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# ASSOCIATION BETWEEN FIRM SIZE AND ENTERPRISE RISK MANAGEMENT LEVEL – LITERATURE REVIEW

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**Abstract.** The paper aims to investigate if firm size plays a role as a driver for the ERM method and as an ERM determinant. A comprehensive literature review (conducted 2010–2021) and primary data (SMEs in Czech Republic, research conducted in 2021) were applied. Latent class analysis and contingency tables were employed. The results show that firm size predicts the adequate ERM method and has positive effects on the ERM level. The contribution is in identifying significant differences between micro- and medium-sized enterprises with respect to the ERM level. At the conclusion, the author discusses other possible ERM drivers and ERM determinants.

**Keywords:** Enterprise risk management, small-medium sized enterprises, Class latent analysis, firm size, ERM determinant.

**JEL Classification:** G32.

## Introduction

Enterprise Risk Management (hereinafter "ERM") is "the process by which organisations in all industries assess, control, exploit, finance and monitor risks from all sources for the purpose of increasing the organisation's short- and long-term value to its stakeholders" (Casualty Actuarial Society, 2003). The ERM approach focuses on all potential risks – both pure and speculative. By expanding the set of risks to include speculative risks, where the outcomes can be in the form of loss, gain, or status quo. Companies have the enhance risk management opportunities that can provide strategic benefits to the company (Lundqvist, 2015). The above definition of ERM is also supported by Meulbroek (2002), where the aim of risk management is not only to minimize overall risks, but also to select an adequate level of risk management that increases value for shareholders and stakeholders. The ERM approach should, among other things, explicitly identify opportunities for the firm (Gatzert & Martin, 2015).

In opposition to this stands traditional risk management, where risks are managed separately. The siloed nature of risk management arose from different departments dealing with different types of risk (e.g., the finance department dealing with risks related to currency fluctuations or interest rates). Over time, each department of the company developed its own tools and procedures that are independent of each other (Dionne, 2013). Responsibility for risk management in each area within the firm are held by the assigned managers (McShane et al., 2011).

The ERM approach originated in financial institutions in response to the Great Financial Crisis and stricter regulation. Thereafter, the approach was gradually extended to large and international firms, strongly capitalised firms. In the last few years, the importance of ERM has been increasing in small and medium-sized businesses. The need is strengthened by the ongoing pandemic situation. The pandemic situation affects almost all sectors. Small and medium-sized enterprises (hereinafter SMEs) play a vital role in many national economies, e.g., in the Czech Republic SMEs make up 99% of the total active business entities.

The arising question is whether shifting the ERM approach to SMEs changes the way of ERM identification and whether the firm size is the ERM determinant. This paper examines the association between the relationship

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between firm size and Enterprise risk management. A literature review (2010–2021) was employed at the same time the theoretical knowledge was enriched by our own research, which took place in September – November 2021 in non-financial SMEs in the Czech Republic. The paper identifies the main differences in the approach of identifying ERM in a firm regarding to the firm size and if the firm size is a determinant for ERM implementation.

The business environment is currently very uncertain and therefore it is crucial to have more focus on ERM than in previous times. The contribution of the article is to provide summary information with respect to firm size as an important determinant of ERM implementation. The article compares large firms and SMEs. Firm size may play a decisive factor in ERM implementation, similar to the industry in which the institution operates (Farrell & Gallagher, 2019) or the riskiness of the environment (Gatzert & Martin, 2015).

The paper concludes by outlining for firm owners/managers the important role of firm size with respect to the ERM approach. The paper also uses primary data collected in 2021 from non-financial SMEs in the Czech Republic.

The novelty of the article is our own research, which shows the significant role of the firm size also in the comparison of micro (4–49 employees) and small enterprises (50–99 employees). Thus, not only the general difference between SMEs and large companies as previous studies have shown. Differences also appear in the SMEs themselves.

## 1. Theoretical background

The theoretical background identifies methods for ERM identification. In the financial sector, the ERM has been originated as well as the first methodologies to identify ERM, e.g., content analysis (Desender, 2011) or the ERM index Gordon et al. (2009).

