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The Influence of Environmental Strategy, Environmental Reporting and Environmental Management Control System on Environmental and Economic Performance

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Abstract: The importance of corporate social responsibility, especially in the environmental domain, continues to grow in an era of mounting climate urgency. This study is based on original, empirical, survey-based research in two post-communist European countries and seeks to add a geographical viewpoint and to investigate the influence of innovative constructs (environmental reporting, environmental strategy, environmental management control system) on environmental and economic performance. Data are analysed through partial least squares structural equation modelling, which enables the use of a complex model with several links between constructs. Findings reveal that environmental strategy has a positive impact on the use of an environmental management control system and an indirect positive impact on environmental performance. The environmental management control system has been shown to have a positive influence on environmental performance and, ultimately, on economic performance.

Keywords: environmental strategy; environmental reporting; environmental management control system; environmental and economic performance

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1. Introduction

Environmental responsibility has become a crucial aspect of corporate social responsibility [1,2] in the effort to mitigate harm to the environment. This is especially true in an age of numerous significant threats to the environment stemming from the activities of corporations. Corporations are one of many subjects influencing the environment, but they are seen as one of the most significant [3,4].

Due to these facts, managers are incentivised by various pressures (often classified as coercive, normative, and mimetic, see [5]) to pay particular attention to environmental responsibility. Recent research [6–9] repeatedly confirms both the increased interest of stakeholders in sustainability and its impact on the internal management of sustainability-related issues by corporations.

In reaction to these pressures, the environmental discourse has become increasingly important for corporations and is, to various degrees, incorporated into the strategy of these subjects [10,11]. Whether the formalised implementation of environmental issues into an organisational strategy and business models [12,13] also leads to the integration of sustainability performance into business [14] and stimulates the implementation of environmental management control system (hereinafter abbreviated EMCS) while positively influencing environmental and economic performance is a key question.

Concerns regarding the relationship between corporate social responsibility and corporate economic performance are reflected in the academic literature [15–17]. The relationship between non-financial performance and the cost of debt capital has been

addressed in [18]. At first glance, it could appear that this relatively long stream of research has extensively studied the relationship between corporate social responsibility and corporate economic performance. This is not the case. In fact, the majority of older studies suffer from an insufficient sample size, an inappropriate measurement of constructs, and relatively simple methods of statistical evaluation, amongst other things.

Historically, empirical research into the relationships between various important constructs (environmental strategy, environmental reporting, EMCS, environmental performance, economic performance, etc.) only addressed a limited number of the relationships in question at the expense of others. Nowadays, more comprehensive investigations are possible thanks to advanced statistical and computational methods.

On the one hand, numerous articles have been recently published to partially fill this research gap, yet the research is still at its outset and rather fragmented regarding geographical areas, construct definitions, and research models.

Our study is, as far as we know, the first survey-based empirical research to address the complex relationships between the key constructs in Central and Eastern Europe, specifically in the Czech Republic and the Slovak Republic. The former nation of Czechoslovakia split into the Czech Republic, and the Slovak Republic on 1 January 1993, and a common history contributing to numerous similarities in these post-communist countries justify the analysis of the joint data set.

Studies from the area of corporate social responsibility (or from the area of public entities social responsibility) dealing with the region of Central and Eastern Europe exist, but they often focus solely on reporting issues [19–22] and not on management, or are in the form of case studies [23–25].

Moreover, to the best of our knowledge, none of the recent studies [15,26–32] has investigated EMCS as an important mediating variable. Our research answers the call of Latan et al. [28], who noted that this study only considered environmental management accounting without examining (broadly defined) EMCS and stressed the need for an investigation of EMCS.

This article examines the combined influence of environmental strategy, environmental reporting, and EMCS on environmental and economic performance and aims to evaluate the power of relationships between these constructs.

Direct relationships are assessed (the influence of environmental strategy on EMCS, the influence of environmental reporting on EMCS, the influence of EMCS on environmental performance, the influence of environmental performance on economic performance), but, more importantly, the indirect influences as well, such as environmental strategy and environmental reporting on environmental performance through EMCS and the influence of environmental strategy and environmental reporting on economic performance through EMCS and environmental performance.

Our study thus investigates a more complex theoretical framework than prior articles while contributing to their findings in several ways. First, data were collected in two post-communist countries from Central Europe with a common history where environmental reporting is not obligatory (with the exception of several of the largest companies—and, even in this case, only in general features through accounting legislation) and where the implementation of EMCS is still in its infancy. Second, this study investigates the indirect influence of environmental reporting on environmental performance through EMCS and on economic performance through EMCS and environmental performance. Third, the results of this study are an important addendum to the existing research because the investigation of complex models through contemporary statistical methods is relatively scant.

