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Exploration of the Factors that Influence the Implementation of Environmental Management Systems—The Case of Slovakia

Eva Petrová *, Tomáš Štofa * and Michal Šoltés

Department of Banking and Investment, Faculty of Economics, Technical University of Košice, Němcovej 32, 040 01 Košice, Slovakia; michal.soltes@tuke.sk

* Correspondence: eva.petrova@tuke.sk (E.P.); tomas.stofa@tuke.sk (T.Š.)

Abstract: Considering internationally accepted voluntary standards of an environmental management system (EMS) as tools that can help businesses meet the agenda for sustainable development and environmental wellbeing, this study aims to examine selected firm characteristics and financial performance that are potentially related to decisions of business entities in the matter of voluntary EMS implementation. We conduct empirical research based on logistic regression to study Slovak firms that are or are not certified according to ISO 14001 and EMAS standards. Our results suggest that there are several factors potentially determining the positive company choice to adopt voluntary EMS. We have confirmed the positive effect of firm size and research and development, however, we were not able to confirm the effects of foreign ownership and profitability effects. In the case of indebtedness, we have found a stronger negative effect of long-term debt. Our results also suggest a positive effect of owning a website, where companies can share information about their certificates. On the other side, especially younger companies tend to be interested in voluntary EMS.

Keywords: business management; voluntary EMS; ISO 14001; EMAS

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1. Introduction

Climate change has been recognized as a significant problem for our planet for a long period and its significance is continuously growing, so more appropriate measures have been emerging at all levels of society. Paris Agreement (2015) as the first global agreement of its kind reflects a notable shift in the reaction to climate change threats. Governments agreed to take actions to promote the transformation to zero-carbon economies in order to slow down global warming. Financial regulators and investors are becoming increasingly interested in the state of readiness of the business sector to address climate change-related challenges and the resulting risks and opportunities, both in terms of mitigation of negative impacts and business adaptation to them as well. There is rising consumer pressure with expectations of consumers and the general public towards companies. Taking into account current society-wide trends and rising regulatory, market and societal pressures, we assume that "business as usual" will no longer be a good indicator of companies' performances for their stakeholders. We can see a lot of challenges for businesses to meet the expectations of different types of stakeholders to continuously improve the environmental performance of firms (Simpson and Sroufe 2014; Roberts 1992). Based on the aforementioned, it seems to be a legitimate presumption that companies should proactively follow the increasing trend in addressing climate change in order to gain or keep their competitiveness, creditworthiness and to achieve or keep sustainability in their financial and business performance. Ideas that emphasizes the importance of forward-looking environmental management in companies are increasingly present nowadays. Environmental management represents one of the single components of business environmental engagement, reflecting the level of a firm's environmental responsibility. In this view, voluntary standards for an Environmental Management System (EMS), particularly certification ISO 14001—Environmental Management Systems and EMAS (Eco-management and Audit Scheme certification) as internationally

well-known environmental standards, could contribute, at least in part, as they can be seen as a way to help companies meet legal requirements and keep expectations of shareholders and other stakeholders. As a non-market instrument, serving for the adoption of management practices aimed at pollution reduction, transparency and efficiency achievement in business (Haque 2020), they can become tools of choice for businesses to help them manage environmental issues and to signal their corporate environmental engagement to stakeholders.

However, as mentioned by Nakamura et al. (2001), investments in a proactive search for win-win solutions to environmental problems in business, if not mandated by regulation, could be considered by firms to be highly risky and inconsistent with profit maximization. Therefore, our main goal is to analyse which particular firm characteristics and financial performance are critical to a positive decision to implement voluntary EMSs into business management processes of firms.

Only a few empirical studies have been devoted to the analysis of the relationship between firm characteristics, financial performance and voluntary EMS implementation by firms. Most studies have covered developed economies and determinants of voluntary EMS implementation that are to the best of our knowledge not examined in the Slovakian context and sparsely in Eastern Europe. Considering the assumption of some previous research that institutional conditions in a country context also influence firms' environmental behaviour, we aim to extend previous research through a perspective of Slovakia and explore whether the results of our research are consistent with previous findings related to other countries with different institutional conditions. Haque (2020) defines these institutional conditions in a country context as the "rules of the game", that consist of formal aspects (rules, law, constitutions), informal aspects (norms of behaviour, conventions, codes of conducts) and their enforcement characteristics. Slovakia, as one of the emerging market economies, still underperforms most other countries in the European Union in environmental protection. (European Commission 2019). Therefore, we see great scope for the improvement of the environmental performance of companies and government processes, where, for example, the update of pollution data is slow and is, therefore, postponed in the European Pollutant Release and Transfer Register in comparison to other countries. By analysing the impact of several firms' characteristics and financial performance on the adoption of EMS standards by firms within the context of Slovakia, we aim to reveal whether the results are consistent with other studies, no matter what the country specifics.