Content analysis is an approach, when ERM approach is identified using manual or automated searches across publicly available information. Content analysis is the most frequently binary-based method. The binary measure is determined by 1 – the company uses ERM metric, or the keywords are listed in the company documents, 0 – the company does not use ERM metric, or the keywords are not listed in the company documents. The binary approach can then serve as a simplified model maturity, where in the binary approach the individual presence of the keywords is summed (i.e., keyword disclosures + 1, vice versa + 0) (Florio & Leoni, 2017). Over time, this method has spread significantly to the non-financial sector and is still widely used today (e.g., Husaini et al., 2020; González et al., 2020). Instead of searching for a complex number of keywords (for example – "enterprise risk management", "chief risk officer", "risk committee", "strategic risk management"), it is also possible to utilize "CRO" or "chief risk officer" as a keyword (Liebenberg & Hoyt, 2003). The presence of the CRO role in the firm is considered an approximation of the ERM approach in the firm.

The second method for identifying ERM is the so-called "ERM index". A well-known index is the Gordon et al. (2009) ERM index. The calculation of the index is based on content analysis and refers to Hoyt and Liebenberg (2011). Based on the identification of ERM users from the US Securities and Exchange Commission's EDGAR database, the necessary information was searched within the publicly available company documents. Gordon's ERM index is based on the four Committee of Sponsoring Organizations [COSO] (2014) objectives – the ability to meet its own objectives in relation to strategy, operations, reporting and compliance. Two indicators are calculated for each of the objectives.

The original index has been modified over the years by other (Anton, 2018; Callahan & Soileau, 2017; Johnston & Soileau, 2020; Kuo et al., 2021; Marc et al., 2018; Mustafa & Nimer, 2018; Naseem et al., 2020; Togok et al. 2016; Zou et al., 2018; Zou & Hassan, 2017; Zungu et al., 2018). Later, Wang et al. (2018) built on Gordon's (2009) ERM index and created an index called ABERM, this is an abnormal ERM index that measures the extent of deviation from the optimal ERM. A higher ABERM value represents a weaker ERM.

The last method for determining the presence of ERM is a questionnaire survey. The paper's author describes only the quantitative questionnaire survey in detail. Appropriate ERM metrics are an essential part of questionnaire construct. The answers to the ERM metrics are used to determine whether or not the enterprise is using ERM, as well as the level of implementation or formalisation. Commonly, questionnaire surveys are inspired by the COSO methodology.

Questionnaire survey inspired by the COSO methodology (2004, 2017). The COSO (2004) methodology identifies eight components: Internal Environment, Objective Setting, Event Identification, Risk Assessment, Risk Response, Control Activities, Information & Communication, and Monitoring. The components are operationalized into questions or statements in a questionnaire survey that are subjectively rated on a selected scale.

The previously mentioned author Desender (2011) was also inspired by COSO-ERM. The questionnaire survey consists of 70 items with binary variables and the total sum indicates the level of ERM. Later, Lundqvist (2015) was also inspired by this questionnaire design. Other authors who have used binary variables include Mafrolla et al. (2016), and the questionnaire construct contains 14 questions.

However, a widely used rating scale is the Likert scale. For example, a questionnaire survey based on the 8 components of COSO is operationalized using three items for each component. Each item is rated on a 7-point Likert scale (Togok et al., 2016). The COSO methodology was partially used in a study where the ERM metrics were

three indicators, namely the scope of the ERM system (rated on a 5-point Likert scale), the definition of ERM (3 statements, +1 point each), and the COSO framework (+3 or +2 or +1 depending on the level of implementation) (Pérez-Cornejo et al., 2019).

In the COSO-inspired questionnaire surveys, direct reference to the original methodology is evident, and the authors do not deviate significantly in the questionnaire survey design and ERM metrics. Differences appear in the formulation of the individual components, specific operationalization, and the scale of measurement of ERM levels.

The other questionnaire survey uses different ERM metrics. For example, the author Sekerci (2015) uses the 7 components of ERM – 7 components of ERM – formal report, board level committee, formal written risk management philosophy (policy), formal written statement of firm's risk appetite, centralized department or staff function dedicated to risk management, assignment of risk owners, centralized process using technology. Other authors identify 3 dimensions of ERM which they operationalize into 14 statements (Brustbauer, 2014; Glowka et al., 2020). Author Mohd (2011) identifies 38 items, which divided into three categories – policies and procedures, response and review, and cost-effectiveness evaluation.

The author described the main ERM identification methods that have developed since the development of the ERM approach. The different methods differ in their structure, complexity, and simplicity/ or difficulty of data collection.

May the authors choose any method, or are they limited by certain assumptions that predetermine their preferred method? Based on a literature review which the author then enriches with own research, the author analyses the associations between firm size and ERM level.

