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Corporate Analysts at Work: Size and Industry Effects in Early Failure Prediction

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Abstract:

The objective is to show the effect of size and industry on the importance of early warning indicators of financial failure as assessed by Finnish corporate analysts. The findings are based on a questionnaire of the importance of 71 warning indicators with 138 responses from Finnish corporate analysts of four different financial institutions. The findings indicate significant differences in the importance of early warning indicators between target companies of different size (micro, medium-size, and large firms) but less significant differences between companies from different industries (manufacturing, trading, and service firms). Thus, early warning and prediction systems for financial distress should be addressed to different size groups of firms using different indicators. It may however be less necessary to specify these systems for different industries.

Keywords: bankruptcy risk; early warning; size effect; industry effect
JEL-code:
G01 Financial Crises; G33 Bankruptcy; Liquidation; G3 Corporate Finance and Governance

1. Introduction

Financial failures of business companies cause large economic and social losses to their stakeholders leading to inefficient allocation of capital and finally to severe domestic or even international crises. Because of its importance, financial distress analysis has played an important role in financial research over many decades (Jones & Hensher, 2004; Altman & Hotchkiss, 2006; Balcaen & Ooghe, 2006; Lensberg, Eilifsen & McKee, 2006). In this literature, failure prediction research has dominated being represented with a vast number of studies (Ravi Kumar & Ravi, 2007; Sun, Li, Huang & He, 2014). This literature includes five characteristics or limitations that are relevant to the motivation of this study. Firstly, the main body of research has heavily concentrated on the use of financial ratios as predictors (Balcaen & Ooghe, 2006). Secondly, partly because of this, the main attention has been paid to short-term prediction, typically for one-year horizon. Since financial ratios only describe the symptoms of failures, not causes, they are effective predictors only in the last stages of the failure process (du Jardin, 2015).

Thirdly, the main body of research deals with failure of larger firms neglecting small firms (Balcaen & Ooghe, 2006). This characteristic is important since the prediction models estimated for large firms are not generally effective in predicting small business failures (Altman & Sabato 2007; Altman, Sabato & Wilson, 2010). Fourthly, prediction models are typically industry-specific because they are estimated only for one industry, usually manufacturing (Bellovary, Giacomino & Akers, 2007). This kind of modelling is problematic when trying to apply the model to companies from other industries (Smith & Lieu, 2007; Chava & Jarrow, 2004). Fifthly, failure research is dominated by statistical and data-mining approaches trying to find the best method to estimate the most efficient prediction model using a sample of failed and non-failed firms (Bellovary, Giacomino & Akers, 2007; Dimitras, Zanakis & Zopounidis, 1996; du Jardin, 2015). Thus, the main body of failure research is limited from the methodological viewpoint.

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This study tries to expand the scope and respond to the five limitations of failure research. The objective of the study is to test the potential size and industry effects on the importance of early warning indicators for financial failure as assessed by a group of Finnish corporate analysts.

Thus, firstly, the study deals with early warning signals that are mostly non-financial and instead of symptoms reflect the causes of bankruptcy. Secondly, the horizon of assessment is set to 2-4 years exceeding the length frequently used in failure studies. Thirdly, in this approach the hypothetical target companies are not limited to large firms but are classified in three size classes (micro firms, small and medium-size firms and large firms). Fourthly, the present study is not industry-specific but instead classifies the hypothetical target companies in three main industries (manufacturing, trade and service). Fifthly, this approach is not a statistical approach as most failure studies trying to develop an efficient model but instead makes use of the human information processing (HIP) approach assessing the perceived importance of a group of analysts. This HIP approach is not designed as an experiment but instead as a survey.

Thus, this study expands the traditional scope of failure research in many ways. In practice, it also provides financial and corporate analysts with important contributions. The findings are important as such, as they deal with non-financial early warning indicators. These indicators help analysts to make predictions for a longer horizon. There is only little research on these indicators and a clear lack of theory that could give general advice how to choose and weight efficient predictors (Marom & Lussier, 2014; Lussier & Halabi, 2010). This study however shows how the importance of early warning indicators differs with respect to size (size effect). Like in other countries, the micro firm failures in Finland make about 90% of the total number of failure while the number is very small for large firms. Therefore, findings about the differences in the importance of predictors between failures of very small and larger businesses are valuable for analysts. Likewise, findings about the differences between industries (industry effect) are valuable since the role of manufacturing firms that are traditionally used in prediction modelling, is continuously diminishing in the number of failure being nowadays only about 10% in Finland. At the same time, only trading firms make about 20% of the total number of failure (Statistics Finland, 2018). Finally, the approach of this study is based on HIP that helps us to understand, describe, evaluate, and improve the decisions taken by analysts. The findings can be used to develop a theoretical foundation for describing important early warning predictors and to direct attention towards empirical questions that need further investigation.

The contents of the paper are organized as follows. The first section presented the background, motivation, and objective of the research. In the second section, a short review of previous studies is presented leading to two hypotheses on the existence of the size and industry effects in the early assessment of failure. The third section introduces the methodology of the study and the empirical data used to derive findings. The findings are based on a survey sent to four Finnish financial institutes. The data were gathered from corporate analysts using direct questions about the importance of different early warning indicators. Since the number of indicators with unknown relevance is as high as 71, an experimental approach was not applied. Experienced corporate analysts are capable of providing valid and insightful responses also to these kinds of questions based on a Likert scale. In all, 138 responses to the survey were got. These responses were used to test the statistical differences in the importance of indicators between hypothetical target companies of different size and industry to recognize the existence of potential size and industry effects. In the fourth section, empirical results are presented and research hypotheses tested. The findings show that there is a strong size effect in failure risk assessment especially with respect to management competence indicators. However, a potential but weaker industry effect is recognized in a wide variety of indicator groups, mainly in efficiency of financial management, caring of stakeholder relations, and efficiency of operations. The last section presents the conclusions of the study and gives hints for further research on early warning indicators.

2. Framework for the Analysis

2.1. Size effect

The characteristics of small and larger firms strongly differ from each other. Gelinas & Bigras (2004: Table 3) present a list of main characteristics which have most significant differences between small and larger firms. The smaller the firm, the more extensive tends the involvement of owners with business and direct contacts with operations be. Smaller firms have usually different objects of sustainability and growth. Especially, founders of micro firms often start a business on the basis of lifestyle or personal factors. Usually, smaller firms show need for independence combined with a low propensity to delegate and consult. Smaller firms are usually more flexible and focus on effectiveness rather than efficiency. They have typically simpler decision-making process focused on immediate action and an organizational structure that is conductive to internal and external interactivity.

Smaller firms are also characterized by under-utilization of information technologies and incremental, short-term planning, and strategic planning over only a relatively short timeframe. Finally, these firms tend to have less formal transfers of information between organizational and operational levels, less precise division of responsibility, and smaller size of production lines, workstations, and workshops. Not all small firms are alike. There are at least two basic types of small firm: classic small firms with modest prospects for growth and high-growth ventures (Katz, 2007: 216). In the same way, some small firms are risk-takers taking a lot of current and long-term debt whereas some of them are risk-averters avoiding debt taking to maintain independence. However, all small firms share the same basic characteristic small size.

The significant differences in the characteristics found between smaller and larger firms may lead to that, the causes of failure are different for firms of different size. Lukason & Hoffman (2015) shortly review the studies on the relationship between cause of failure and size. They conclude that smaller firms have less financial capital, and less skilled employees, and thus a higher risk of failure. This is consistent with Hall (1992) reporting that the most important reason for failure given by the owners of insolvent small firms is weaknesses in operational management, particularly in the adequacy of their capital. Hall (1992) also found that differences in the failure causes varied with firm size. Smaller firms typically concentrate on narrow market-niches, are more flexible and faster making decisions than larger firms do but at the same time more vulnerable to poor decision making. Larger firms have competitive advantage due to their larger resources. They strive for market share growth due to their economies of scale and scope, and to their power over suppliers and customers. The flexibility of smaller firms may enable them to cope with external changes while the structural Inertia of large firms may make it difficult for such firms to respond appropriately. Lukason & Hoffman (2015) conclude likewise that causes of failure are associated with the size of the firm. Their empirical analysis showed firstly that the larger the firm, the more likely it is to fail due to both internal and external causes and secondly that the smaller the firm, the more likely it is to fail due to the internal causes. Since the causes of failure differ with respect to business size, it is likely also that early warning signals differ in smaller and larger firms from each other.