This study, therefore, empirically tests the validity of previous research, while additionally tests new variables in the context of the Slovak business environment, specifically website ownership and firm age.

In the article, we first explore the theoretical background. Subsequently, the empirical research process presenting data and the method applied to research is described. Results of the research are discussed in relation to previous empirical studies' conclusions. Based on our results and discussion, conclusions are finally summarized.

2. Literature Review

2.1. Environmental Aspects in Business and Their Link to Climate Risk

Climate change-related challenges are driven by both physical impacts of climate change and responding changes e.g., in the regulatory field, market trends, or technologies, following the need to act toward environmental aspects in business (Monnin 2018; Sakhel 2017; Weinhofer and Busch 2013). In that sense, the Task Force on Climate Change (TCFD 2017) generally categorizes climate risks related to the business environment into two major groups: (i) physical climate risks and (ii) transition climate risks. In this categorization, physical climate risks reflect potential economic and financial losses due to direct or indirect threats to business activities, arising from physical environmental consequences of climate change. On the other hand, both regulatory aspects, the market and changes in technology are sources of the transition climate risks. They arise from the efforts to mitigate future consequences of global climate change, mainly by the transition to a low-carbon

economy, but also by reducing the overall polluting impact of businesses, resulting in new costs for companies, that have not been considered yet. Both physical and transition climate risks could transform into substantive financial and strategic implications for businesses by their potential to affect the whole business value chain in several different ways (CDP 2020; Mazzacurati et al. 2018; Monnin 2018; Sanderson et al. 2019) and that is why increasing attention is being paid to address this kind of environment-related risks in business.

As stated by Colas et al. (2019) new initiatives have recently been emerging for pushing on the business field to develop and to enhance their climate-related financial disclosures in order to provide clear, consistent and comparable information to the public. Environmental take-carrying and environmental-related company's disclosure is supported by the Organisation for Economic Co-operation and Development (OECD) in Principles of Corporate Governance, highlighting the possibility to attract capital, maintain confidence in the capital markets, or avoid unethical behaviour and loss of market integrity.

At the firm level, there is, in addition to meeting some minimum standards of environmental protection, a demand to "increased commitment to the constant improvement of environmental performance levels through such activities as environmental monitoring, formal reporting and validation of environmental performance by independent agencies" (Nakamura et al. 2001). Nakamura et al. (2001) have identified three levels of a firm's commitment to environmental protection objectives. At the first level a firm identifies environmental objectives and institutionalizes them formally regardless of whether these environmental objectives are implemented or not. The second level includes the integration of environmental policy into company management policy with the substantial support of top executives. The third level of commitment represents the process of continuous improvement of environmental protection, which is validated by third-party certification. Voluntary implementation of standardized EMS, particularly ISO 14001 and EMAS, as stated by Simpson and Sroufe (2014), fits into the aforementioned third level, as they are considered to be reportable environmental management practices. Therefore, we refer to two EMS standards as a proxy to environmental management in firms, that presents one single component of environmental engagement at the firm level.

2.2. The Role of Voluntary Environmental Management System (EMS) Standards in Business

EMS standards provide guidelines for formulating environmental policy and targets, implementing and monitoring their environmental goals (Horváthová 2020; Morrow and Rondinelli 2002; Verchot et al. 2007). According to Ozusaglam et al. (2018), voluntary EMSs improve existing products or product lines, reduce input costs, solve efficiency in the management processes and serve as tools to reduce the risk of unexpected incidents concerning a company's physical climate risk. At the same time, they provide several external benefits, particularly serving as signalling tools to all stakeholders (Simpson and Sroufe 2014) and could ensure compliance with legal emission limits and other regulatory rules, contributing to business transition risk management. Standardized EMS could be viewed as a signal of proactive environmental behaviour within environmental-related financial disclosures of companies. The greener image of the company could increase the trust of employees, consumers, shareholders and insurers, make better access to financial markets and reduce insurance charges and so affecting the firm's business performance, as stated by Ozusaglam et al. (2018). EMS standards can be considered to be supporting tools for climate change adaptation and mitigation schemes in business (Verchot et al. 2007), as they provide systematic approaches in addressing environmental aspects from a business perspective.

