and the degree of competition [Beal, Yasai-Ardekani, 2000, 2008], government regulation measures [Gunningham, 2002].

Our review of published papers on the industry life cycle has given us reason to believe that there is still no

unanimity in this research field. Studies are mainly limited to identifying the number of phases in a life cycle and the indicators of transitioning from one phase to another. We have included these parameters in our classification of approaches to studying the industry life cycle (Table).

According to modern approaches, industry life cycle develops through 3–5 stages, while each approach offers its own phase indicators, from the simplest (such as the number of enterprises) to more complex ones (such as the dynamics of competition and demand, changes in consumer behaviour, dynamics and source of innovative solutions, changes in demand, development of market consolidation processes, etc.).

We found very few works linking the sustainable development of an organization (regardless of the scale of activity) to the stages of the industry life cycle. In particu-

lar, Sabol, Šander and Fuckan [2013] and Sengupta [2018] state that business strategies of firms vary depending on the stage of industry life cycle. Cucculelli and Peruzzi [2020] confirmed that innovation behaviour of firms changes significantly over the industry life cycle. Firms focus on product-oriented innovation during the growth stage of the industry life cycle, and on process-oriented innovation during the maturity phase of industry evolution. A recognized expert in the field of organization efficiency, Adizes [2008] considers this problem through the lens of "changing management type and functionality at different stages of an organization's lifecycle". He emphasizes the need for management changes as a company progresses through various stages of development. While acknowledging the merits of his approach to strong management formation, we believe, for obvious reasons, that

Classification of approaches to studying the phases of the industry life cycle
Классификация подходов к изучению стадий жизненного цикла отрасли

Research approaches	Authors	ILC stages	Indicators of transition and characteristics of life cycle stages
Based on the dynamics and degree of competition	Porter [2001], Thompson and Strickland [2006], Simons [2003], Beal and Yasai-Ardekani [2000], Beal [2008]	Start-up, growth, maturity, decline	The main indicator is the dynamics of competition; additional indicators are the number and size of companies, barriers to entry and exit, the main economic indicators of the industrial development, the level of uncertainty, the threat of new players entering, new competitive threats. At the same time, Simons [2003] empirically proved that the number of companies decreases as they move from early to later stages
Based on the demand dynamics	Ansoff [1989]	Start-up, growth acceleration, growth slowdown, maturity, fading	The main indicator is slowing demand, which is an inevitable process as an industry 'ages', but is by no means a market distortion
Based on the consumer behaviour dynamics	Moore [1991], Bauer and Auer-Srnka [2012]	Innovators, early majority, late majority	The main indicator is consumers switching from one key need to others. In the first stage, the key needs are aimed at the consumption of goods with the largest number of functions; in the second stage, a desire for reliability and market expansion appears; in the third stage, consumer demands are shifted towards convenience
Based on innovations	Dickinson [2007], Fogarty et al. [2009]	Innovation, imitation, repeat, substitute, decline	The main indicator is the state of the industry called "quality overabundance", when manufacturers reach a level of product quality that allows them to fully satisfy existing consumer needs, after which the needs shift to other quality characteristics. Christensen [2011] introduced the concept of disruptive innovation. In stage 1, enterprises mainly use internal innovations to improve business processes and achieve competitive advantages. In stage 2, external innovations are implemented to improve the product. In stages 3 and 4, both internal and external innovations are used, with a tendency to increase internal innovations and decrease external innovations. In stage 5, there are no innovations
Based on innovation intensity	Audretsch and Feldman [1996], Maciariello [2015]	Introduction, growth, maturity, decline	The main indicator is the level and source of innovations (small or large companies). In industries with high intensity of innovations, if innovations come from small companies the main indicator is the introduction stage; if innovations come from large companies, it is the growth stage. In industries with low intensity of innovations, if innovations come from large companies the main indicator is the maturity stage; if innovations come from small companies, the main indicator is the decline stage
Based on the market consolidation process	Borner [2006], Fomina and Alekseev [2018], Noam [2016], Vizcarrondo [2013]	Start-up, growth and consolidation, maturity, decline, or start-up, growth, specialization, equilibrium	The main indicator is the development of market consolidation processes. In stage 1, the industry / market is significantly fragmented, participants are concentrated, and there is no consolidation. In stage 2, acquisition processes develop. In stage 3, transactions become larger but fewer; the market is gradually dominated by a small number of companies with declining return on capital. Most of them seek to form international alliances

the famous PAEI code¹ is hardly applicable in small businesses due to limitations in staff recruitment.

There are few empirical works studying the characteristics of the life cycle of small enterprises in Russia (the latest paper was published more than a decade ago (see, [Shamray, 2010])). We did not find any papers in Russian on the quantitative assessment of individual demographic characteristics of small enterprises, including studies of the diversity of strategic behaviour, during our literature review of the past 15 years.