In failure prediction research, small firms are often neglected. This neglecting is a consequence of the fact that annual accounts may especially in small firms be unreliable because of the lack of an internal control system or because of annual account adjustments made by the auditor in the light of a bankruptcy filing. Because of the unreliability of annual account information, small business failure prediction models based on financial ratios may be distorted and their practical usefulness may be limited (Balcaen & Ooghe, 2006:82). However, in many failure prediction studies based on financial ratios the size of the firms is included in the model, usually as logarithmic total assets (Bellovary, Giacomino & Akers, 2007: Appendix B). Laitinen & Suvas (2013) used in their failure prediction model the first and second order terms of total assets taking account the fact the relationship between failure risk and size is not necessarily monotonic. The inclusion of a size measure may not be enough to take account the size effect in financial ratio models. Altman & Sabato (2007) estimated a specific SME model and showed that its performance in terms of prediction accuracy was clearly higher than that of the generic corporate model. They concluded that small and medium-sized enterprises are significantly different from large corporates from a credit risk point of view. Therefore, banks should also use instruments, such as scoring and rating systems, specifically addressed to the SME portfolio.

Later, Altman, Sabato & Wilson (2010) confirmed these results but they also showed that non-financial variables are able to make a clear contribution to small business failure models based on financial ratios only. Therefore, particularly for small firms the implicit assumption that financial ratio models reflect all relevant failure information may not be true (Balcaen & Ooghe, 2006: 83; Argenti, 1976: 138; Zavgren, 1985: 22-23). Zavgren (1985: 22-23) concluded her findings in the following way: "Any econometric model containing only financial statement information will not predict with certainty the failure or nonfailure of a firm". Consequently, many researchers have advised including non-financial variables in failure prediction models especially for small firms (Keasey & Watson, 1987; Lussier and Corman, 1994; Lussier, 1995; Marom & Lussier, 2014). Sometimes, failure prediction models do not include financial ratios at all. Balcaen & Ooghe (2006: 83) concluded that this might be particularly appropriate when studying small firms, which often lack reliable annual accounting information. Examples of non-financial indicators are management experience, education, age, motivation, social skills, and the leadership quality of the owner/manager, the number of partners, the existence of a plausible long-term business strategy, productive efficiency, customer concentration, dependence on one or a few large suppliers, and subcontracting status. Thus, in conclusion, prior studies indicate that the reasons of failure, the relevant set of failure predictors, and the relative importance of predictors may be different for firms of different size. The following general hypothesis (H1) will be presented:

Hypothesis 1 (H1): There are differences in the importance of early warning indicators for firms of different size, which means that there exists a size effect in the importance.

2.2. Industry effect

The basic characteristics of business firms from different industries differ significantly from each other. Industry refers to the technology of the production process describing how the work processes of the firm operate transforming inputs to outputs and includes machines, tools, people, software, and knowledge (Chenhall, 2003). Firms acting in different industries (such as manufacturing, service business or trading) have differences in technology factors such as the degree or replication, routine, and task variety in their production systems (Khandwalla, 1972; Abernethy & Lillis, 1995). Thus, their production processes are significantly different. Manufacturing firms buy production factors to use them in the transformation process as materials in making their own product that will then be sold to customers. These manufacturing firms have typically inventories for raw materials, semi-finished products, and finished products. Service firms provide intangible products with no physical form to their customers. Service firms do not have any significant inventory, because no physical product is being sold. Trading firms buy finished products at a purchase price to their inventory and sell the same products at a higher selling price from the inventory without changing product form. These obvious differences between the firms from different industries result in significant differences in the structure of both income statement and balance sheet.

The differences in the structure of financial statements indicate that there can also be differences in the relevance of financial ratios between different industries. Thus, McDonald & Morris (1984; 1985) suggested that simple ratio analysis was not a reliable tool for cross-industry comparison and that controls for industry differences were needed. Similarly, Jones (1987) suggested that the accuracy of failure prediction models could potentially be improved by including industry indicators where applicable. Platt & Platt (1990: 31-32) concluded that selecting firms for a failure prediction study from several industries is problematic when industries differ with respect to factors of production, product life cycles, competitive structure ,and distribution modes which cause industry differences in financial ratios. This suggests that financial ratios of a firm reflect capital structure and revenue/expense patterns specific to its industry. The financial strength of a firm with a given set of financial ratios may thus depend on the industry of which it is a part. Therefore, Ooghe & de Prijcker (2008) emphasize that firms in different industries, even with a similar financial profile, have a different probability of failure. They also emphasize that industry type has proven to be a very important variable in failure prediction.

Although a potential industrial effect on failure prediction is obvious, only little attention has been paid to industry effects in the previous academic literature. Chava & Jarrow (2004: 538) emphasize that economic intuition suggests that industry effects should be an important component in bankruptcy prediction for two reasons. Firstly, different industries face different levels of competition and, therefore, the risk of bankruptcy can differ for firms in different industries with identical financial statements. Secondly, different industries may have different accounting conventions, which implies that the risk of bankruptcy may differ for firms in different industries with identical financial statements. Empirically, Chava & Jarrow show that different industrial groupings affect both the intercept and slope coefficients in the forecasting equations. Altman, Iwanicz-Drozdowska, Laitinen & Suvas (2016) showed that an extended Z"-score Model with industry dummies significantly outperformed the benchmark model in failure prediction accuracy supporting the existence of an industry effect. Similarly, Smith & Liou (2007) in testing five industrial sectors found variation in the association of specified financial variables and the incidence of failure. They suggested that particular industrial sectors should be modelled separately to achieve greater classification accuracy because their inclusion in a generalized model will make it more vulnerable to error, and potentially unreliable. Thus, empirical evidence supports the existence of an industry effect, which affects the importance of financial predictors of failure.

The potential industry effect on non-financial early predictors of failure is not as straightforward as on financial predictors. Cook (1994) considered the effect of industry on the success factors of a firm important. He emphasized that the management of a firm needs understanding of industry and anticipating of its future trends to succeed. The management have to identify abilities that are superior to competitors to use them to establish a competitive advantage with the help of success factors. Success factors are those elements that determine whether a company succeeds or fails in a given industry. Cook emphasized that success factors vary greatly by industry. Examples of success factors include quick response to market changes, a complete product line, fair prices, excellent product quality or performance, knowledgeable sales support, a good record for deliveries, solid financial standing, or a strong management team. Thus, the success factors vary by industry, which implies that potentially, also the importance of early warning indicators will vary across industries reflecting an industry effect.

However, there is also empirical evidence that does not support this kind of conclusion. Russel Baldwin & Gellatly (2003: 162-165) showed that the causes of bankruptcy are generally robust across industries. While the rates of bankruptcy differ by industry, the causes of bankruptcy are quite similar. They found that the top external causes (economic downturn, competition, and customer difficulties) were the same for all industries although service industries were slightly less affected.

The three most frequently cited internal causes were deficiencies in general management, financial management, and marketing capabilities in all industries. The only differences across industries was that the manufacturing and (business) service industries placed greater emphasis on human resource problems that did other industries. If the early warning indicators are associated with failure causes more closely than with success factors, the industry effect on the importance of these indicators will not be strong. This argument may explain why the models based on early warning indicators (see Marom & Lussier, 2015) are general and only seldom specified to any industry. However, in spite of the mixed evidence the following general hypothesis (H2) on the industry effect will be presented:

Hypothesis 2 (H2): There are differences in the importance of early warning indicators for firms from different industries, which means that there exists an industry effect on the importance.