The most common standards in the European region are well known and internationally accepted ISO and EMAS standards. ISO 14001 represents the minimum requirements of an environmental management system for organizations in any industry or field. As stated by Johnstone (2020), ISO 14001 standards are quantifiable performance measures upon documented processes and procedures that primarily improve firm-level environmental and financial impacts. The second standard, the European Union (EU) Eco-Management and Audit Scheme (EMAS) is a voluntary European Union instrument designed for organi-

zations to help assess, manage and improve their environmental performance. While both share identical objectives, EMAS, compared to ISO, considers some additional requirements for organizations to provide its certification.

2.3. Factors Explaining the Circumstances of Standardized EMS Implementation

There are several studies examining factors potentially linked to decisions to participate in voluntary environmental activities. Research has been empirically conducted across various countries, like e.g., Japan (Hibiki et al. 2003; Nakamura et al. 2001; Nishitani 2009), India (Singh et al. 2014, 2015), France (Nadel et al. 2016; Ozusaglam et al. 2018), Germany (Morrow and Rondinelli 2002) and others. However, there are few studies examining Europe. Most studies draw attention to ISO 14001, but there are also similar studies employing other types of environmental standards or other ways of systematic environmental management in firms (e.g., Arora and Cason 1996; Blackman and Guerrero 2012; Kouloukoui et al. 2019b).

Nakamura et al. (2001) postulated two types of model to explain positive choice for implementation of EMS. One type of model is based on simple profit maximization and thus involves variables, that could potentially affect costs and benefits resulting from EMS's implementation. The second type of model is based on utility maximization/organizational agency relationships and it additionally involves variables potentially affecting the utility of managers and their behaviour. Our study follows a simple profit maximization model and is based on selected firms' characteristics and financial performance used in several previous studies. The study analyses the impact of the following main characteristics of EMS adoption: firm size, age, industry classification, ownership origin, profitability, indebtedness, research and development (R&D), and website ownership.

Size and age: this is the basic and the most discussed firm characteristic associated with participation in voluntary environmental management programs. Hibiki et al. (2003); Horváthová (2020); Nakamura et al. (2001); Nishitani (2009) and Singh et al. (2014) suggest that the probability to implement voluntary EMS rises with the firm's size. Nakamura et al. (2001) explain that size of the firm affects the capacity to take environmental action since certification involves some significant fixed costs and these costs are less significant for larger firms than for smaller ones because of economies of scale in certification processes. However, Ozusaglam et al. (2018) describe the relationship between firm size and EMS adoption as an inverted U-shape, concluding that moderately large or medium-sized companies are those with a higher probability to voluntarily adopt standardized EMS. This can be explained by much higher implementation costs that large firms have in relation to extensive employee participation and documentation of the organization's processes (Kollman and Prakash 2001; Ozusaglam et al. 2018). Mueller et al. (2009); Ozusaglam et al. (2018) and Simpson et al. (2007) state that large firms prefer to develop their own yet not standardized or certified voluntary EMS. Another reason for the size impact on the participation of the company on environmental issues is based on legitimacy theory which explains that larger firms are more "visible" to the public and so are more environmentally active in order to enhance their reputation (Kouloukoui et al. 2019a). The company size was in the literature measured using various proxies: assets (Horváthová 2020; Kouloukoui et al. 2019a), number of employees (e.g., Nakamura et al. 2001; Nishitani 2009; Ozusaglam et al. 2018), or even sales.

Regarding firm age, Singh et al. (2015) have found a net suppressor effect, where there is a positive correlation with EMS adoption but it has a significant negative regression coefficient. Similarly, Ho et al. (2017) state that the older companies have a much higher chance to implement EMS. On the other hand, the negative effect could be explained by the employees and stockholder resistance to change, emphasized by Low et al. (2015). Therefore, the older the company, the lower the chance to adopt EMS.

Industry classification: several studies find industry effects to be an important determinant of EMS implementation (e.g., Hibiki et al. 2003; Horváthová 2020). Industry classification could be based on several aspects, e.g., on level of pollution (Kouloukoui et al. 2019a;

Muttanachai and Stanton 2012), manufacturing vs. services (Ozusaglam et al. 2018), regulated vs. non-regulated (Weinhofer and Busch 2013). Some authors use simple diversification of industries according to NACE Statistical classification of economic activities in the European Community (Horváthová 2020), or another national industry classification codes (Singh et al. 2014) for further analysis based on more detailed industry characteristics. As stated by Nishitani (2009), companies with a higher environmental burden generally tend to adopt voluntary EMS. Considering industry specification as a proxy to the environmental burden, we expect higher activity in areas with higher environmental pollution.