There are also few empirical works on the strategic behaviour of small companies in developing economies. These studies are usually built on the typology proposed by Miles et al. [1978], which is classical for management theory. These works, for example, develop the typology in relation to the performance of small companies in China [Tang, Tang, 2012], or in the context of the influence of the strategic orientation of small industrial enterprises in Dubai on some organizational determinants [Al-Ansaari, Pervan, Xu, 2014], or test the validity of a theory in relation to Australian SMEs [Blackmore, Nesbit, 2012] or Spanish SMEs [Yanes-Estévez, García-Pérez, Oreja-Rodríguez, 2018]. Notably, authors are more focused on the strategic *choice* of small companies, using the popular behaviour typology of Miles et al. [1978]. Such works are often based on the application of this typology in a rather subjective and discretionary manner [Yanes-Estévez, García-Pérez, Oreja-Rodríguez, 2018], since there are no clear criteria for classifying organization as one or another type of strategic behaviour.

A literature review revealed a research gap in the empirical study of the strategic behaviour of small industrial enterprises in the context of individual (a specific small company) and systemic (a specific industry) life cycles. This paper proposes our solution to this problem.

DATA AND METHODS

We based our research design on the following assumptions.

1. Age is not a reliable indicator of the stage of the industry life cycle, since scientific and technological achievements can significantly increase or reduce the time an industry exists. Moreover, in different countries, the same industries may be at different life cycle stages. In particular, Russia experienced a period of rapid economic growth beginning in the 2000s, which contributed to the import of new technologies from Western countries, and most industries resumed the growth phase (due to technological innovations).

2. Realizing that the duration of the industry life cycle phases is determined not only by the general economic business cycle, but also by changes in production technologies, state regulation, and subsidies, we reduced the definition of the industry life cycle stage only to quanti-

tative indicators, because after 1991 in Russia changes in life cycle phases were mostly associated with importing new equipment and technologies.

3. The growth and maturity stages of the life cycle of an enterprise and an industry are the most interesting in terms of the sustainable development of small enterprises, since in the start-up stage a business is a mystery to the market and the owners themselves, while in the decline stage it is already too late to make proactive decisions. Researchers pay special attention to the maturity stage because it is the longest one, and it is the stage during which it is most critical to build sustainable development strategies to maximize profits and net cash flows.

Based on the literature review and the stated assumptions, we developed the following method for identifying types of intuitively strategic behaviour (TISB) of small industrial enterprises.

Step 1. Determining the industry life cycle stage. When studying the industry life cycle in developing countries, it is inappropriate to use all the indicators highlighted in Table 1. They should be selected based on the characteristics of small industrial enterprises and the characteristics of the development of such industries in emerging economies. From this standpoint, we consider it inappropriate to use several indicators presented in Table 1. Dynamics of competition should not be utilized as the number of small enterprises in the Russian Federation is growing rather insignificantly². The dynamics of consumer behaviour is rather difficult to monitor and evaluate. Innovations and innovation intensity are inappropriate since innovation is very weak in small businesses in Russia³. Finally, consolidation should be excluded as it is a relatively uncommon process for small businesses. As a result, we selected three indicators to determine the stage of the industry life cycle: the number of operating enterprises, as proposed by Porter [2001]; the dynamics of total revenue, as proposed by Simons [2003] and Ansoff [1989] as an indirect characteristic of demand; and the dynamics of production capacities, which is the depreciated book value of fixed assets [Shamray, 2010].

However, we believe that we should mainly focus on relative indicators, namely chain growth rates. Accordingly, each of the three indicators was analysed to determine if its growth rate corresponds to the growth or maturity stage. The growth stage is distinguished by the volatility of the number of enterprises (actively appearing and just as actively leaving the game, losing in competition) and a predominance of positive growth rates for the industry's total revenue, the average values of which should exceed the average annual inflation rate. Fixed capital investments should be distinguished by a stable increase at the

² According to the Tax Service of the Russian Federation. <https://nalog.gov.ru>.

³ According to Rosstat, the innovative activity of small manufacturing industries in 2021 amounted to only 19.4%. <https://rosstat.gov.ru/statistics/science>.

¹ P is producer; A is administrator; E is entrepreneur; I is integrator.

industry growth stage. In the industry maturity stage, the number of enterprises is either unchanged or decreases slightly (in general, new players enter the market less actively than in the growth stage). The industry's total revenue displays moderate or even weak growth; the growth rate slows down as the market becomes saturated and is close to the average annual inflation rate. Fixed capital investments have a gentle growth pattern (plateau) or a gradual downward trend.

Step 2. We included the economic consequences of strategic decisions in the concept of "the type of the intuitively strategic behaviour of a small enterprise", which implies an evaluation indicator. We propose to assess this concept through the TISB ratio (1):

$$R_{TISB} = \frac{Cov(I_s, I_m)}{Var(I_m)}, \quad (1)$$

where R_{TISB} (ratio) indicates the type of the intuitively strategic behaviour of a small enterprise; Cov is the covariance of the estimated value (revenue of a small company) and the reference value (revenue of the industry in general); I_s is the revenue of a small company; I_m is the reference value (revenue of the industry in general); Var is the variance of the total industry revenue.

Note that the logic behind the TISB ratio is similar to that of the well-known beta coefficient, as they both perform similar functions from a statistical perspective: comparing covariance and variance. However, while beta deals with stock prices, the indicator we propose utilizes entirely different metrics and, consequently, characterizes entirely different processes.