2. Development of Hypotheses and the Measurement of the Constructs

2.1. Development of Hypotheses

A relatively complex model is tested in this article, with the key constructs being "EnvStrategy", "EnvReporting", "EMCS", "EnvPerf", and "EconPerf", which have been identified as highly relevant on the basis of the screening of the prior literature.

It was suggested [28] that, according to [8], companies that incorporate environmental issues into their business strategy produce improved environmental performance, hence:

Hypotheses 1 (H1). *Environmental strategy is positively related to the environmental performance.*

Moreover, the degree of utilisation of environmental management accounting (EMA) and EMCS is affected by the inclusion of environmental topics into a business strategy. Consequently, EMA and EMCS influence environmental performance [17,33] through a variety of mechanisms. The study of Melnyk et al. [33] highlighted that the existence and quality of formal EMCS supports high levels of overall environmental performance. The following hypotheses can be formulated:

Hypotheses 2 (H2). *Environmental strategy is positively related to the environmental management control system.*

Hypotheses 3 (H3). *Environmental strategy has a positive indirect effect on environmental performance through the environmental management control system.*

Hypotheses 4 (H4). *The environmental management control system is positively related to the environmental performance.*

The relationship between environmental reporting and EMCS has not been addressed by many articles. Some authors [34] advocate that the way companies communicate their reports indicate their level of commitment to social responsibility, and it is possible to hypothesise that this commitment influences the degree of implementation of EMCS, therefore:

Hypotheses 5 (H5). *Environmental reporting is positively related to the environmental management control system.*

Hypotheses 6 (H6). *Environmental reporting has a positive indirect effect on environmental performance through the environmental management control system.*

The relationship between environmental performance and economic performance has been the focus of researchers for a long time, and the vast body of research on this relationship was summarised in several review articles [15,16,35–43]. On the one hand, there is significant agreement that there is a relationship between environmental performance and economic performance and that this relationship is often positive.

While the relationship between environmental performance and economic performance is often positive, the character of this relationship is still unclear, with some studies finding a positive linear relationship and others suggesting a U-shaped relationship or an inverted U-shaped hypothesis, e.g., [44]. It is beyond the scope of this article to deal with this topic in detail.

Whether or not better environmental performance determines better economic performance or better economic performance determines environmental performance is disputed, and other hypotheses regarding this relationship exist, e.g., a bi-directional hypothesis or cyclic hypothesis. A meta-analysis [45] suggested that in a 1-year time-horizon, financial resources could increase a firm's environmental performance, but these effects diminish in the long term. On the contrary, an improvement in environmental performance improved financial performance in the long term and did not have a short-term effect on financial performance. All these disputes imply that research concerning this perplexing problem is unresolved.

Our article is inspired by a group of studies combining research on the relationship between environmental performance and economic performance with research regarding mediating and moderating variables. These studies mostly predict a positive relationship between environmental performance and economic performance. It is, therefore, possible to hypothesise:

Hypotheses 7 (H7). *Environmental strategy has a positive indirect effect on economic performance through the environmental management control system and environmental performance.*

Hypotheses 8 (H8). *Environmental reporting has a positive indirect effect on economic performance through the environmental management control system and environmental performance.*

A model comprising constructs EnvStrategy, EnvReporting, Size, EMCS, EnvPerf, and EconPerf is depicted in Figure 1. All variables (indicators) used for the measurement of the constructs mentioned can be found in Appendix A, and all constructs in the model are measured reflectively. Figure 1 depicts only direct relationships, however, indirect relationships have also been analysed and evaluated.