Domestic/foreign ownership structure: as stated by Nakamura et al. (2001), foreign ownership could lead to different potential results. On the one hand, foreign owners do not need to improve the environmental situation in a foreign country above the level required by law, but on the other hand, they can bring a good name for the company and enhance their competitive position in foreign markets. Furthermore, maintaining a good corporate image can affect the voluntary adoption of international standards. Similarly, Wang and Jin (2007) have identified a positive influence of foreign ownership on environmental performance in China, so these companies are considered to be more likely to adopt EMS standards.

Profitability: results of several previous studies examining the impact of profitability interpreted by different indicators as Return on Assets (ROA), Return on Equity (ROE) are inconsistent. The basic assumption is that more profitable firms are more financially flexible, i.e., they can use internal funds, but they also benefit from better capital access and lower capital costs. However, only a few studies could find a relationship between profitability and the environmental participation of firms. Examining ISO 14001 adoption, Nishitani (2009) and Nakamura et al. (2001) confirmed a positive relationship between profitability and initial EMS adoption. By contrast, Horváthová (2020) has not found any significant relationship between profitability and EMS adoption.

Debt ratio: debt ratio represents the level of indebtedness and reflects the capital structure of an organization, so it could determine the financial flexibility and the costs of capital, but also the influence of different stakeholders on the environmental behaviour of firms. Kouloukoui et al. (2019a, 2019b); Lu and Abeysekera (2014) and Roberts (1992) perceive debt financing to be a sign of a higher creditor's power over the firm, to which firm responds by striving for the fulfilment of the expectations concerning the firm's role in socially responsible activities. On the other hand, Nakamura et al. (2001) suggest that firms with heavy short-term debt are less likely to place a priority on aspects, that does not appear to affect directly their economic performance. These companies try to implement projects, which can be directly valued by revenues. However, the results are also inconsistent, because Horváthová (2020) states that there is no significant impact of indebtedness on the EMS implementation when examining the total debt ratio.

R&D: considering R&D activities as a capacity to implement new knowledge within the company and make use of new resources (Wakke et al. 2015; Cohen and Levinthal 1990), R&D intensity could be one of the factors potentially influencing the likelihood to participate in standardized voluntary EMS. Firms investing more in R&D activities are more likely to adopt EMS because they will be able to find technological solutions to their environmental problems (Nakamura et al. 2001). On the other hand, the low R&D activity could limit the ability to mitigate environmental impact and, therefore, these companies would omit the certificate implementation.

Website ownership: regarding the use of information technology, the impact of website ownership on the adoption of EMS was also examined. This variable was not analysed in the empirical literature according to our knowledge. However, Hudson and Orviska (2013) suggest that ISO 9000 and 14000 certification is positively correlated with a company's use of the Internet to communicate with clients because it represents a progressive and entrepreneurial attitude. Their own website, as an online communication tool, represents a place that facilities the acquisition of all types of data, as with other communication methods, but also information about the certification. As Hudson and Orviska (2013)

suggested, signalling company quality can be crucial in reaching distant markets. Website ownership can help to achieve this goal by providing information about the company as well as the quality of the company indicated through successful certifications.

3. Data and Methodology

To analyse the relationship between selected company characteristics and voluntary EMS adoption, information related to EMS implementation was collected from several sources. We created a list of Slovak firms implementing EMAS from publicly available European register of EMAS certified organizations, published by the European Commission (2020). Information related to ISO 14001 Slovak certified companies were gathered from several Slovak certification agencies accredited by SNAS (Slovak National Accreditation Service) and their websites, or upon request. ISO surveys served to validate the information about total number of certified companies in Slovakia. According to internationally published ISO surveys (Charlet 2019), there are 1710 ISO 14001 certified companies in Slovakia for 2019. We managed to make a list of about 1100 Slovak companies certified by ISO 14001 to September 2020 and we obtained the full list of 20 Slovak companies certified by EMAS. A firm's decision to implement an EMS is a dependent binary variable, with regard to value, if the firm has an EMS certification (ISO 14001 or EMAS), or zero otherwise. This variable is tied to September 2020, in terms of time.

Financial data and other relevant firm characteristics come from FinStat (2019), the Slovak commercial database of financial statements and annual reports. We gained a list of about 130,000 Slovak companies. However, not all companies reported full financial and firm data. After cleaning up and merging data from all the aforementioned sources, we gained a final sample of 64,846 companies, which contained 952 EMS certified companies. This dataset contains financial and other reported firm data for the year 2019, signified as time $t - 1$.