## 2. Material and methods

This section describes the methods applied in the paper. The paper considers two aspects of firm size – if firm size is related to the ERM method and if firm size is a determinant of ERM implementation.These two aspects of firm size are examined using different methods, which are described below. Taken together, the two aspects present an integrated view of the association between firm size and ERM.

A literature review was employed to answer if an association exists between firm size and the ERM methodology. The empirical studies were analysed using a literature review from 2010–2021 using Web of Science and Scopus (keywords: "ERM", "Enterprise Risk Management").

To answer if firm size is a determinant of ERM implementation, primary data research was used. Based on the literature, a quantitative questionnaire survey was employed as a fitting method for data collection in SME. Data were collected October–November 2021 across non-financial SMEs in the Czech Republic (the firm's size was evaluated on the basis of the number of employees). First, the level of ERM in the SME was evaluated using Latent Class Analysis (LCA). Based on the types of variables (binary variables), the author considers the segmentation method appropriate. The questionnaire survey construct for ERM contains many proxy variables that enter the latent variable. By using the LCA method, commonalities can be identified across classes that will help to assess the current usage of ERM levels. LCA is robust and not burdened by assumptions about data normality, linear correlation or homogeneity of variances (McCutcheon, 1987). To evaluate whether firm size is a determinant of ERM, a contingency table was calculated to show the association between the number of employees and the level of ERM (including chi-squared test, Gamma coefficient and Kendall's Tau-b).

## 3. Results

The paper is pursuing two objectives and hence the results are divided into two parts – firm size as a driver for ERM methodology (based on the literature review) and firm size as an ERM determinant (based on the own research provided by the author). The results of the paper are then synergized in the Conclusion section.

### 3.1. Firm size as a driver for ERM methodology

The purpose of the chapter is to analyse if an association exists between the sample of data and the method of ERM identification.

The author focuses on the following methods that have been identified in theoretical background – content analysis, ERM index and questionnaire surveys.

Content analysis was used for American financial companies where the keywords searched were Chief Risk Officer or Director of Risk Management (Pagach & Warr, 2010). A study from the financial industry used a detailed search of financial reports, and other sources for evidence of ERM activity (binary scale) (Hoyt & Liebenberg, 2011). A similar method of searching for keywords across public documents was used by the authors for listed on the Malaysian Stock Exchange (Tahir & Razali, 2011). Other studies have also used a pre-defined data sample using the databases – S&P risk management rating (Baxter et al., 2013; McShane et al., 2011; Nair et al., 2014), American Institute of Certified Public Accountants (AICPA) and the Canadian Institute of Chartered Accountants (CICA) (Quon et al., 2012).

A questionnaire survey inspired by the COSO methodology was used in a study that examined firms listed on the Thailand Stock Exchange (Laisasikorn & Rompho, 2014). Other empirical studies inspired by the COSO methodology have used Listed on the Malaysian Stock Exchange (Ai Ping & Muthuveloo, 2015), US-based publicly traded firms (Callahan & Soileau, 2017), largest firms in Denmark (Sax & Andersen, 2019).

The results of the literature search show that companies listed on stock-exchange or large companies mostly use content analysis and questionnaire as a method to identify ERM. Only a few studies have used the ERM index. The study using the ERM index according to Gordon (2009) used sample data listed firms in the UK (Malik et al., 2020). Another study used data of Asia Pacific listed firms (Naseem et al., 2020)

In the studies where the companies surveyed were SMEs, only the questionnaire survey method was used.

The empirical study in Zimbabwe used a quantitative questionnaire survey where respondents (n = 119) were owners and managers of the firms in question. They responded to the 4 dimensions of ERM inspired by Lundqvist (2015). The results of the study indicate the need for further analysis in terms of differences in ERM adoption in relation to firm size, firm age and firm affiliation (Jenya & Sandada, 2017). Another study from an SME in Pakistan used a structured questionnaire inspired by the 6 items (Sax & Torp, 2015) where the respondents were owners and senior managers (n = 304). The authors Rehman and Anwar (2019) also used a questionnaire survey by Sax and Torp (2015) for empirical research to investigate the significance of the relationship between ERM and SMEs. The authors investigating SMEs in Malaysia used a questionnaire survey with statements that was inspired by the 8 COSO components. Respondents (n = 105) identified "Environmental Control" and "Risk Appetite" as the main components of ERM practices used in SMEs. A study also using a COSO-inspired questionnaire construct showed that "Information and Communication" was the most frequently used component in ERM (Suttipun et al., 2019). A study (Kulathunga et al., 2020) in Sri Lanka examined ERM across all SME sectors. A structured questionnaire was used, with respondents (n = 319) answering 6 questions inspired by Sax and Torp (2015).