3. Survey and statistical methods

3.1. Questionnaire

The empirical part of the study is based on a questionnaire responded by Finnish corporate analysts. The traditional way to analyze human information processing (HIP) or human judgment in this case is to design an experimental setting where an experiment is set up to test research hypotheses (effect of size and industry) using failure as a criterion variable, early warning indicators as information cues, and corporate analysts as decision-makers. This kind of setting is generally been based on the Brunswik Lens Model (Brunswik, 1952; Routledge & Gadenne, 2004). This kind of Lens model has however, a critical aspect since imperfect human decisions have two causes, which are difficult to separate (Houghton & Woodliff, 1987: 538-539). Firstly, they may be a product of imperfect information describing the criterion event (information cues fail to reflect exactly the criterion event). Secondly, they may be attributed to sub-optimal processing of data (imperfect cue usage). Routledge & Gadenne (2004: 35) state that determining suitable (relevant and sufficient) predictor variables (financial variables) to include in this type of experiment is problematic due to the lack of a theoretical bases on which selection can be based. Therefore, the selection of their financial predictor variables was subjectively based on a review of a considerable body of prior financial distress research focusing on failure prediction. The selection of a limited but sufficient set of non-financial variables for an experiment is even more problematic due to the lack of both theory and scientific research. Marom & Lussier (2014: 64) describe the situation as follows: "Why do some businesses succeed and others end up bankrupt? There is great discrepancy in the literature as to which variables do in fact lead to success, thus, there currently is no theory". Therefore, in this study a large set of variables (early warning indicators) is selected based on prior studies and expert opinions to form a set of items to be used only in a questionnaire instead of an experiment. Thus, the setting of this study can be described as a limited Lens Model as outlined in Figure 1.

There is little consistency in the literature supporting which non-financial variables do in fact explain and predict success vs. failure (Marom & Lussier, 2014). Since the discrepancy in the relevant literature is high, a large number of early warning signals were potential to be included in the survey. Marom & Lussier (2014) discussed prior research and decided to use the Lussier (1995) model in their research because it was the most extensive model based on 15 variables identified from 20 prior studies (Marom & Lussier, 2014: Table 1 and 2). The Lussier (1995) model includes variables such as record keeping and financial control, industry experience, management experience, planning, and marketing skills. This model is suitable especially to predict success vs. failure of small newly founded firms. Argenti (1981) presented a more general A-model to assess failure risk. His model was introduced in a form of a process and it included factors as management weaknesses and accounting deficiencies that lead the management to make mistakes (high gearing, overtrading, or too big project). The final stage of the process occurs when the symptoms of failure become visible (financial signs, creative accounting, non-financial signs, and terminal signs). These factors were scored in the A-model to get an estimate of the likelihood of potential failure. Laitinen & Chong (1999) also used this kind of process view and developed an early-warning system based on seven classes of variables (incompetence of the management, the owners role in the business, deficiencies in accounting systems, deficiencies in operations, attitude towards customers, industrial factors, and general economic and political factors.

In all, this model included over 40 variables. Management incompetence was regarded as the most significant class of variables, followed by deficiencies in the accounting system and attitude towards customers.

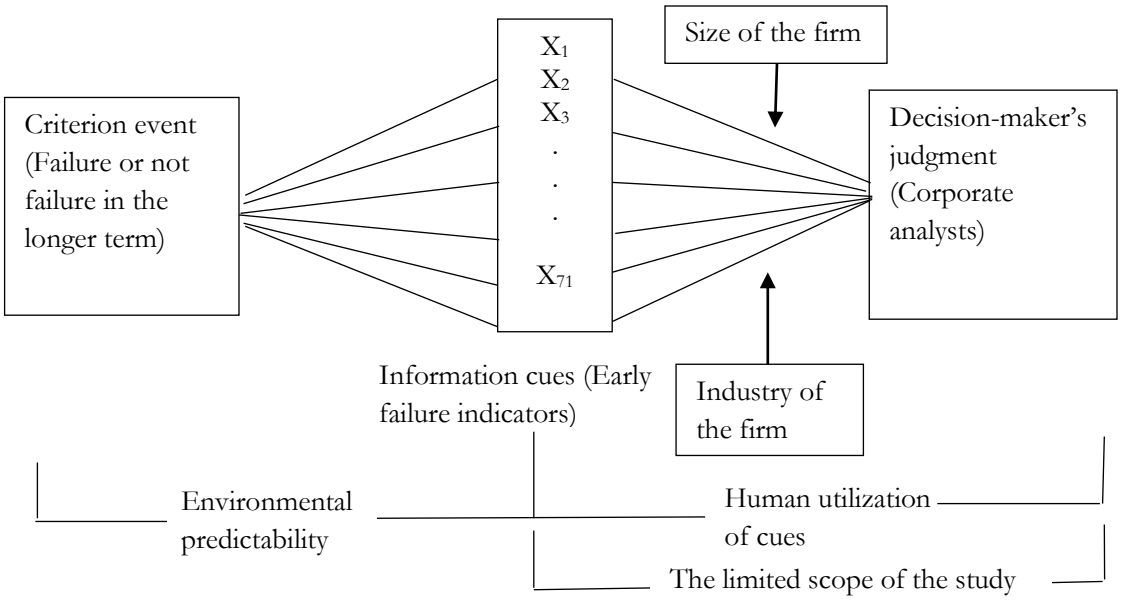

Figure 1. The limited Lens model framework of the study

Ooghe & de Prijcker (2007) presented a typology of failure processes and causes based on the conceptual failure model developed by Ooghe & Waeyaert (2004). Their general model was based on five broad classes of variables in a form of a failure process (immediate environment, general environment, management or entrepreneur, corporate policy, and company characteristics). Ooghe & de Prijcker used the conceptual model to draw a typology of the four different failure processes (unsuccessful start-up company, ambitious growth company, dazzled growth company, and apathetic established company). Mellahi & Wilkinson (2004) addressed the major deficiencies observed in the diverse body of organizational failure literature and suggested an integrative framework (Mellahi & Wilkinson, 2004: Figure 2). Their framework was based on four broad classes of organizational failure determinants (environmental factors, ecological factors, organizational factors, and psychological factors). These determinants are associated with each other and linked to the failure event. Mellahi & Wilkinson argued that to develop a better understanding of organizational failure it is necessary to understand how external factors and organizational factors interact to cause a failure. The integrative framework shows that typically management actions alone do not yield an organizational failure. To increase the predictability of management actions, the latter should be examined within the framework of the dynamics of the industry and the wider context in which a firm operates. Their framework suggests that there will be significant differences in the outcomes of the same internal factors across firms in different business environments.

The brief review of previous early warning frameworks shows that there is a wide variety of potential warning indicators. However, the relevant frameworks also share some common characteristics. Firstly, they have been shaped in a form of a process. Secondly, they include both internal and external factors. Thirdly, they emphasize the importance of management competence and the role of financial management. These characteristics have also included in the present framework. The initial framework was introduced by the authors of this study but it was further developed and tested by a team consisted of experienced specialists of corporate analysis. Figure 2 presents the final framework for the questionnaire as a form of a process. This failure or success process consists of eight classes of variables: A. Management competence, B. Relationships between owners and management, C. Efficiency of financial management, D. Caring of stakeholder relationships, E. Efficiency of operations, F. Financial results during the current year, G. Industrial environment, and H. General economic environment. The framework is not purely based on non-financial variables because the classes also include a class of financial results. The opinion of the expert team was that these variables cannot be neglected when predicting failure even for a long horizon. The role of the team was significant in selecting variables to the eight classes. In all, the framework is consisted of 71 variables considered potentially important by the team (see Appendix 1).