Due to the nature of the data, we decided to modify this data and transform the extreme values using the winsorizing method. We have used 90% winsorization, where all data below the 5th percentile and above the 95% percentile were replaced by the corresponding percentile to obtain more robust estimators than in the standard form.

Table 1 presents the basic statistics of the categorical variables used in the model. In this dataset, we have analysed both ISO 14001 and EMAS certificated companies, although these certificates are not substitutes in practice, as stated by Horváthová (2020). Most companies represent micro-sized firms with domestic ownership. This distribution corresponds to real market conditions.

Table 1. Summary of categorical variables.

Variable	Level	Frequency	Share
EMS	FALSE	63,894	98.53%
	TRUE	952	1.47%
FirmSize	Micro	54,096	83.42%
	Small	8148	12.56%
	Medium	2079	3.21%
	Large	523	0.81%
Industry	NACE A	2057	3.17%
	NACE—BCF	758	1.17%
	NACE—DE	25,987	40.07%
	NACE—GHI	14,816	22.85%
	NACE—JLMNRS	21,228	32.74%
Ownership	Domestic	57,586	88.80%
	Foreign	7260	11.20%
WebPage	FALSE	35,106	54.14%
	TRUE	29,740	45.86%

To describe the size of the company, we chose a categorical variable based on the number of company employees. The number of employees was used in Nakamura et al. (2001); Nishitani (2009) and Ozusaglam et al. (2018), although they used the number itself or its logarithmic value. Critical values for the distribution of the size of companies are based on the globally accepted rules shown in Table 2. Company assets or the number of branches could be also used to define the size of the company, but problems of possible multicollinearity limited the choice of variable to the number of employees.

Table 2. Division of firm size variable.

Group	Number of Employees	Count
Micro	0–9	54,096
Small	10–49	8148
Medium	50–249	2079
Large	>250	523

Industry classification is based on NACE codes and we follow exactly the approach used in the study of Horváthová (2020), so we group NACE codes into the following groups: NACE—A (Agriculture, forestry and fishing), NACE—B, C, F (Mining and quarrying, Manufacturing, Construction), NACE—D, E (Electricity, gas, steam and air conditioning supply, water supply, sewerage, waste management, and remediation activities), NACE G, H, I (Wholesale and retail trade; Repair services, Transporting, Accommodation and food service), NACE J, L, M, N, R, S (Information and communication, Real estate activities, Professional, Scientific and technical activities, Administrative and support service activities, Arts, entertainment and recreation, Other services activities). Most of the companies come from the last 3 groups, representing one group with a higher environmental burden and two groups representing services.

Company ownership is used to monitor the impact of foreign ownership on the adoption of EMS. As can be seen, most companies represent companies owned by residents. Most foreign-owned companies are medium and large companies. The main objective of this variable is to determine the effects of foreign ownership on the implementation of the EMS, similar to Nakamura et al. (2001).

To analyse the level of reach on the internet we have used the binary variable characterizing the existence of the company webpage, where a company can share the information with the public about focus, products or even their certification. The effects of this variable could not be found in the literature.

Continuous variables are described in Table 3. These calculations are based on already winsorized variables, therefore the extreme values of the data are limited. Since most of the numerical variables were normalized as a ratio to the total assets, we did not use the assets themselves in the model and the firm size was measured by the categorical variable above.

Table 3. Summary of continuous variables.

Variable	n	Mean	sd	Median	Min	Max
R&D	64,846	0.0002	0.0050	0.0000	0.0000	0.4963
FirmAge	64,846	11.2104	7.1011	11.0000	2.0000	26.0000
ROA	64,846	0.1231	0.2284	0.1105	−0.4280	0.5850
ShortTermDebtRatio	64,846	0.4601	0.4072	0.3460	0.0289	1.1001
LongTermDebtRatio	64,846	0.0789	0.1399	0.0091	0.0001	0.5058

The profitability of the company is calculated as the return on assets (ROA) indicator using earnings before interest, taxes, depreciation, and amortization (EBITDA) and total assets of the company. ROA was used by Horváthová (2020), although she found no significant impact. Kouloukoui et al. (2019a) state that profitability is an important factor when examining voluntary projects implemented.