In contrast, a study analysing family SMEs chose to proxy ERM by the presence of a CRO in the firm (Glowka et al., 2020), the study analysed the tourism sector and recommends further case studies across more sectors in the country.

Content analysis has a number of disadvantages, these include different levels of company disclosure across firms and sectors (e.g., Danisman & Demirel, 2019; Silva et al., 2019; Zungu et al., 2018). In most countries and sectors, disclosure of information in relation to the risk management is on a voluntary basis. These prerequisites may have a direct impact on the range of the sample of examined firms. The obligation to disclose information about risk management systems is imposed on stock-exchange companies, top-ranking companies, or regulated companies. Among other things, publicly available documents may not contain all the necessary information for the ERM identification or calculating ERM index, as not the primary purpose of the disclosure. The information may even be overstated, and the published information may not be consistent with the actual implementation of ERM.

The rigorous content analysis method (without other complementary methods) does not provide researchers / authors sufficient information to properly understand or evaluate the level of ERM.

On the other hand, it is the most straightforward method of obtaining data, considering the time and financial effort involved.

The same limitations apply to the ERM indexes which are based on this method. A keyword search is used to determine whether a company is an ERM user and then an ERM index is computed. The calculation of the indexes can be a demanding area, as the information may not be publicly available.

Content analysis is based purely on objective information, which may be advantageous compared to the questionnaire survey. On the other hand, according to many authors, the documents published by the company do not tell the true state of the ERM approach. In some cases, this may be a marketing initiative to increase the competitiveness of the company. However, there is no doubt about the validity of the content analysis. Content analysis and ERM indexes have limitations in terms of obtaining the necessary information. The authors attempt to reduce this limitation by using a pre-identified data sample with publicly available information. However, this may bias the results of the research.

Based on a detailed analysis of empirical studies, it is evident that firm size plays a crucial role in the decision of which method to use to identify ERM. Large firms are compact with all methods, but SMEs can only use questionnaire survey.

The literature review presented recommendations for researchers on which ERM methodologies are appropriate to use for which types of companies. The literature search shows evidence that firm size is an important factor in deciding which ERM methodology to use to obtain adequate and meaningful results.

### 3.2. Firm size as an ERM determinant

Research shows that firm size and complexity firm positively influence ERM implementation (Gordon et al., 2009; Sprčić et al., 2017). At the same time, large and relatively complex companies require a formal, comprehensive methodological framework for ERM. Smaller and less structured companies may adopt a less formal and structured approach to ERM. In cases of informal risk management, the need to implement ERM decreases. The size and complexity of the firm is related to its existence, which is a crucial control variable (Brustbauer, 2014; Hoyt & Liebenberg, 2011). Small enterprises lack resources and reliable mechanisms to support their risk management activities (Brustbauer, 2014).

On the other hand, the implementation of formal ERM is a costly affair and therefore implementation is more affordable for large, capital-intensive companies (Faisal & Hasan, 2020; Iswajuni et al., 2018).

Previous studies show that firm size might be a determinant for ERM implementation.

The author of this paper conducted her own research in SMEs in the Czech Republic (primary data collection was conducted in 2021). The intended sample of respondents was 300 to maintain the representativeness of the sample, quota selection was used to ensure the possibility of generalizing the results. The final data sample was 296 (based on the results of the reliability of responses).

The research focused on identifying if firm size is a ERM determinant within SMEs. The data sample was divided based on the number of employees as shows in Table 1.

Table 1. Firm size based on the number of employees in the sample (Czech republic) (source: Author (2022)

| | Absolute number | Relative number |
|---|---|---|
| 4–49 employees | 159 | 53.7 % |
| 50–99 employees | 77 | 26.0 % |
| 100–249 employees | 60 | 20.3 % |

To identify the ERM level, the author used a questionnaire survey by Sprčić et al. (2017). It consisted of 14 statements with a binary scale (1 – agree with the statement, 0 – disagree with the statement). Respondents were mostly owners/managers and directors of companies.

The results show that the three latent classes appear to be optimal (based on a comparison of the BIC values in each class). These three classes identify different levels of ERM implementation within SMEs in the Czech Republic – (1) no ERM, (2) informal ERM and (3) best practice ERM.