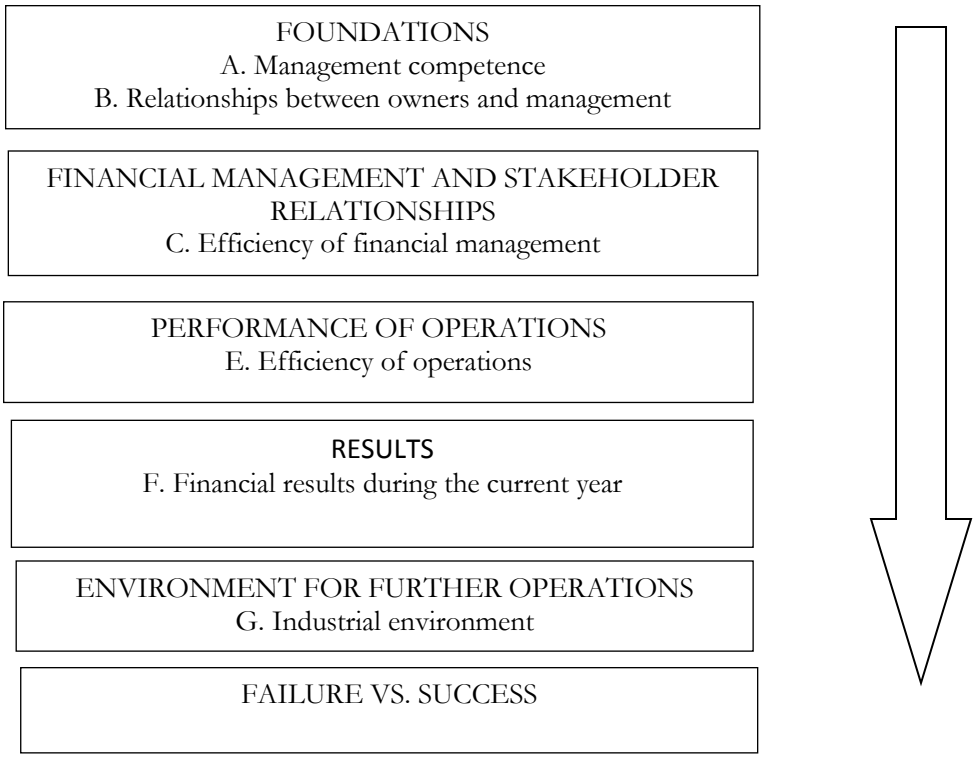

Figure 2. Framework for the questionnaire.

3.2. Data and methods

The questionnaire was accompanied by instructions for the potential respondents. They were asked to consider a situation where they are predicting a failure of a firm that would possibly happen after 2-4 years. This prediction horizon may be quite long to financial ratios (late warning indicators) and should largely be done using the early warning indicators presented in the questionnaire. Each participant was asked to assess the subjective importance of each variable to the prediction of hypothetical failure using the following Likert scale:

0 = this variable has no importance in prediction
1 = this variable has some importance in prediction
2 = this variable is important in prediction
3 = this variable is very important in prediction

The scale of importance is quite rough to eliminate the potential subjective scaling differences between the participants. The expert team had also the strong opinion that in practice it is not possible to assess the importance of early warning indicators on a scale with higher number of steps (precision). The questionnaire setting was organized in the way that the heads of corporate analysis department in four Finnish financial institutions were asked to deliver the survey to the corporate analysts in their department.

The questionnaire was enclosed by instructions that each participant (corporate analyst) should be specialized at least on one of the nine groups of hypothetical target firms:

1. Micro manufacturing firms (< 10 employees)
2. Micro trading firms (< 10 employees)
3. Micro service firms (< 10 employees)
4. SM manufacturing firms (10 < employees < 250)
5. SM trading firms (10 < employees < 250)
6. SM service firms (10 < employees < 250)
7. Large manufacturing firms (> 250 employees)
8. Large trading firms (> 250 employees)
9. Large service firms (> 250 employees)

Each participant filled the questionnaire assuming that the target firm in the hypothetical failure prediction process is a representative of one of the nine groups on which the corporate analyst is specialized. If an analyst was specialized on more than one categories, he or she was able to fill the questionnaire also for those categories. Thus, the respondents to each category of firms were experienced corporate analysts specialized just on that category. The corporate analysts had experience of several years in analyzing the target category of firms. Therefore, they felt easy to self-assess the importance of the survey variables without any experimental design. It is probable that practical prediction accuracy and awareness about the relevance of early warning indicators in this kind of prediction were high and quite equally distributed among the participants. The heads of the departments controlled the filling of the survey, gathered the filled questionnaires, and sent them back to the researchers. Because the questionnaires were filled under the control of the head, all available corporate analysts in the four financial institutions responded to the survey. Table 1 shows statistics about the distribution of the responses to the questionnaire. In all, 138 responses were obtained. The number of responses to the nine categories is satisfactory except for the categories of large trading and large service firms. There are only two responses to the former and four responses to the latter category.

Table 1. Distribution of the responses by target groups (n = 138).

Panel 1. All responses by all target groups (n = 138).

Target group	Frequency	%
1. Micro manufacturing firms (< 10 employees)	28	20,30
2. Micro trading firms (< 10 employees)	10	7,20
3. Micro service firms (< 10 employees)	13	9,40
4. SM manufacturing firms (10 < employees < 250)	37	26,80
5. SM trading firms (10 < employees < 250)	11	8,00
6. SM service firms (10 < employees < 250)	16	11,60
7. Large manufacturing firms (> 250 employees)	17	12,30
8. Large trading firms (> 250 employees)	2	1,40
9. Large service firms (> 250 employees)	4	2,90
Total	138	100,00

Panel 2. All responses by target size group (n = 138).

Target size group	Frequency	%
1. Micro firms (< 10 employees)	51	37,00
2. SM firms (10 < employees < 250)	64	46,40
3. Large firms (> 250 employees)	23	16,70
Total	138	100,00

Panel 3. All responses by target industry group (n = 138).

Target industry group	Frequency	%
1. Manufacturing firms	82	59,40
2. Trading firms	23	16,70
3. Service firms	33	23,90
Total	138	100,00

When testing the hypotheses on the size and industry effects, the main attention is paid to the average values of the importance of the early warning indicators. Because the Likert scale is rough with only four steps, the use of medians will lead to a large number of ties in the comparison of importance diminishing the amount of information. Therefore, the hypotheses are tested by the ANOVA F-test that assesses whether the expected values of the indicators within pre-defined size and industry groups differ from each other. The F-test is an omnibus test that is performed to detect any of the differences between the three size groups and between the three industry groups. Because of the limited Likert scales, the distributions of importance do not exactly conform to the normality making the test slightly biased. However, the results are quite comparable with the non-parametric Kruskal-Wallis test performed along the F-tests. Because the means of the variables are more informative than the medians to be reported, also the F-test designed for means is used for consistency. The Kruskal–Wallis test is a non-parametric method for testing whether samples originate from the same distribution. It is used for comparing independent samples of equal or different sample sizes.

4. Empirical results

4.1. General results

The participants of the survey also assessed the importance of early warning indicators at the level of variable classes. Table 2 presents the average values of importance for the eight variable classes using the same scale of importance as for the indicators. Class Management competence (A) has regarded as the most important class of variables in each group of firms. Furthermore, classes Efficiency of operations (E), Financial results during the current year (F), and Efficiency of financial management (C) have got high degrees of importance, in this order. For comparison, the statistical significance of the differences in the means of the classes between the size and industry groups are assessed by both the F-statistic and the non-parametric Kruskal-Wallis statistic. Both statistical tests give similar results. The differences in the importance of classes between the size groups are significant at the level 5% for classes Caring of stakeholder relations (D), Efficiency of operations (E), and Efficiency of financial management (C). For all these classes, the average importance is exceptionally low for micro firms. For the industry groups, the differences are not as significant as for the size groups. However, at the level of 5% there are significant differences for classes Efficiency of financial management (C), General economic environment (H), and Industrial environment (G).

For each class of variables, trading firms have got exceptionally high average values of importance. Thus, at the level of variable class, there exist both a size effect and an industry effect.

Table 2. Average importance of eight variable classes by size and industry.