The short-term and long-term debt was expressed as the debt-to-asset ratio indicators, to normalize the variable and create a comparable indicator within our dataset. As Kouloukoui et al. (2019a) stated, there is a negative association between corporate climate risk disclosures and the level of indebtedness, therefore we could expect lower EMS implementation efforts. In the context of Nakamura et al. (2001), we expect short-term debt companies to be more focused on activities that are fast-paced as a result of the settlement, and thus their EMS efforts will be lower.

We also analysed the influence of the age of the company on the adoption of EMS itself. As FinStat also contains data on the date of establishment of the company, it was possible to calculate the age of these companies whereby this value has been rounded to years.

To assess R&D expenditures, we used a balance sheet item from the financial statements of these companies. This value represents long-term intangible assets created by their research and development. This value was normalized concerning the size of the enterprise represented by total assets. As stated by Hibiki et al. (2003); Nakamura et al. (2001) and Wakke et al. (2015), companies with higher R&D expenses are more likely to have an EMS system.

This study is based on the study of Horváthová (2012, 2020) which examines the impact of selected firms' characteristics and financial performance on EMS adoption in the Czech Republic. Similar empirical studies have been conducted in Japan (Nakamura et al. 2001), Malaysia (Singh et al. 2015) and other countries. In this paper, we study factors determining the implementation of the EMS system, with two possible outcomes—implemented and not implemented. Given this binary character of a response variable, we construct an empirical model based on logistic regression to analyse factors potentially affecting a firm's decision to implement EMS.

Based on the literature review we take into account several variables and test their impact on voluntary standardized EMS adoption. The model explains the probability that the firm will choose to adopt a voluntary third-party environmental certification (in this context ISO 14001 or EMAS). These independent variables contain a set of financial variables, as well as non-financial properties of the company. Industry effects were assessed by the NACE categorization. To better explain the impact of the variables, log odds have been calculated. The model was built based on Horváthová (2020) and is shown in Equation (1) below.

$$\begin{aligned} P(EMS_{i,t} = 1) = \; & \phi(a_i + \beta_1 \times FS_{i,t-1} + \beta_2 \times I_{i,t-1} + \beta_3 \times O_{i,t-1} + \beta_4 \times RD_{i,t-1} \\ & + \beta_5 \times FA_{i,t-1} + \beta_6 \times WP_{i,t-1} + \beta_7 \times P_{i,\,t-1} + \beta_8 \times SD_{i,t-1} \\ & + \beta_9 \times LD_{i,t-1}) + e_{i,t} \end{aligned} \quad (1)$$

where:

$EMS_{i,t}$	is a binary variable about implementation of EMS by the firm i in time t
$FS_{i,t-1}$	is the size of the company i in time $t-1$
$I_{i,\,t-1}$	is industry classification of the company i in time $t-1$
$O_{i,t-1}$	is ownership type of the company i in time $t-1$
$RD_{i,t-1}$	is knowledge capital ratio of the company i in time $t-1$
$FA_{i,t-1}$	is the age of company i in time $t-1$
$WP_{i,t-1}$	is the availability of the company i webpage in time $t-1$
$P_{i,t-1}$	
$SD_{i,t-1}$	is the short term debt to assets ratio of the company i in time $t-1$
$LD_{i,t-1}$	is the long term debt to assets ratio of the company i in time $t-1$
a_i, β_1-β_9	is a constant and coefficients of the logistic regression
$e_{i,t}$	is the error term

The adoption process usually takes several months, therefore we used the Horváthová (2020) methodology and the dependent variables are lagged by circa 9 months. In connection with the previous literature, we tried to analyse a wide range of potential determinants, while we narrowed this selection to 9 variables due to problems with multicollinearity as well as missing data.

4. Results and Discussion

This section is devoted to the description of the results of logistic regression used in this study to explain what factors increase the probability to implement EMS by companies in Slovakia. Results are shown in Table 4. To make the effect of the individual variables more visible, we calculated the values of log odds. At the same time, we also present the probit model as a robustness check.

Table 4. Logistic regression results.