We included revenue in the calculation of the coefficient since revenue is a classic indicator of company / industry life cycle stage and unlike net profit and net cash flow, revenue is the most valid and least susceptible to manipulation by the management of a small company [Vaisman, Podshivalova, Alola, 2022].

The TISB ratio determines the co-dependence of the rates of changes and the alignment of the total turnover of the industry and the revenue of a particular small industrial enterprise. Total turnover reflects the general trend in the development of the industry, and by comparing it with revenue, we can detect those companies that grew or fell faster than the industry. On the contrary, small enterprises with a coefficient from 0 to 1 are companies that grow more slowly than the industry and fall more slowly during recession periods. Such companies are less vulnerable to market / industry volatility. We identified three intervals of numerical values of this coefficient and described the supposed type of intuitively strategic behaviour for each (see Step 4). Before calculating the coefficient, the Irwin method should be applied to check the time series for anomalous observations. Then the smoothing procedure is performed using the weighted moving average method, since this allows the influence of random factors (anomalous observations) to be levelled.

Step 3. Determining the stage of the life cycle of each small enterprise in the sample. To this end, we used the method proposed earlier for assessing the stage of the life cycle of a small company [Vaisman, Podshivalova, Alola, 2022]. A measure of the variation in the small company's revenue over the entire period of its life is used as an indicator of its life cycle stage. The indicators of the time series of revenue from sales, ignoring indirect taxes, are also subject to the Irwin smoothing procedure. In a previous paper [Vaisman, Podshivalova, Alola, 2022], we justified the following criteria: the Growth stage corresponds to cases, where the coefficient of variation is between 40% and 80%; the Maturity stage corresponds to cases, where the coefficient of variation in revenue over the entire life is less than 40%. It is impossible to determine the life cycle stage for companies with a coefficient of variation exceeding 80% without obtaining internal statistics (to exclude the influence of random factors not identified by the Irwin method). Such companies were excluded from subsequent analysis.

Step 4. Comparing the stage of the life cycle of the industry and the stage of the life cycle of the small company in the context of the three intervals of the coefficient of the intuitively strategic behaviour of a small enterprise: $R_{TISB} > 1$; $0 \leq R_{TISB} \leq 1$; $R_{TISB} < 0$. Each of the intervals implies one of three types of strategic behaviour. If $R_{TISB} > 1$, a small company both grows and falls faster than the industry, which corresponds to aggressive behaviour. The management of such an enterprise, in most cases, is able to work mainly in a growing market (due to the strengths of small businesses). On the other hand, these enterprises easily lose their position during market decline periods and fall faster than the industry because it cannot even out its weaknesses (defend itself).

If $0 \leq R_{TISB} \leq 1$, the small company is employing the defender strategic behaviour. Small companies are less dependent on the volatility of the external environment, because, although they grow more slowly than the industry, when the industry falls, they are able to maintain and even improve their market position, which is reflected in the slower rate of decline (or even growth) of small companies when there is a decline in the industry. These small companies are able to defend themselves, levelling out the weaknesses inherent in small business, and they experience certain 'growing pains', not being able to develop their strengths (and, therefore, cannot grow faster than the industry during rise periods).

If $R_{TISB} < 0$, the changes in the total turnover of the industry and the revenue of a particular small enterprise are generally multidirectional, and the type of behaviour can be defined as a counterstrategy. Note that the term 'counterstrategy' is not so much associated with countering something as with the multidirectional vectors of industry development and small business. This behaviour is typical of various small businesses, especially dependent companies, the decisions of which are determined mainly by an-

other legal entity or a single co-owner. These companies belong to various holding structures (property or contractual holding, as well as informal subordination through affiliated persons). These small manufacturing enterprises are actually managed in a more "hands-on" manner and are, therefore, poorly linked to the dynamics of the industry. Notably, belonging to a holding is not a determining factor for this type of strategic behaviour. The degree of the company's dependence on external management is a determining factor. The second category of company for which counterstrategy is typical are small companies with state participation; the mechanism of their dependence is similar to the previous variant. Counterstrategy can also be observed in small companies selling specific goods and services (a clearly defined market niche), and the dynamics of the industry and the enterprise itself become more multidirectional as the niche narrows. Finally, this category can also include companies with poor management, lack of professional and experienced managers, their low motivation, uninterested owners.

RESEARCH RESULTS

We chose two industries to test the proposed method. These industries had to be at different stages of the life cycle (growth or maturity) and have a sufficient number of small enterprises with statistical data available for the last 23 years (from 1999 to 2021). A preliminary analysis

showed that metal casting and newspaper printing meet these requirements.

Determining the industry life cycle stage. Let us prove the growth stage in the metal casting industry based on the initial assumptions of the analysis. We used three quantitative criteria. Figure 1 shows the dynamics of the chain growth rates of the first two indicators for the metal casting industry.

To determine trends in the number of industry insiders, we used the total number of enterprises primarily focused on metal casting operating as of July 1, 2022 (OKVED¹ 24.5). Figure 1 shows that total revenue in the industry², except for crisis and pandemic periods, grew by more than 100% and the average annual growth rate of the indicator over the 20-year period was 110%, which is higher than the average annual inflation rate for the same period³. The growth rate of the number of operating enterprises showed a similar trend.