Panel 1. Means of variable class importance by size groups

	Variable class:							
Size group	A	B	C	D	E	F	G	H
Micro firms	2,76	1,84	1,92	1,35	2,22	2,20	1,63	1,47
SM firms	2,58	1,67	2,23	1,98	2,56	2,19	1,95	1,73
Large firm	2,65	1,78	2,35	1,87	2,52	2,13	1,83	1,43
Total	2,66	1,75	2,14	1,73	2,43	2,18	1,81	1,59
F	1,758	0,573	4,783	8,571	5,133	0,082	2,905	2,130
Sig.	0,176	0,565	0,010	0,000	0,007	0,922	0,058	0,123
Kruskal-Wallis	4,598	1,470	8,971	14,705	7,684	0,093	5,795	4,400
Sig.	0,100	0,480	0,011	0,001	0,021	0,954	0,055	0,111

Panel 2. Means of variable class importance by industry groups

	Variable class:							
Industry group	A	B	C	D	E	F	G	H
Manufacturing firms	2,61	1,68	2,05	1,60	2,46	2,11	1,82	1,56
Trading firms	2,83	1,91	2,48	1,87	2,57	2,35	2,09	1,96
Service firms	2,67	1,82	2,12	1,97	2,24	2,24	1,61	1,39
Total	2,66	1,75	2,14	1,73	2,43	2,18	1,81	1,59
F	1,491	0,760	3,933	2,520	2,253	1,344	3,030	3,687
Sig.	0,229	0,470	0,022	0,084	0,109	0,264	0,052	0,028
Kruskal-Wallis	2,853	1,391	7,498	4,975	5,112	2,693	6,126	6,688
Sig.	0,240	0,499	0,024	0,083	0,078	0,260	0,047	0,035

Legend:
Early warning variable class:
A = Management competence
B = Relationships between owners and management
C = Efficiency of financial management
D = Caring of stakeholder relations
E = Efficiency of operations
F = Financial results during the current year
G = Industrial environment
H = General economic environment
Scale of importance:

0 = This variable class has no importance in prediction
1 = This variable class has some importance in prediction
2 = This variable class is important in prediction
3 = This variable class is very important in prediction

Appendix 1 presents for the total sample descriptive statistics of the importance assessments for all 71 early warning indicators. Table 3 reports the ranked (top) set of the twenty indicators that corporate analysts on average have regarded as the most important indicators. In this top set, five indicators measure Management competence (A), five Efficiency of operations (E), four Efficiency of financial management, four Caring of stakeholder relationships (D), and two Financial results (F). This top set does not include any indicators reflecting external environment in terms of Industrial environment (G) or General economic environment (H). In fact, the least important indicators from all indicators are measures of Fluctuations in foreign exchange rates (H5) and Incentive tax system (H6) reflecting General economic environment (H).

The most important indicators in this ranking are associated with CEO's ability to manage risks (A2) and understand financial matters (C10). Furthermore, CEO's ability to make decisions (A3) has also a high ranking in the list. The third indicator in the top set is a flexibility measure Ability of activity to adapt external changes (E2)reflecting Efficiency of operations (E).The financial indicators included in the top set measure respectively the level of liquidity (F5) and the level of income financing (F3), for example in terms of quick ratio and operational cash flow.

Table 3. Rank of importance for twenty most important variables.

Variable title	Variable	Mean	Median	Range	Std. Dev.
CEO's ability to manage risks	A2	2,620	3	2	0,582
Entrepreneur's / CEO's ability to understand financial matters	C10	2,580	3	1	0,495
Ability of activity to adapt to external changes	E2	2,560	3	3	0,618
Customer satisfaction with the company's products / services	D4	2,530	3	3	0,606
CEO's ability to make decisions	A3	2,500	3	2	0,607
Level of liquidity (quick ratio)	F5	2,480	3	3	0,607
CEO's commitment to the company's business	A4	2,460	3	2	0,630
Executive board / management members business professionalism	A11	2,460	3	3	0,685
Quality of pricing calculations	C5	2,460	2,5	2	0,581
Quality of the management of customer relationships	D1	2,450	3	2	0,663
Optimality of the number of employees	E5	2,440	3	3	0,651
Level of income financing (net profit + depreciation)	F3	2,430	2,5	3	0,649
CEO's overall vision for business	A8	2,400	2	3	0,657
Quality of cost accounting	C4	2,360	2	2	0,615
Commitment of key personnel to the company	D10	2,330	2	3	0,775
Quality of activity control	E8	2,330	2	2	0,620
Success in deciding the amount of investments	E4	2,320	2	3	0,673
Transmission of financial information and its use in operation	E6	2,310	2	3	0,765
Maintaining employee motivation	D9	2,280	2	2	0,579
Financial management's capacity to formulate economic calculations	C1	2,270	2	3	0,760

Scale of importance:
0 = this variable has no importance in prediction
1 = this variable has some importance in prediction
2 = this variable is important in prediction
3 = this variable is very important in prediction

Table 4 presents the twenty early warning indicators that show the highest statistical significance for the differences in the importance between all nine size and industry groups ranked by the F-statistic. This top list is dominated by measures from the classes Management competence (A) and Efficiency of financial management (C) which both have seven measures in the list. Level of activity and professionalism of the board (A13) and Ability of management to create good strategic plans (A12) are the indicators showing the most significant difference between the groups. The indicators are very important for assessing large manufacturing and service firms but quite insignificant for assessing small firms from any industry. However, level of entrepreneur's or CEO's private drawings from the company (C11) are very significant early warning indicators in small firms irrespective of industry but insignificant in large firms and relatively insignificant in SMEs with the exception for service SMEs. This kind of measure is of high relevance especially for small non-corporate (partnership) firms. The top list does not include any measures from the class Financial results (F).

Table 4. Rank order of F statistic for twenty variables with highest statistical difference between all groups.

	Group means											
	Micro firms			SM firms			Large firms					
Variable	Manuf.	Trad.	Serv.	Manuf.	Trad.	Serv.	Manuf.	Trad.	Serv.	Total	F	Sig.
A13	0,89	0,50	0,46	1,62	1,55	1,56	2,24	2,00	2,75	1,38	11,051	0,000
A12	1,46	1,20	0,92	2,19	1,82	2,00	2,71	2,00	3,00	1,88	10,166	0,000
C11	2,43	2,80	2,69	1,62	1,45	2,19	1,29	0,00	1,50	1,96	7,598	0,000
A5	0,86	0,80	0,69	1,49	1,64	1,56	1,71	2,00	2,25	1,31	6,639	0,000
A14	0,71	0,60	0,62	1,46	1,55	1,44	1,76	2,00	2,25	1,24	6,348	0,000
H3	0,96	0,70	0,69	1,65	1,27	1,25	1,82	2,50	1,75	1,31	5,536	0,000
C8	1,00	1,00	1,15	1,70	1,64	1,69	1,76	2,00	2,50	1,49	4,987	0,000
C3	1,71	1,80	1,31	2,22	2,27	2,00	2,35	2,00	3,00	2,01	4,535	0,000
C1	1,93	2,10	1,62	2,43	2,64	2,19	2,65	3,00	3,00	2,27	4,515	0,000
H5	0,71	0,70	0,46	1,41	1,30	1,00	1,29	2,50	1,50	1,07	4,187	0,000
B2	2,21	2,80	2,31	1,97	1,91	2,00	1,29	0,50	1,75	2,00	4,185	0,000
C6	1,86	1,80	1,77	2,43	2,36	2,19	2,47	3,00	3,00	2,20	4,108	0,000
B3	2,04	2,20	1,92	1,49	1,73	1,63	1,00	1,00	1,25	1,65	2,980	0,004
E1	1,71	1,50	1,62	2,08	2,00	2,19	2,24	3,00	2,75	1,98	2,744	0,008
A7	2,11	2,10	2,31	1,62	1,64	1,94	1,29	1,00	2,00	1,82	2,700	0,009
C4	2,07	2,20	2,23	2,49	2,64	2,44	2,29	3,00	3,00	2,36	2,458	0,016
A4	2,61	3,00	2,62	2,32	2,36	2,50	2,29	1,50	2,25	2,46	2,437	0,017
C7	1,68	1,70	1,38	1,89	2,09	1,81	2,06	2,00	2,50	1,83	2,260	0,027
A10	1,50	1,80	1,62	2,16	1,82	2,00	1,94	2,00	2,50	1,88	2,141	0,036
D1	2,25	2,90	2,77	2,38	2,64	2,50	2,18	3,00	2,50	2,45	2,113	0,039

Legend: See appendix 1 for the variable code.