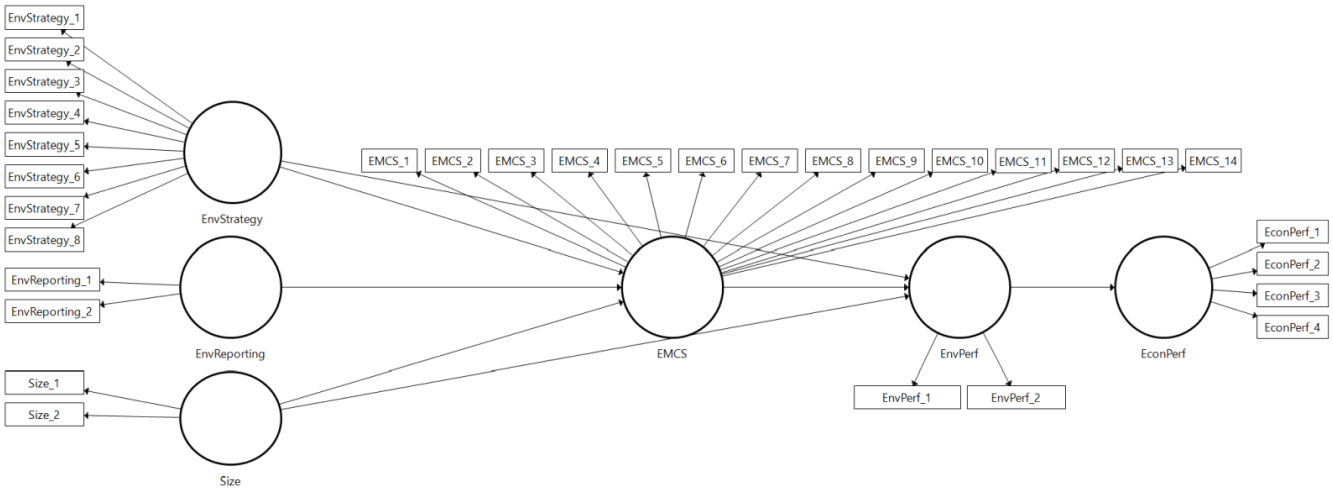

Figure 1. Model of relationships between strategy, environmental management control system, environmental performance, and economic performance.

2.2. Measurement Instrument

The complete measurement instrument used for this article, including measurement scales, can be found in Appendix A. The individual questions were developed on the basis of an extensive literature review, which revealed that a general agreement on the measurement of the analysed constructs is missing. Well-established measures were adopted whenever possible, but it is necessary to point out that, in most cases, there is no general agreement on the measurement of the constructs used in this study.

Most survey questions solicited subjective opinions regarding the constructs investigated (inclusion of environmental issues into strategy, extent of environmental reporting, use of EMCS, environmental performance, and economic performance). Research based on the measurement of subjective opinions has been used by numerous authors (for example, Hadid and Al-Sayed [46], Lisi [17], Solovida and Latan [30]), and it is appropriate for a deeper understanding of such complicated relationships.

Each construct was measured reflectively. Company size was measured by means of archival data obtained from annual reports.

2.2.1. Environmental Strategy (ES)

ES was, in previous studies, measured in various ways [13,27,30].

Study [28] measured ES as a construct consisting of four indicators of environmental performance measurement, environmental investments, ISO certification, and long-term commitment to the environment. Our study is inspired by this approach, but ISO certification and environmental investments have been removed from this construct.

This study was significantly inspired by [28] and utilises the construct "EnvStrategy", which is measured subjectively (respondents' self-assessment) via eight questions (see Appendix A). The first question is related to the inclusion of environmental issues into strategic discourse across the company, i.e., the question relates to perceiving and discussing environmental issues as a strategic topic within the company. The remaining questions

relate to the measurement of environmental performance across its different dimensions (e.g., energy consumption, effluents, and waste).

2.2.2. Environmental Reporting (ER)

As far as we know, ER was not investigated as an endogenous construct in this field of research despite the fact that a mutual interplay between ER, EMCS, and environmental performance was discussed and tested both conceptually and empirically [47–49].

In this study, ER is represented via the construct "EnvReporting" and measured subjectively (respondents' self-assessment) using two items. The first item is investigated through a question asking respondents about the extent of voluntary ER in their annual report. The second item is measured via a question investigating if a company issues a standalone sustainability report.

Specifically, to avoid misunderstandings, it is important to highlight that environmental reporting was measured not by asking the respondents whether they report or not but using the questions: "Does your company issue information on environmental issues beyond the minimal legal requirements within its annual report?" and "Does your company issue a standalone corporate responsibility report as a separate document available from your web pages?". These questions are relevant regardless of the possible obligation of a company to report non-financial information (which can be a consequence of requirements of Directive 2014/95/EU [50], which has been implemented both in the Czech Republic and the Slovak Republic).

2.2.3. Size

The size of a company serves as a control variable in this article because it is considered to be an important contingent variable in numerous studies. Total revenues, assets, or the number of full-time employees are used as proxies for company size.

In this study, company size is represented by the construct "Size" and evaluated using two measures—assets and turnover. The values of these measures were found in the latest annual financial reports of the responding companies.