Variable	Logit Model	Log Odds	Probit Model
(Intercept)	−3.0345 (***)	0.0481	−1.8355 (***)
FirmSize_small	2.4291 (***)	11.3492	1.1430 (***)
FirmSize_medium	3.8502 (***)	47.0044	1.9418 (***)
FirmSize_large	4.5971 (***)	99.1971	2.2750 (***)
Industry_NACE_DE	1.2724 (***)	3.5694	0.5982 (***)
Industry_NACE_JLMNRS	−0.9218 (**)	0.3978	−0.3504 (**)
Industry_NACE_BCF	0.3392	1.4040	0.2226
Industry_NACE_GHI	−1.0542 (**)	0.3485	−0.4091 (**)
Ownership_Foreign	0.1910	1.2105	0.0298
R&D	5.5467 (*)	256.4028	2.3726 (*)
FirmAge	−0.4558 (***)	0.6339	−0.1659 (***)
WebPage_TRUE	2.6332 (***)	13.9188	1.0866 (***)
ROA	−0.3698	0.6908	−0.1616
ShortTermDebtRatio	−0.6312 (***)	0.5319	−0.2107 (***)
LongTermDebtRatio	−1.7395 (***)	0.1756	−0.7255 (***)
McFadden Pseudo R2	0.5792		0.5412

The significance codes marked as (*), (**), (***) correspond to the significance levels $p < 0.1$, $p < 0.05$, $p < 0.01$.

The model suggests that larger companies are more prone to adopt voluntary and standardized EMS, and therefore we can confirm the positive relationship of firm size to EMS adoption. This is in line with the studies as Hibiki et al. (2003); Horváthová (2020); Nakamura et al. (2001); Nishitani (2009) and Singh et al. (2014). Larger companies usually have more resources to invest and therefore are more likely to adopt EMS. Although it seems that this relationship is not linear, we cannot confirm the results of Ozusaglam et al. (2018) of the U-shape of the relationship. According to the log odds, the relationship between the size and the EMS implementation is not linear.

In the case of industry type based on the NACE classification, the companies focused on providing services (groups G, H, I and J, L, M, N, R, S) show lower certification activity than reference group A representing agriculture companies. This indicates that such companies do not consider the EMS certificate to be conducive given their industry type. The log odds suggest the highest probability to adopt the EMS is in NACE group D and E, where we can find companies focused on electricity, gas, steam and air conditioning supply, water supply, sewerage, waste management, and remediation activities. These results are consistent with the study of Singh et al. (2015), where they found firms in chemical, agricultural and manufacturing sectors are more likely to adopt EMS. However, the group containing mining activities and manufacturing and construction companies does not show significant results in our dataset. This could be related to the findings of Hibiki et al. (2003), where they have found that manufacturing companies tend to be slower in EMS adoption. Polluting companies tend to be the targets of environmental regulatory agencies and are more likely to be monitored by the media and public, while the service companies do not. Therefore, given our results, we can assume there is a relationship between pollution and adoption of the EMS standards, indicating that environmental performance significantly affects EMS adoption, as stated by Horváthová (2020) and Nishitani (2009).

In the case of ownership, we were not able to confirm the significant impact of the ownership structure. This can be either a sign of mixed effects of foreign ownership

suggested by Nakamura et al. (2001), but also of big regional and cultural differences when compared to other studies such as Wang and Jin (2007).

The positive effect of R&D described by Hibiki et al. (2003); Nakamura et al. (2001) and Wakke et al. (2015) was successfully confirmed, while having the highest log-odds of the analysed variables. R&D expenditures can be understood as a degree of innovation in the company. The EMS standards require strict rules to be followed, which results in the need for better technologies. Therefore, especially innovative companies are showing an effort to adopt this system. This is in contrast with Singh et al. (2015), which suggests, that innovation motivations are not a significant factor to adopt EMS practices.

In this article, we also tried to examine the influence of the age of the company on the adoption of the EMS system. Although the beta coefficient is negative, the further analysis of dataset showed that there is a higher ratio of older companies with EMS implemented, therefore we assume to expect the existence of net suppressor effect described in Singh et al. (2015). There is a positive correlation between firm age and EMS adoption, but the beta coefficient is negative. As Singh et al. (2015) emphasize, 'the basic purpose of firm age is to suppress the error variance in firm size'. This is in line with Ho et al. (2017), where the companies older than 15 years are more likely to adopt EMSs.

In connection to previous results, it is necessary to mention the positive impact of a business website's existence on EMS adoption. As Hudson and Orviska (2013) suggested, companies with higher internet usage are more likely to adopt international standards. The presence of a company website makes it possible to share attractive information about the company's CSR (Corporate Social Responsibility) practices and certificates, which in turn can improve the company's competitive position, and improve corporate image, as presented by Singh et al. (2015). This result may also correlate with positive effect of a firm's size, on EMS adoption and so these results should be subject to further research.

In terms of profitability, we cannot confirm studies of Cormier and Magnan (2003); Hibiki et al. (2003) and Nishitani (2009), which claim that profitable companies have better opportunity to apply for EMS and so are more likely to adopt EMS standards. The impact of the ROA variable on EMS adoption is not statistically significant in our research and this result corresponds to the results of Horváthová (2020). However, it should be noted that the short-term profitability of companies was analysed. As the process of EMS implementation has a long-term character, further research should also consider profitability over a period of a few years.