4.2. Size effect

Table 5 reports statistics for the twenty most important early warning indicators by size groups ranked by the mean of the importance value. The rankings in different size groups differ significantly from each other. For micro firms, the most important indicator is CEO's commitment to the company's business (A4) that only has rank 15 in the rank order for SMEs and is outside the top twenty indicators for large firms. For large firms, the most important indicator is Financial management's capacity to formulate economic calculations (C1) that has rank 14 for SMEs and is outside the top twenty for micro firms. For large firms, also Ability of the executive board/management to create good strategic plans (A12) is very important but it is outside the set of top twenty indicators for other size groups. The most important indicators for SMEs are important also for micro and large firms. For SMEs, the most important variable is CEO's ability to manage risks that has rank 2 for micro firms and rank 4 for large firms.

Level of liquidity (F5) and level of income financing (F3) are the only financial indicators that are included in the top twenty indicators for each size group. However, their ranks are not high in the top list. For each size group, external environment variables from classes G and H are outside the top indicators.

Table 5. Rank order of mean importance for twenty variables in different size groups.

Micro firms			SM firms			Large firms		
Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.
A4	2,69	0,55	A2	2,63	0,52	C1	2,74	0,69
A2	2,61	0,67	C10	2,63	0,49	A11	2,70	0,56
D4	2,59	0,57	C5	2,59	0,56	A12	2,70	0,64
C11	2,57	0,61	D4	2,55	0,56	A2	2,65	0,57
E2	2,57	0,54	E2	2,53	0,69	C6	2,61	0,50
C10	2,55	0,50	A3	2,52	0,56	E2	2,61	0,58
A3	2,53	0,61	A11	2,52	0,56	E4	2,57	0,51
D1	2,51	0,67	C4	2,50	0,56	C10	2,52	0,51
F5	2,51	0,58	A8	2,45	0,64	E5	2,52	0,59
E8	2,50	0,54	D1	2,45	0,67	F5	2,52	0,79
D9	2,41	0,61	E5	2,44	0,61	C4	2,48	0,51
E5	2,41	0,73	F5	2,44	0,56	F3	2,48	0,73
F3	2,41	0,67	F3	2,42	0,61	A8	2,43	0,59
D10	2,37	0,82	C1	2,41	0,66	C3	2,43	0,59
B2	2,35	0,84	A4	2,38	0,60	E6	2,43	0,59
E9	2,35	0,66	C6	2,36	0,63	A3	2,39	0,72
A6	2,33	0,77	F4	2,34	0,74	C2	2,39	0,66
E4	2,33	0,65	D10	2,31	0,73	C5	2,39	0,66
A8	2,31	0,71	F2	2,30	0,77	E1	2,39	0,66
C5	2,31	0,55	E6	2,28	0,77	D4	2,35	0,78

Legend: See appendix 1 for the variable code.

Table 6 reports the twenty indicators that show the highest statistical significance for the differences in the importance between all size groups ranked by the F-statistic. These indicators show all differences that are statistically significant at level 1%. This top list is really dominated by measures from classes Management competence (A) and Efficiency of financial management (C) which have respectively eight and seven measures in the list. Level of activity and professionalism of the board (A13) and Ability of the executive board/management to create good strategic plans (A12) show the most significant difference followed by CEO's education in leadership (A5). These measures are quite insignificant for corporate analysts of micro firms but relatively important for those of SM and large firms. The top list also includes Level of entrepreneur's/CEO's private drawings from the company (C11) that is very important for micro firms but insignificant for SM and large firms. Furthermore, the list includes variable Mutual relationships between owners (B2) being important for micro firms but not for other groups. CEO's commitment to the company's business (A4) is quite important for each group but especially for micro firm group making a significant difference between the groups. Financial management's capacity to formulate economic calculations (C1) and Quality of cash flow forecasting (C6) are regarded as very important for SM and large firms but not for micro firms. In conclusion, the top twenty indicators are quite different for the size groups and, in addition, there are significant differences in importance for a large number of indicators. Thus, empirical results support hypothesis *H1*.

Table 6. Rank order of F statistic for twenty variables with highest statistical difference between size groups.

	Micro firms		SM firms		Large firms		Total			
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	F	Sig.
A13	0,71	0,81	1,59	0,71	2,30	0,70	1,38	0,94	41,232	0,000
A12	1,27	0,78	2,08	0,72	2,70	0,64	1,88	0,89	34,401	0,000
A5	0,80	0,57	1,53	0,71	1,83	0,72	1,31	0,77	25,415	0,000
A14	0,67	0,68	1,47	0,73	1,87	0,97	1,24	0,88	25,334	0,000
C11	2,57	0,61	1,73	0,88	1,22	1,28	1,96	1,00	22,847	0,000
H3	0,84	0,67	1,48	0,76	1,87	0,87	1,31	0,84	18,155	0,000
C8	1,04	0,66	1,69	0,66	1,91	0,79	1,49	0,77	18,043	0,000
C1	1,88	0,74	2,41	0,66	2,74	0,69	2,27	0,76	14,412	0,000
C6	1,82	0,77	2,36	0,63	2,61	0,50	2,20	0,73	14,371	0,000
C3	1,63	0,80	2,17	0,66	2,43	0,59	2,01	0,76	13,451	0,000
B2	2,35	0,84	1,97	0,76	1,30	0,93	2,00	0,89	13,093	0,000
H5	0,65	0,63	1,29	0,85	1,43	0,90	1,07	0,85	12,325	0,000
B3	2,04	0,70	1,56	0,89	1,04	1,02	1,65	0,91	11,480	0,000
E1	1,65	0,82	2,09	0,73	2,39	0,66	1,98	0,80	9,144	0,000
A7	2,16	0,86	1,70	0,71	1,39	0,99	1,82	0,86	8,204	0,000
C7	1,61	0,64	1,91	0,64	2,13	0,55	1,83	0,65	6,418	0,002
A10	1,59	0,90	2,06	0,64	2,04	0,71	1,88	0,78	6,206	0,003
A4	2,69	0,55	2,37	0,60	2,22	0,74	2,46	0,63	5,987	0,003
C4	2,14	0,66	2,50	0,56	2,48	0,51	2,36	0,62	5,800	0,004
A9	1,53	0,92	1,78	0,68	2,13	0,69	1,75	0,80	4,818	0,010

Legend: See appendix 1 for the variable code.

4.3. Industry effect

Table 7 presents statistics for the twenty most important indicators by industry groups ranked by the mean of the importance value. The rankings in different industry groups differ from each other but not as significantly as for the different size groups. For manufacturing firms, corporate analysts regard CEO's ability to manage risks (A2) as the most important indicator and it has also rank 2 for trading firms and rank 4 for service firms. Similarly, the second most important indicator for manufacturing firms is Entrepreneur's/CEO's ability to understand financial matters (C10) that has rank 1 for trading firms. However, for service firms it has only rank 13 in the top twenty indicators. The third most important indicators for manufacturing firms, Ability of activity to adapt to external changes (E2) is also regarded as important by corporate analysts for trading and service firms. The third most important variable for trading firms is Quality of the management of customer relationships (D1) that has the same rank for service firms but only rank 17 for manufacturing firms. For service firms, Customer satisfaction with the company's products/services (D4) is considered the most important indicator. It has a relative high rank 7 for manufacturing firms and rank 6 for trading firms. The second important indicator for service firms is CEO's ability to make decisions (A3) having rank 6 for manufacturing firms and rank 9 for trading firms. The level of liquidity (F5) is the only financial variable that is located in the twenty top list of indicators for each group. However, its rank is relatively low. The top sets do not include any indicators of external environment (classes G and H).

Table 7. Rank order of mean importance for twenty variables in different industry groups.