To evaluate the dynamics of production capacities, we used the depreciated book value of the fixed assets of all enterprises which have ever operated in the industry. Figure 2 shows the dynamics of both the absolute and

¹ OKVED is the Russian National Classifier of Types of Economic Activity.

² Taking into account all companies that have ever operated in the industry.

³ According to Rosstat, the average annual inflation in Russia for 2002–2021 was 8.24%.

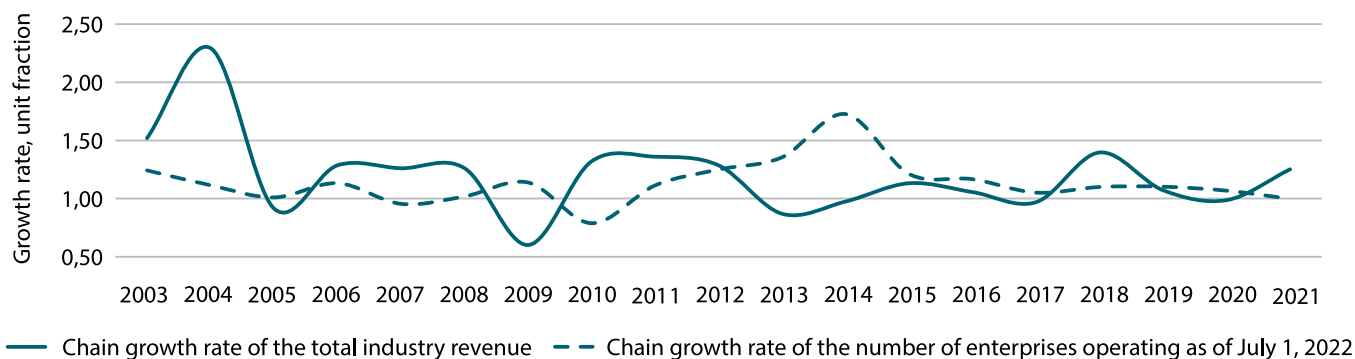


Fig. 1. Chain growth rates of the number of enterprises in the metal casting industry and total revenue

Рис. 1. Цепные темпы роста количества предприятий литейной промышленности и общей выручки

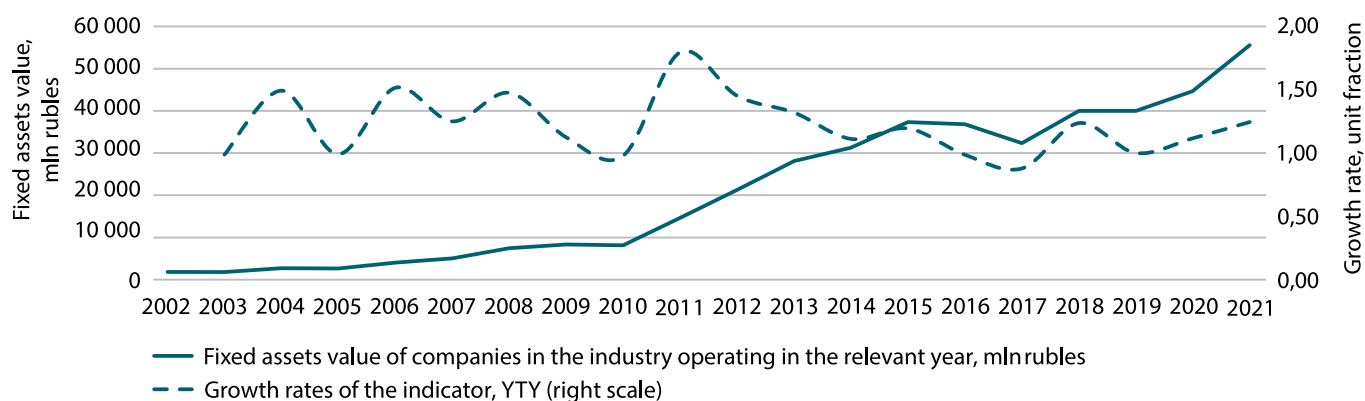


Fig. 2. Dynamics of production capacities in the metal casting industry

Рис. 2. Динамика производственных мощностей в литейной промышленности

relative indicators. Production capacities in the industry actively increase, which is also confirmed by the chain growth rates, which exceeded 100% in the vast majority of periods.

This analysis leads us to believe that the metal casting industry in Russia is currently in the growth stage. At first glance, this conclusion may seem surprising, given that metal casting originated even before our era. However, if we take into account the impact of technological innovations on the industry life cycle which rekindle the growth stage, the obtained result is viable. The life cycle of many traditional industries tends to be a spiral. The transition to a new twist always results from innovative changes in the industry itself or in consumer industries.