2.2.4. Environmental Management Control System (EMCS)

EMCS can be considered [28] to be an important link between ES and environmental performance. Interestingly, there is no current empirical research that would incorporate EMCS into the structural model, meaning more narrowly defined environmental management accounting (EMA) is investigated instead.

The conceptual model of EMCS adopted in this study was proposed by [51,52], where the importance of integration between strategy, plans and programs, and structure and systems is highlighted. Plans and programs are implemented to achieve sustainability goals and objectives and to include a broad spectrum of instruments from minor to radical changes. Structures and systems are, more or less, formalised instruments, e.g., ISO 14001.

Specifically, in this study, the degree of EMCS implementation is represented by the construct "EMCS", which is measured subjectively (respondents' self-assessment) via an instrument comprised of 14 questions aimed both at plans and programs and structure and systems.

2.2.5. Economic Performance (EP)

The issue of measurement of organisational EP was intensively discussed in the prior literature [53]. Yet, unresolved areas still exist, and there are several key decisions that must be made during the process of measuring the construct "EconPerf", especially: (i) whether to measure short term performance (STP) or long-term performance (LTP); (ii) whether to measure the performance through subjective or objective criteria; (iii) deciding which specific indicators should be used.

Our study deals mostly with companies that are privately held, for whom indicators of market performance do not exist, and the measurement of long-term performance on

the basis of objective criteria is complicated by the fact that a reliable and complete time series of such data is often missing.

Due to these facts, EP is represented by the construct "EnvPerf" which is measured subjectively (respondents' self-assessment) via an instrument comprised of four questions, the exact wording of which can be found in Appendix A, Table A1. Specifically, respondents were asked to compare the performance of their organisation, with respect to the sector in which the organisation operates, across four indicators (revenue development, market share development, operating profit development, and return on assets development) over the past five years. Respondents chose between five options: "well below average in sector", "below average in sector", "average in sector", "above average in sector", "well above average in sector".

2.2.6. Environmental Performance (EnP)

Measurement of EnP is a compelling task [54,55] and requires assessment in several areas. Similar to EP, EnP is measured across multiple dimensions. In the case of EnP measurement, there are analogous issues, as in the case of EP measurement, and, moreover, the availability of objective data regarding EnP is even lower than in the case of EP.

While the practical measurement of EnP has to be complex and detailed, the wording of questions in surveys has to be reasonably compact and based both on subjective and objective criteria. Some researchers [5] measured EnP subjectively (self-assessment of respondents) using a group of four questions. Objective data are often available only for a narrow group of corporations or in special cases. For example, the authors of study [30] were able to obtain an objective PROPER ranking used by the Indonesian Ministry of Environment. Unfortunately, in the case of non-existent data of such measurement programmes (such as in the Czech Republic and the Slovak Republic), research has to be based on subjective self-assessment criteria.

In this study, EnP is therefore operationalised by the construct "EnvPerf" and measured subjectively (respondents' self-assessment) via an instrument comprised of two questions aimed at broadly defined environmental performance and the environmental friendliness of products.

3. Materials and Methods

3.1. Data Collection, Respondents

The data collection was realised using an online questionnaire survey that was prepared on the basis of a literature review, then discussed with three scholars in environmental accounting before being pilot-tested. These activities led to minor changes in the questionnaire.

The structure of respondents included senior managers from environmental functional areas and general managers at top or middle levels. One person from each selected company was contacted.

The population for this study were medium and large companies (according to the definition in [56]) across all industrial sectors in the Czech Republic and the Slovak Republic. It is important to highlight that this classification is according to the directive of the European Union and that classification in the Slovak Republic is different, while in the Czech Republic, the classification criteria were adopted exactly according to the directive.

Specifically, according to the Czech Act on Accounting [57], large companies are defined as such undertakings which on their balance sheet dates exceed at least two of the three following criteria: (1) balance sheet total: CZK 500,000,000 (equivalent of EUR 20,000,000), (2) net turnover: CZK 1,000,000,000 (equivalent of EUR 40,000,000), (3) the average number of employees during the financial year: 250. Medium companies are defined as such undertakings that are not micro-undertakings or small undertakings and which on their balance sheet dates do not exceed the limits of at least two of the following criteria: (1) balance sheet total: CZK 500,000,000 (equivalent of EUR 20,000,000), (2) net turnover: CZK 1,000,000,000 (equivalent of EUR 40,000,000), (3) the average number

of employees during the financial year: 250. Finally, small companies are defined as undertakings that are not micro-undertakings and which on their balance sheet dates do not exceed the limits of at least two of the following criteria: (1) balance sheet total: CZK 100,000,000 (equivalent of EUR 4,000,000), (2) net turnover: CZK 200,000,000 (equivalent of EUR 8,000,000), (3) the average number of employees during the financial year: 50.