Manufacturing firms			Trading firms			Service firms		
Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.
A2	2,62	0,60	C10	2,87	0,34	D4	2,64	0,60
C10	2,57	0,50	A2	2,78	0,42	A3	2,61	0,56
E2	2,52	0,64	D1	2,78	0,52	D1	2,61	0,56
A11	2,51	0,69	E2	2,77	0,53	A2	2,52	0,62
E5	2,51	0,57	C5	2,70	0,56	A4	2,52	0,62
A3	2,45	0,61	D4	2,65	0,49	E2	2,52	0,62
D4	2,45	0,63	A4	2,57	0,59	F5	2,52	0,57
F3	2,45	0,69	F5	2,57	0,51	E8	2,48	0,62
F5	2,44	0,65	A3	2,52	0,67	E9	2,45	0,67
C5	2,43	0,59	A11	2,52	0,73	C4	2,42	0,66
A4	2,41	0,65	C4	2,48	0,73	A1	2,39	0,66
A8	2,39	0,68	D10	2,48	0,67	A8	2,39	0,66
E4	2,33	0,67	E6	2,48	0,59	C10	2,39	0,50
E6	2,32	0,74	E7	2,48	0,73	B1	2,36	0,78
C1	2,30	0,77	E8	2,48	0,67	C5	2,36	0,55
C4	2,30	0,56	E16	2,48	0,59	D9	2,36	0,55
D1	2,29	0,69	A6	2,43	0,66	D10	2,36	0,78
C2	2,27	0,57	A8	2,43	0,59	F3	2,36	0,65
D10	2,27	0,80	C1	2,43	0,73	E5	2,33	0,82
F2	2,26	0,80	D9	2,43	0,66	C11	2,30	0,81

Legend: See appendix 1 for the variable code.

Table 8 presents the twenty indicators that show the highest statistical significance for the differences in the importance of the indicators between industry groups ranked by the F-statistic. There are only three indicators with a statistically significant difference at level 1%. Thus, the significance of the differences between industry groups is clearly lower than for the size groups. The most significant difference is found for Entrepreneur's/CEO's ability to understand financial matters (C10) that, however, is regarded as a relevant indicator for each industry. This same holds also for Quality of the management of customer relationships (D1) that shows a difference with the second highest significance. These indicators are regarded as very important with a small variation (a high consensus) especially in analyzing trading firms. At level 10%, there are found significant differences in some important indicators. Firstly, Quality of activity control (E8) is more important for trading and service firms than for manufacturing firms. Secondly, Quality of pricing calculations (C5) seems to be in analyzing trading firms more relevant than in analyzing manufacturing and service firms. However, for both indicators, the differences between groups are not large, since the means exceed 2 (important) for all three groups. In conclusion, there are some differences in the top indicators between the industry groups but the differences are not as significant as for the size groups. Thus, the findings give somewhat support to hypothesis *H2* but the industry effect does not seem to be strong.

Table 8. Rank order of F statistic for twenty variables with highest statistical difference between industry groups.

	Manufacturing firms		Trading firms		Service firms		Total			
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	F	Sig.
C10	2,57	0,50	2,87	0,34	2,39	0,50	2,58	0,50	6,794	0,002
D1	2,29	0,69	2,78	0,52	2,61	0,56	2,45	0,66	6,628	0,002
E16	1,98	0,70	2,48	0,59	2,03	0,77	2,07	0,72	4,673	0,011
H1	1,73	0,82	2,17	0,94	1,58	0,75	1,77	0,84	3,777	0,025
A12	2,05	0,85	1,57	0,79	1,70	0,98	1,88	0,89	3,768	0,026
A1	2,04	0,68	2,26	0,81	2,39	0,66	2,16	0,71	3,405	0,036
E8	2,22	0,59	2,48	0,67	2,48	0,62	2,33	0,62	2,999	0,053
H3	1,45	0,82	1,13	0,92	1,09	0,77	1,31	0,84	2,917	0,057
C11	1,83	1,02	1,91	1,13	2,30	0,81	1,96	1,00	2,719	0,070
E7	2,15	0,76	2,48	0,73	2,03	0,68	2,17	0,74	2,659	0,074
C5	2,43	0,59	2,70	0,56	2,36	0,55	2,46	0,58	2,533	0,083
A7	1,72	0,92	1,78	0,80	2,09	0,68	1,82	0,86	2,279	0,106
B1	2,06	0,92	2,39	0,72	2,36	0,78	2,19	0,87	2,226	0,112
G3	2,05	0,59	2,35	0,71	2,09	0,63	2,11	0,62	2,113	0,125
E3	2,21	0,70	1,91	0,85	2,00	0,66	2,11	0,72	2,014	0,137
E9	2,18	0,63	2,26	0,75	2,45	0,67	2,26	0,67	1,990	0,141
D3	1,77	0,79	2,13	0,87	1,94	0,83	1,87	0,82	1,945	0,147
A6	2,22	0,74	2,43	0,66	2,03	0,88	2,21	0,77	1,918	0,151
C1	2,30	0,77	2,43	0,73	2,06	0,75	2,27	0,76	1,905	0,153
D9	2,21	0,56	2,43	0,66	2,36	0,55	2,28	0,58	1,831	0,164

Legend: See appendix 1 for the variable code.

5. Summary and conclusions

This study is concentrated on assessing size and industry effects in longer horizon bankruptcy prediction. Firstly, previous studies have pointed out that there is a size effect in failure prediction when financial ratios are used as predictors (Altman & Sabato, 2007; Altman, Sabato & Wilson, 2010). This effect is considered so serious that authors conclude that financial institutions should use scoring and rating instruments specifically addressed to SMEs. This conclusion also deals with short-horizon failure prediction models that include non-financial variables together with financial ratios. For the longer horizon, there are a number of prediction models specified for small firms and based on non-financial indicators only (Marom & Lussier, 2014). These models obviously include variables that are special for SMEs and irrelevant for large firms. However, there is lack of studies that systematically compare the relevance of non-financial variables for early failure prediction of small and large firms. In failure prediction, there is also found an industry effect when financial ratios are used as predictors (Chava & Jarrow, 2004; Smith & Liou, 2007). The failure risk of firms and the target values of financial ratios vary across industries (Platt & Platt, 1990). However, in the longer term the industry effect is not as straightforward as the size effect. In the longer term, predictors, early warning indicators, maybe associated with the causes of failure that can be robust across industries (Russel Baldwin & Gellatly, 2003). Thus, there has been a lack of evidence on the importance of early warning indicators across different size groups and industries.

The purpose of this study was to respond to the lack of evidence assessing the potential size and industry effects in early failure prediction using a survey methodology. The findings are based on a questionnaire responded by experienced Finnish corporate analysts. The task was designed to assess the importance of a large number of early warning indicators in failure prediction on a four-step Likert scale.

The hypothetical target firms were classified in nine groups defined as micro, SM, and large firms from manufacturing, trading, or service industries (3 x 3 = 9). Each questionnaire on a type of firm was filled by an experienced corporate analyst just specialized on that type of firms. This questionnaire with 138 replies on the importance of 71 indicators gave a number of interesting results on the size and industry effects.

The findings of this study generally support the conclusions drawn from previous studies on bankruptcy causes in that most important indicators are associated with management competence and efficiency of financial management (Argenti, 1981; Laitinen & Chong, 1999; Marom & Lussier 2014). These classes of variables are also identified as the most important internal causes of bankruptcy (Russel Baldwin & Gellatly, 2005).

Although financial ratios are considered as short horizon predictors of failure (du Jardin, 2015), some of them seem to be important indicators also for a longer period. Traditional textbooks regard profitability and capital structure as having longer perspective than liquidity. However, the findings of this study show that they do not belong to the top set of early indicators. Instead, corporate analysts consider both static (for example, quick ratio) and dynamic (traditional cash flow) aspects of liquidity as relevant early predictors. Earlier studies also emphasize the central role of external failure causes in bankruptcies (Russel Baldwin & Gellatly, 2005; Lukason & Hoffman, 2015). However, in this study external indicators of general and industrial environment have got very low ratings of importance. It seems that corporate analysts pay more attention to the characteristics of the firm, especially to the competence of management, than to the surrounding environment. This is logical because poor management does not survive even in a good environment but good management will survive also in a poor environment.