Let us examine and determine the life cycle stage of one of the subtypes of the printing industry, namely newspaper printing. Figure 3 shows the chain growth rates of the total revenue in this industry. The growth rate tends to slow down (the average annual growth rate for 20 years was 108%, which is comparable to the inflation rate for the same period¹). Figure 4 shows the changing number of companies whose primary activity was newspaper printing (OKVED 18.11). At first glance, the number of enterprises in the industry is unstable, but two key periods can be distinguished here. In the first decade, the

number of companies in the industry did not change significantly, fluctuating within 130 units. Since 2013, there was a sharp increase in the number of companies, and growth continued until 2021. The high volatility in the number of companies in the industry over the past 9 years is caused by certain macroeconomic factors that do not reflect the influence of the life cycle stage, for example, splitting large and medium-sized businesses into several small companies to gain access to special tax regimes. Thus, we can conclude that for this industry, the number of companies is not a reliable indicator of the life cycle stage.

We believe that the dynamics of production capacities (see Fig. 4) is the main argument indicating that the newspaper printing industry is in the mature stage. There is an obvious downward trend of investments in the expansion of production capacities; over time, the processes of fixed assets retirement and depreciation begin to prevail.

We compared the absolute values of their total turnover to additionally explain the difference in the life cycle stages of the two considered industries, since the graph (Fig. 5) clearly shows the difference in the changes: a sharp increase in the metal casting industry and a gentler slowdown (typical of maturity) in the newspaper printing industry.

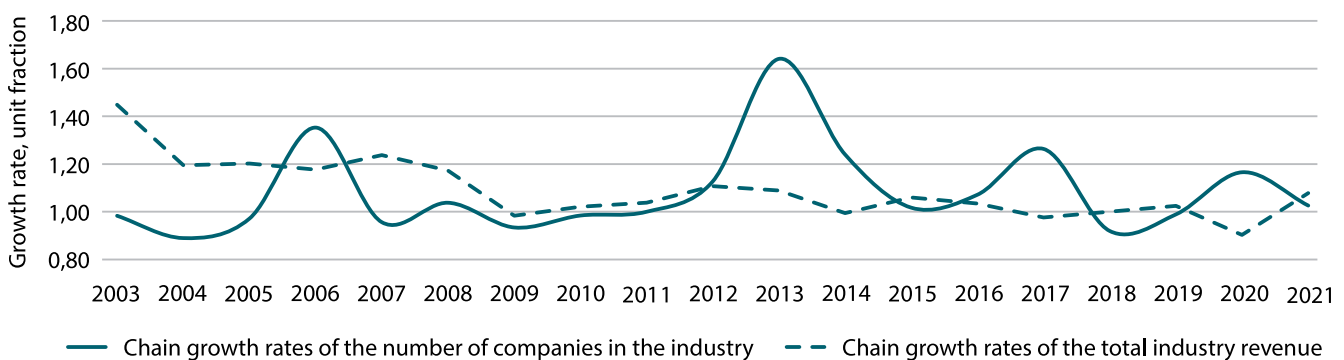


Fig. 3. Chain growth rates of the number of enterprises in the newspaper printing industry and total revenue

Рис. 3. Цепные темпы роста количества предприятий и общей выручки в отрасли печатания газет

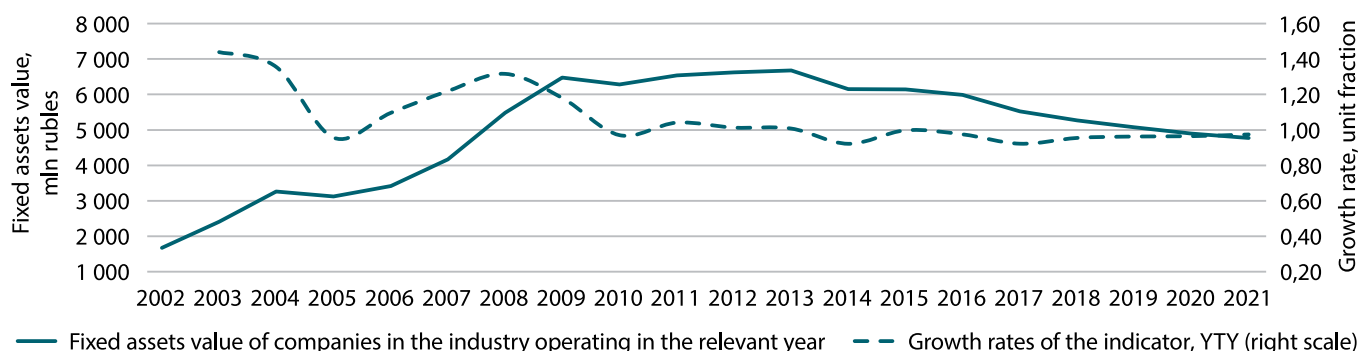


Fig. 4. Dynamics of production capacities in the newspaper printing industry

Рис. 4. Динамика производственных мощностей в отрасли печатания газет

¹ According to Rosstat, the average annual inflation in Russia for 2002–2021 was 8.24%.