On the other side, indebtedness seems to play an important role in the prediction of the dependent variable. According to Nakamura et al. (2001), the debt ratio could have similar effects as profitability, thus increasing the odds of adopting EMS standards. This claim was supported by Nishitani (2009) analysing the total debt ratio. In this paper, we want to point out possible differences between short-term and long-term debt financing. In general, we can confirm the results of these studies, as higher indebtedness has a negative effect on the explanatory variable. However, we must point out that in the case of long-term debt the probability to adopt EMS is lower. This also suggests high long-term debt amplifies financial pressures and thus these companies do not consider the effort to apply the EMS standards as a priority. This result is in contrast with Nakamura et al. (2001), where he points out that companies with high short-term debt focus on activities that affect economic results more quickly and, therefore, have a lower probability of EMS implementation. Hang et al. (2019) suggest, that EMS adoption and so better environmental performance significantly improves economic performance in a long run. This information also supports the view that financial performance has a significant impact on the adoption of the EMS, although the direct impact of the economic outturn has not been confirmed in this study. Considering non-consistent results in the literature and our study, this should be a subject for further research.

5. Conclusions

In this paper, we study the motivation of firms for the adoption of an environmental management system (EMS), namely certified ISO 14001 or EMAS environmental management systems. Merging all the relevant data and creating a list of Slovak companies with or without EMS certifications, we were able to confirm several assumptions indicated by other studies conducted both in developed and developing countries, while being the first to apply the research on the Slovak business environment. Our findings contribute to the knowledge of circumstances surrounding environmental management practices in business from a firm perspective.

In line with suggestions of previous research, firm size remains one of the most important factors of EMS adoption. This is likely due to higher financial possibilities, but also due to the increased attention of companies to reputation. A bigger company is generally "more visible" to all stakeholders, so under greater pressure of external stakeholders to manifest the image of being environmentally friendly. However, our results suggest a non-linear relationship between the size and the probability to implement EMS.

Sharing positive information about EMS standards adoption with the public by using their official websites seem to play an important role. We have found these pressures greater in younger companies with a higher share of R&D expenditures, which probably reflects the higher willingness of employees and managers to adapt to new things.

On the other hand, we could not support the idea that good financial results lead to the adoption of the standards, but we found that adoption is significantly affected by the debt ratio of the companies. In this context, there are significant differences between short and long-term debt. Although both values negatively affect EMS adoption, the long-term debt burden has a much higher impact. As EMS themselves do not have a directly visible impact on the economic outcome, in times of high debt, companies are focused on activities with direct and short-term returns. This is in contrast with the suggestions of Kouloukoui et al. (2019a) and other studies, that assume a positive relationship between the level of indebtedness and probability to adopt environmental programs, explained by greater creditor's power over the company and effort of the company to fulfil the expectations in CSR activities, or it could indicate currently weak attention of creditors on a firm's environmental behaviour. Should this be a case, practical implications towards Slovak financing institutions and their perception of firms' environmental pro-activities could be derived.

The main theoretical implications are represented not only by confirmation of other studies but also by expanding the knowledge to a perspective of Slovakia, as a country with different country conditions, specifically with different codes of conduct compared to previous research applied to developed countries. We also provide some new findings. This paper advances the knowledge in the field by indication of the non-linear relationship between firm size and EMS standards adoption, highlighting the differences of the impact of long- and short-term indebtedness and a new finding of the positive impact of owning a website.

This study has some potential implications for policymakers, financial institutions, and firms as well. Given our findings, policymakers can identify companies that have not adopted EMSs and create tools to support the implementation of EMS in these companies. We would also recommend that policymakers create a list of ISO-certified companies that could help in some way to support green supply chains. This database could assess supply chains in the field of environmental impact, which could then be used in the multi-criteria evaluation of government procurement. Such a form could also encourage small businesses to be more interested in these environmental programs.

However, our results have some limitations. In our case, R&D do not represent all R&D expenditures, but only those of successful projects that the company has recorded through its accounting. Therefore, a more detailed analysis of the impact of R&D should be part of further research. At the same time, it is necessary to address further research to the analysis of the profitability impacts on the adoption of EMS, because of its ambiguous impact. The

second significant limitation of this article is that information on when companies obtained certification could not be obtained, so this study works with cross-sectional data for 2019 and 2020.

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