To evaluate whether firm size is a determinant of ERM, a contingency table was calculated to show the association between the number of employees and the level of ERM. The results are in Table 2.

Table 2. Contingency table – relationship between firm size and ERM level (source: Author (2022)

| Number of employees | | No ERM | Informal ERM | Best-Practice ERM | Total |
|---|---|---|---|---|---|
| 4–49 | Observed | 64 | 69 | 26 | 159 |
| | % within row | 40.3% | 43.4% | 16.4% | 100% |
| | % of total | 2.6% | 23.3% | 8.8% | 53.7% |
| 50–99 | Observed | 22 | 24 | 31 | 77 |
| | % within row | 28.6% | 31.2% | 40.3% | 100% |
| | % of total | 7.4% | 8.1% | 10.5% | 26% |
| 100–249 | Observed | 12 | 18 | 30 | 60 |
| | % within row | 20 % | 30% | 50 % | 100% |
| | % of total | 4.1% | 6.1% | 10.1% | 20.3% |
| Total | Observed | 98 | 111 | 87 | 296 |
| | % within row | 33.1% | 37.5% | 29.4% | 100% |
| | % of total | 33.1% | 37.5% | 29.4% | 100% |

*Note*: $\chi^2$ test = 30.2, Gamma = 0.388, Kendall's Tau-b = 0.254.

Based on the results of the chi-squared test, Gamma coefficient and Kendall's Tau-b, a significant direct association between the level of ERM and firm size was found.

The results show that in the group of larger and medium-sized enterprises (100–249 of employees) there is a significantly higher proportion of enterprises with a higher level of ERM. Enterprises with 4–49 employees show that the largest representation is of firms with no ERM (40.3%).

The results show two conclusions – firm size is a determinant of ERM implementation and at the same time there are even differences among SME firms.

## Conclusions

This paper examines firm size as a possible driver of ERM identification and as an ERM determinant.

Based on the literature review conducted, the author concludes that firm size is a key driver for ERM method selection. All ERM identification methods are suitable for publicly traded firms, large firms, international firms, or top-ranked firms. However, for SMEs only a questionnaire survey is a possible method. SMEs are not strictly regulated and at the same time they are not obliged to disclose information regarding their risk management system. At the same time, in SMEs, ERM can be used in a tacit way, not formally embedded in internal guidelines.

Content analysis and ERM indexes are methods that require objective data that can be obtained from publicly available documents. This fundamental limitation excludes SMEs as sample data for these methods. However, the questionnaire survey is suitable for all sizes and types of companies. Researchers need to identify the suitability of each questionnaire survey with respect to the size and complexity of the firm.

The author of this paper conducted own research within SMEs in Czech Republic, which confirmed the positive association between firm size and ERM level. The firm size is a significant ERM determinant. The originality of the paper lies in the detailed analysis of the differences in the influence of firm size on ERM levels in individual SME groups divided by number of employees. The results even show significant differences between micro- and small-sized enterprises with respect to ERM level.

The positive influence may be because as the size of the firm increases, the need to manage the firm through formal procedures and internal guidelines.

Small businesses lack resources and reliable mechanisms to support their risk management activities (Brustbauer, 2014). Moreover, for small businesses that are not under regulatory pressure, full implementation of ERM may not be desirable, as the costs associated with ERM are not outweighed by the benefits of ERM. Larger companies are more formalized, have a greater need for more effective ERM techniques, and therefore may be able to implement ERM due to greater resources.

The level of risk management in Czech non-fincial SMEs is still relatively low, although many small and medium-sized enterprises have already implemented some components of ERM. This finding supports the argument of economic of scale that larger companies have a more developed risk management process due to their larger exposure to risk and high implementation costs. Accordingly, most studies show that larger companies are more likely to implement ERM activities (Sprčić et al., 2017). However, this finding may not hold true for large listed companies where there is no significant difference in the scope of ERM implementation by firm size (Hernández-Madrigal et al., 2020).

An opportunity for further research is to identify other drivers for the selection of ERM methods, e.g., detailed analysis of industries or sectors.

At the same time, identifying other ERM determinants and what direction the association between a particular determinant and ERM level. The author of the paper proposes for further research the analysis of firm age as an ERM determinant. Firm age is generally directly related to firm size. However, higher firm age may cause resistance to change or rigidity of management to use traditional risk management.

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