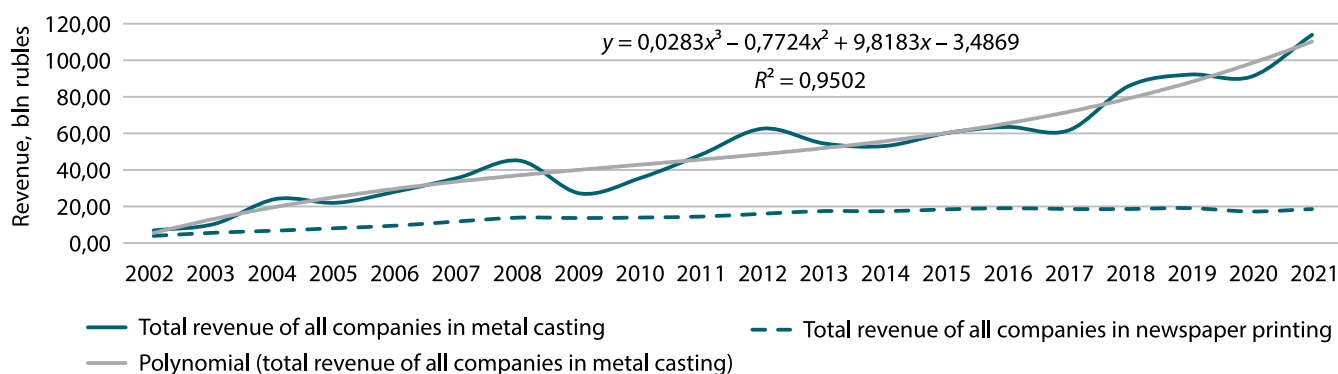


Fig. 5. Dynamics of the total revenue of the metal casting and newspaper printing industries

Рис. 5. Динамика общей выручки предприятий литейной промышленности и отрасли печатания газет

Determining the types of intuitively strategic behaviour of small companies in the sample. To calculate the TISB ratio coefficients, we formed two samples from among small enterprises operating in the metal casting industry and the newspaper printing industry. The study period was 1999–2021 (23 years). We downloaded the financial statements of 1,363 operating enterprises of various sizes from the SPARK Interfax database¹. Then, we selected small enterprises from this set, which amounted to 107 metal casting enterprises and 27 newspaper printing enterprises. Finally, the samples of both industries were additionally processed. The stages of additional processing are shown in Fig. 6.

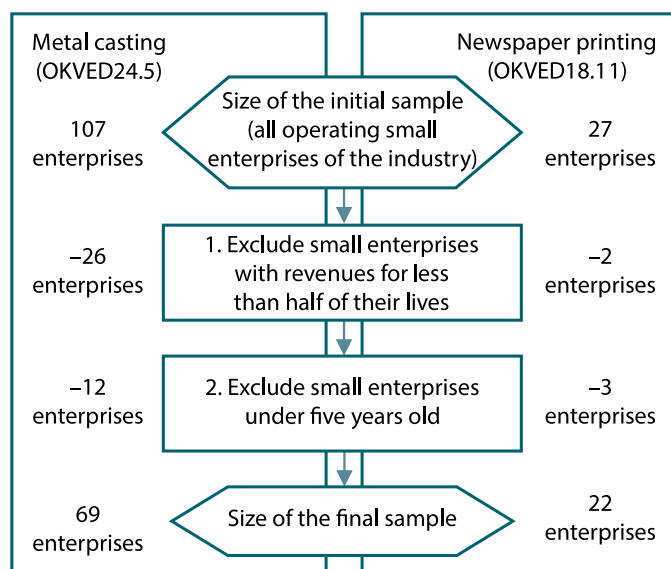


Fig. 6. Stages of the initial samples processing

Рис. 6. Этапы формирования конечной выборки исследования

Thus, we formed a sample of 'living' small² enterprises in the growth or maturity stages. To this end, we excluded companies younger than five years old (corresponding to

the start-up stage) and companies which reported sales revenue for a period of less than half of their life, since such small enterprises are close to the recession stage. As a result, we selected 69 small enterprises in the metal casting industry and 22 small enterprises in the newspaper printing industry, which is 64.5% (69 out of 107) and 81.5% (22 out of 27), respectively, of the total the number of small 'living' enterprises in each industry.

Then we sequentially processed the data series of each small enterprise in the sample to identify throw points, eliminate them, and smooth the time series. First, anomalous observations were excluded from the time series of both the industry and individual enterprises by identifying them with the Irwin method:

$$I_i = \frac{|y_i - y_{i-1}|}{S_y}, \quad (2)$$

$$S_y = \sqrt{\frac{\sum_{i=1}^n (y_i - \bar{y})^2}{n-1}}, \quad (3)$$

$$\bar{y} = \frac{1}{n} \sum_{i=1}^n y_i, \quad (4)$$

where I_i is the value of the abnormality criterion; n is the sample size; S_y is the sample standard deviation calculated for sample n ; y_i is the sample value under study; i is the observation number.

The limit value I_i is normalized and depends on the number of observations n , wherein some n -s have a fixed value. Since we analysed 5 to 23 time periods (corresponding to the age of the enterprise), according to the established data, the limit value should not exceed 1.3 with a probability of type I error equal to 0.01. Thus, the detected anomalous observations (values exceeding 1.3 modulo) were excluded from the time series and replaced by the calculated values obtained using neighbouring observations. Next, we smoothed the series using the weighted moving average method:

$$\bar{y}_t = \frac{y_{t-1} + 2y_t + y_{t+1}}{4}. \quad (5)$$

As a result, the individual R_{TISB} was calculated for each company; the calculation period corresponded to the age

¹ SPARK. <https://spark-interfax.ru/>.