The findings on the size effect show that the most important early warning indicators for micro firms and large firms are specific only for these size groups. The analysts of micro firms emphasize the commitment of CEO to business whereas for large firms it is more important that the board is able to create good strategic plans. SM firms seem to share characteristics and thus important measures of both micro firms and large firms. Financial analysts of SM firms regard CEO's ability to manage risks as the most important indicator and this measure is important also for micro and large firms. The most significant differences between the size groups are found in indicators of management competence and efficiency of financial management. The differences in the perceived importance of these indicators between the size groups are statistically very significant. Therefore, the findings give clear support to the research hypothesis on the existence of a size effect in early prediction of failure. This significant size effect makes it very difficult to find a general early prediction model of failure that can be efficient in predicting failure of firms from different size groups. Especially, it is difficult to find an integrated model applicable to both micro firms and large firms. Therefore, it is concluded that financial institutions should use early scoring and rating instruments specifically addressed separately to each size groups.

The findings on the industry effect did not give similar results as for the size effect. There are differences in the importance of indicators between the industry groups. However, the differences are statistically very significant only for three measures, which all are important in each industry group diminishing the impact of the difference. Many differences are found for indicators that are not very relevant to any of the industry groups. The corporate analysts of different industries share the opinion that CEO's different abilities, ability of activities to adapt external changes (flexibility), and customer satisfaction are important early indicators of failure. For logical reasons, customer satisfaction is the most important indicator for the analysts of service firms but it is also very relevant for those of manufacturing and trading firms. In conclusion, the findings show that although there are differences in the perceived importance of early warning indicators across industries, these differences may have only little practical value. Thus, empirical evidence gives partial support the hypothesis on the existence of an industry effect in early prediction of failure. However, the effect may be so weak in practice that it is not necessary to develop and use early scoring and rating instruments specifically addressed separately to each industry group. Thus, it is possible to develop an efficient integrated instrument for the groups on the basis of indicators that are highly important for each industry. This general model can however further adjusted to different industries using indicators that are special to that industry.

The present study gives outlines for further research on the field. The study dealt with a very high number of potential early warning indicators, which made it difficult to choose relevant cues a priori and to design any experiment to test the size and industry effects. The findings of this study can however be used to diminish the set of relevant indicators and to use them as cues in an experimental design. Therefore, further studies should expand the limited Lens model applied in this study (Figure 1) as an experiment to deal with prediction accuracy (environmental predictability) as well. Furthermore, further studies are encouraged to estimate and test different early warning models in several size and industry groups. These kinds of statistical models have already developed for financial predictors using different estimation methods. This kind of seminal statistical analysis should be expanded to deal also with early warning indicators.

In this kind of setting, it would be possible to compare the decision accuracy and cue usage of corporate analysts and statistical models (Routledge & Gadenne, 2004).

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Appendices

Appendix 1. Descriptive statistics of 71 early warning variables (n = 138).

Variable title	Variable	Mean	Median	Range	Std. Dev.
A. MANAGEMENT COMPETENCE					
CEO's ability to co-operate	A1	2,160	2	2	0,707
CEO's ability to manage risks	A2	2,620	3	2	0,582
CEO's ability to make decisions	A3	2,500	3	2	0,607
CEO's commitment to the company's business	A4	2,460	3	2	0,630
CEO's education in leadership	A5	1,310	1	3	0,772
CEO's experience in the business sector	A6	2,210	2	3	0,768
CEO's health	A7	1,820	2	3	0,856
CEO's overall vision for business	A8	2,400	2	3	0,657
Continuity of the executive board / management work in a new situation	A9	1,750	2	3	0,802
Mutual relationships between the executive board / management members	A10	1,880	2	3	0,784
Executive board / management members business professionalism	A11	2,460	3	3	0,685
Ability of the executive board / management to create good strategic plans	A12	1,880	2	3	0,888
Level of activity and professionalism of the board	A13	1,380	1	3	0,938
Continuity of the work of the board in a new situation	A14	1,240	1	3	0,884
B. RELATIONSHIPS BETWEEN OWNERS AND MANAGERS					
The alignment of owners' and management objectives	B1	2,190	2	3	0,868
Mutual relationships between owners	B2	2,000	2	3	0,888
Relationships between the entrepreneur / CEO and family	B3	1,650	2	3	0,912
Number of business transfers	B4	1,880	2	3	0,880
C. EFFICIENCY OF FINANCIAL MANAGEMENT					
Financial management's capacity to formulate economic calculations	C1	2,270	2	3	0,760
Carefulness of financial management	C2	2,250	2	2	0,605
Financial planning quality	C3	2,010	2	3	0,764
Quality of cost accounting	C4	2,360	2	2	0,615
Quality of pricing calculations	C5	2,460	2,5	2	0,581
Quality of cash flow forecasting	C6	2,200	2	3	0,727
Quality of external financial accounting	C7	1,830	2	3	0,646
Financial management's perseverance in informing corporate management	C8	1,490	1	3	0,766
Reliability and professionalism of the accounting firm / accountant	C9	1,970	2	2	0,734
Entrepreneur's / CEO's ability to understand financial matters	C10	2,580	3	1	0,495
Level of entrepreneur's / CEO's private drawings from the company	C11	1,960	2	3	1,003
D. CARING OF STAKEHOLDER RELATIONS					
Quality of the management of customer relationships	D1	2,450	3	2	0,663
Maintaining the high quality of the customer base	D2	1,980	2	3	0,797
Extent and number of customers	D3	1,870	2	3	0,818
Customer satisfaction with the company's products / services	D4	2,530	3	3	0,606
Company's flexibility to clients' specific needs	D5	1,930	2	3	0,701
Quality of the management of financer relationships	D6	1,880	2	3	0,755
Successful choice of financer relationships	D7	1,640	2	3	0,862
Quality of the management of supplier and subcontractor relations	D8	1,960	2	3	0,693
Maintaining employee motivation	D9	2,280	2	2	0,579
Commitment of key personnel to the company	D10	2,330	2	3	0,775
E. EFFICIENCY OF OPERATIONS					
Clarity and awareness of mission in the company	E1	1,980	2	3	0,797

Ability of activity to adapt to external changes	E2	2,560	3	3	0,618
Success in selecting the objects for investment	E3	2,110	2	3	0,722
Success in deciding the amount of investments	E4	2,320	2	3	0,673
Optimality of the number of employees	E5	2,440	3	3	0,651
Transmission of financial information and its use in operation	E6	2,310	2	3	0,765
Quality of workers' skills	E7	2,170	2	3	0,744
Quality of activity control	E8	2,330	2	2	0,620
Level of capacity utilization	E9	2,260	2	2	0,665
Modernity of production technology	E10	1,910	2	3	0,763
Technical quality of the products	E11	1,990	2	3	0,673
Innovation and regeneration ability	E12	1,950	2	3	0,758
Effectiveness of marketing	E13	1,700	2	3	0,787
Profitability of the business idea	E14	1,960	2	3	0,832
Level of company specific know how	E15	1,960	2	3	0,827
Development of the order and tender backlog	E16	2,070	2	3	0,721
Company's risk management program and its follow-up	E17	1,470	2	3	0,756
Quality of competitor evaluation	E18	1,840	2	3	0,848
F. FINANCIAL RESULTS DURING THE CURRENT YEAR					
Increase of market share	F1	1,230	1	3	0,767
Level of profitability (level of ROI)	F2	2,240	2	3	0,779
Level of income financing (net profit + depreciation)	F3	2,430	2,5	3	0,649
Level of solidity (equity ratio)	F4	2,170	2	3	0,845
Level of liquidity (quick ratio)	F5	2,480	3	3	0,607
G. INDUSTRIAL ENVIRONMENT					
Continuation of turnover growth for industry companies	G1	1,460	1,5	3	0,706
Health of competition in the industry sector	G2	2,140	2	3	0,686
Economic capacity of the industry sector	G3	2,110	2	2	0,624
H. GENERAL ECONOMIC ENVIRONMENT					
General economic outlook	H1	1,770	2	3	0,840
Level of access to finance	H2	1,940	2	3	0,733
Evolution of the international competitive situation	H3	1,310	1	3	0,835
Positive and supportive entrepreneurial environment	H4	1,520	2	3	0,916
Fluctuations in foreign exchange rates	H5	1,070	1	3	0,846
Incentive tax system	H6	0,880	1	3	0,844

Scale of importance:
0 = this variable has no importance in prediction
1 = this variable has some importance in prediction
2 = this variable is important in prediction
3 = this variable is very important in prediction