² Ignoring micro-enterprises; small enterprises were classified according to the criteria under the legislation of the Russian Federation: Art. 4 of the law "On the development of entrepreneurship in the Russian Federation" dated 24.07.2007 No. 209-FZ.

of a small company. However, since the smoothing method removes extreme values from the data series, R_{TISB} could not be calculated for five enterprises in the metal casting industry. Thus, 64 metal casting enterprises and 22 newspaper printing enterprises remained for further analysis.

The next step was to assess the life cycle stage for each small company in the sample. Figure 7 shows the results of this assessment compared to the age and TISB ratio of a small company. In the newspaper printing sample, the industry of which is mature, 68% of the small companies were mature. The vast majority of mature companies (12 out of 15) exhibit the aggressive type of behaviour ($R_{TISB} > 1$), regardless of the company age. This is paradoxical: in the industry, companies transitioning through the maturity stage are more aggressive in making decisions and grow faster than the industry in general. Small companies in the growth stage in this sample (7 out of 22) were nearly evenly distributed between aggressive and defender behaviour (3 versus 4 companies, respectively). The defender behaviour is observed in companies older than 15 years. Only one company (mature, older than 15 years) out of 22 companies in the sample employs the counterstrategy.

According to the classical theory of the life cycle, maximum competition is observed at the stage of maturity. So, in a mature industry, mature companies which realize the upcoming decline in the industry behave more aggressively when trying to maintain and increase their market presence. At the same time, there are also property holdings firms among the 12 small companies with an aggressive strategy (verified by the authors in the SPARK database). In this case, their increased growth may be associated with inter-holding support of demand.

A similar analysis was carried out for small enterprises in the metal casting sample (Fig. 7). Only 51 out of 64 enterprises were in the distribution because 13 enterprises had a coefficient of variation higher than 80% and were excluded from the analysis according to the initial assumptions of our method. As we can see, slightly more than half of the small companies in the sample (57%) are in the growth stage, similar to the metal casting industry. At the same time, the defender ($0 \leq R_{TISB} \leq 1$) and counterstrategy ($R_{TISB} < 0$) behaviours prevail among both growing and mature companies. Counterstrategy is generally typical of mature companies younger than 10 years old and growing companies younger than 15 years old. For the aggressive behaviour type, enterprises in the growth stage are relatively evenly distributed by age, while mature companies are usually younger than 10 years old.

Overall, regardless of the age and life cycle stage of the enterprise, 19 out of 51 enterprises in the sample employ counterstrategy, 19 enterprises use the defender behaviour, and every fourth company (13 out of 51) uses the aggressive behaviour.

We can assume that when the industry is in a growth stage, small companies at any stage of their life cycle are generally less vulnerable to the external environment (a growing industry is favourable for them), so it is surprising that the defender strategy of behaviour was identified in most companies (19 out of 51). In the newspaper printing industry, long-livers dominate among such companies, while in the metal casting sample, 16 out of 19 defender companies are over 15 years old. We believe that the defender behaviour is chosen in this case because the long-livers of the industry have already accumulated significant experience, which allowed them to survive many economic crises and develop the skills necessary to operate in falling and highly volatile markets.

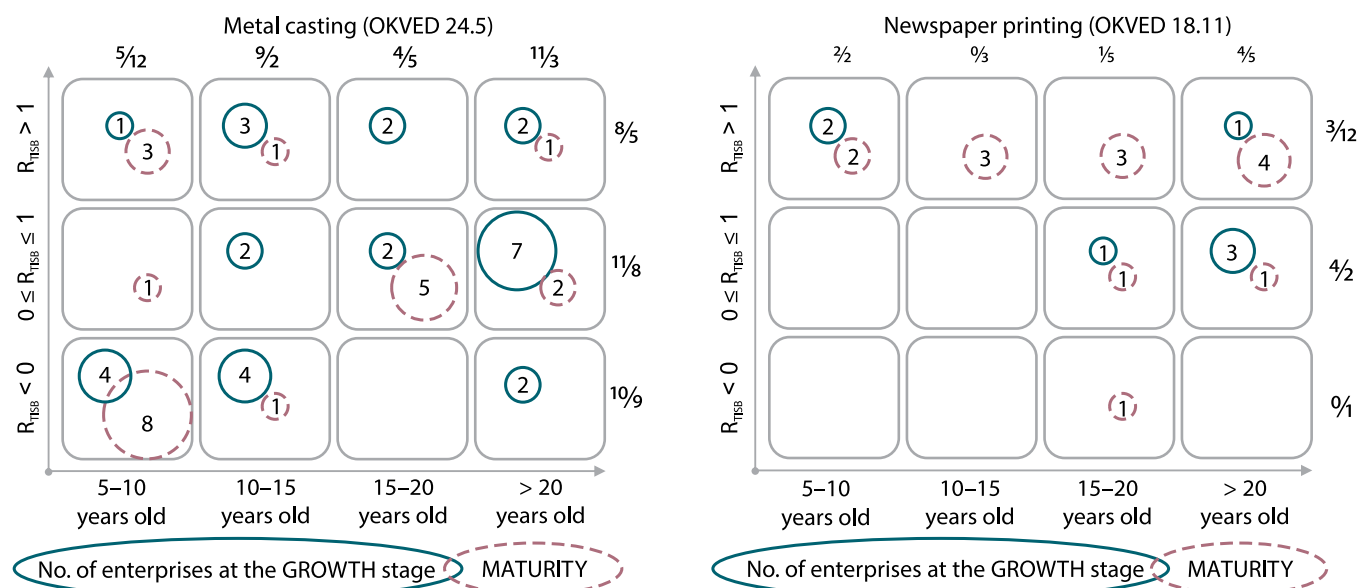


Fig. 7. Distribution of small enterprises by the level of R_r , stages of the life cycle and age, units

Рис. 7. Распределение малых предприятий по уровню R_r , стадии жизненного цикла и возрасту, ед.

CONCLUSION

Our research has shown that a mature industry is dominated by mature small enterprises employing the aggressive type of intuitively strategic behaviour. In a growing industry, slightly more than half of small companies are also in the growth stage of the life cycle, and the dominant types of behaviour, regardless of the stage of the enterprise life cycle, are defender and counterstrategy.

Similar results were obtained by Kumar et al. [2012], who concluded that SMEs mostly follow the defender or reactor strategy according to the typology of Miles et al. [1978]. In this typology, the defender strategy behaviour means that the company defends its market share without looking for new opportunities outside its business. Our interpretation of the defender type of intuitively strategic behaviour is similar in its independence from the external environment and its ability to maintain its market position when the market falls. The difference lies in its connection to the identified management dilemma, namely, the fact that the defender is able to protect itself by evening out the weaknesses inherent in small business.

As for the reactor strategy in the typology of Miles et al. [1978] (lack of any strategies, low efficiency and competitiveness), the counterstrategy type of intuitively strategic behaviour that we identified is significantly different. This behaviour is typical not only of enterprises with poor management, but also of those affiliated with holdings or government agencies, as well as companies promoting specific products or operating in a narrow market niche.

We have thus revealed a paradox in the real behaviour of SIEs: in a growing industry, regardless of the stage of the enterprise life cycle, companies typically exhibit the defender or counterstrategy types of behaviour, while the aggressive type is expected because a growing market forces companies to make significant efforts to compete to win a larger share of it. This paradox additionally proves the validity of our idea of the intuitively strategic behaviour of small businesses. Besides, there is empirical evidence [Blackmore, Nesbit, 2012] that a significant proportion of SMEs (42% of the sample) may follow a static strategy (low growth or life-style pathway).

On the other hand, this paradox can be explained by the fact that risks are higher in the growth stage [Shahzad et al., 2019], hence the desire of Russian small companies to even out the risks when they are experiencing high market volatility and limited resources. Besides, in Russia, the defender type of behaviour is also explained by the accumulated experience of working in the conditions of various permanent crises.

Sabol, Šander and Fuckan [2013] and Sengupta [2018] concluded that a company's strategy generally depends on the stage of the industry life cycle. Our study suggests that not all small enterprises in the strategic reality

manage to intuitively grasp the relationship between the industry life cycle stage and the strategic solutions they make. In particular, this is evidenced by the identified prevalence of counterstrategy among small companies in the growing industry (metal casting).

The conducted research contributes to the development of the theory of strategic management as applied to SMEs. In particular, we proposed a new method to quantitatively identify the type of intuitively strategic behaviour used at a small enterprise. We also developed the theory of the life cycle by working out a new method to determine the stage of the industry life cycle. Finally, the research fills in the gap related to the lack of empirical works describing the strategic reality of small business with consideration of the stages of the life cycles of the industry and the enterprise itself. We showed the difference in the types of the intuitively strategic behaviour of small industrial companies depending on these two factors.

The obtained results can be practical for adjusting existing programs of state support for small businesses, as well as industrial policy in various industries. Adjustments can be based on our methodology, which allows identifying the most viable, sustainable small industrial enterprises and providing them with additional support measures, in particular, reducing the tax burden, placing government orders, and implementing pilot projects.

The results will also be useful to managers of small companies when they intend to move away from intuitive behaviour and when they have a strategic goal of long-term market presence. The transition from intuitive strategic decision-making to justified decisions can assist in transforming a small enterprise into a larger business, including through the awareness of the identified management dilemma.

However, like any empirical research, our work has several limitations. Our method is only applicable to small enterprises older than 5 years, which excluded start-ups from the study. The sample also did not include micro-enterprises, since they do not play a significant role in the industries we examined. In addition, we have not studied the behaviour of individual entrepreneurs, although they may be classified as small business entities. Finally, we should mention that the methods and criteria for classifying enterprises as SMEs differ in other countries, which somewhat limits the possibility of cross-country comparisons.

Possible lines of our future research can include assessing the impact of belonging to holding structures on the stage of the life cycle of a small enterprise, and the study of the strategic behaviour of small companies at the stages of market entry and growth, which are still underinvestigated. ■

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