The Slovak Act on Accounting [58] uses a different classification and differentiates only three types of undertakings: micro-undertakings, small undertakings, and large undertakings, i.e., medium-sized undertakings are not defined. Moreover, in the Slovak Republic, the criteria for large undertakings are different than in the Czech Republic; Slovak large undertakings basically correspond with Czech medium and large undertakings. Specifically, in the Slovak Republic, large undertakings are considered to be undertakings that exceed at least two of the following criteria: (1) balance sheet total: EUR 4,000,000, (2) net turnover: EUR 8,000,000, (3) the average number of employees during the financial year: 50.

From the viewpoint of our analysis, there is a critically important observation that stakeholders in the Czech Republic consider not only large but also medium companies to be important subjects with significant social responsibility. This means that medium and large companies (according to the classification used in the Czech Republic) are similar in terms of external and internal pressures that motivate them to implement and use systematic management procedures in the area of social responsibility. It is, therefore, possible to advocate that companies in our sample can be analysed as one dataset without differentiating between large and medium companies.

Contact information (email, website, phone number) was sourced from the Albertina CZ Gold Edition database, with the total number of companies meeting the criteria being 475 in the Slovak Republic and several thousand companies in the Czech Republic. For the sake of the questionnaire, 1000 Czech companies were randomly selected. The number of companies selected from each country reflects their relative size according to the number of inhabitants. Unfortunately, not all selected companies provided a correct email address resulting in 475 companies in the Slovak Republic and 984 companies in the Czech Republic being contacted. Access to the questionnaire lasted from February 2018 until April 2019.

The procedure of data collection was as follows. First, a link to the web-based questionnaire was sent to all selected companies. Consequently, two reminders were sent to the companies who did not complete the questionnaire within two or three months and randomly selected companies were also contacted by telephone call. The response rates in the Czech and Slovak Republics were 10.77% and 10.32%, respectively, as 106 usable questionnaires were received in the former and 49 in the latter, i.e., 155 observations in total.

There are numerous methods for the estimation of the minimal acceptable sample size in PLS-SEM. Often cited is the "10 times rule", especially because of how simple it is to apply [59] (p. 24). According to this rule, the minimum sample size should be ten times the amount of the maximum number of arrowheads pointing at a latent variable anywhere in the PLS path model. In our specific case, it means that according to this rule, the minimum sample size is equal to 30. Nevertheless, the contemporary literature (e.g., Hair et al. [60] and Kock and Hadaya [61]) considers this rule obsolete and highly imprecise and advocates that other methods should be used.

Hair et al. [59,60] suggested the use of the "minimum R-squared method", which is based on Cohen's [62] power tables and considers three elements: the maximum number of arrows pointing to a latent variable in a model; the significance level used; and the minimum R^2 in the model. The model in our article has a maximum of three arrows pointing to a latent variable, minimum R^2 is 0.110, and let us assume that power is set at 0.8. Then, using the table provided by Hair et al. [59] (p. 26), at significance level 0.01, the minimal sample size is 145, and at significance level 0.05, the minimal sample size is 103. Considering that our sample includes 155 observations, it also fulfils this criterion. The minimum R-squared method was used, e.g., by Aranda-Usón et al. [63], and can therefore be considered an acceptable method for determining the minimal sample size. Samples of

similar size to the size of our sample are used in analogously complex models, e.g., Hadid and Al-Sayed [46], who used PLS-SEM with a sample of 149 observations.

Kock and Hadaya [61] proposed two alternative methods for minimum sample size estimation—the inverse square root method, which uses the inverse square root of a sample's size for standard error estimation and the gamma-exponential method, which relies on gamma and exponential smoothing function corrections applied to the standard error estimation used in the inverse square root method. These two methods are more demanding on the sample size than the older methods. Kock and Hadaya [61] stated that the Gamma exponential procedure has a tendency to provide mode accurate estimates of the minimal sample size and the inverse square root method tends to provide overestimated minimal sample size. Kock and Hadaya [61] also imposed a question, "what is a reasonable value for minimum sample size?", if we do not know in advance the value of the path coefficient with the minimum absolute magnitude, and proposed that answer would be 160 according to the inverse square root method and 146 according to the gamma exponential method.

It is fair to acknowledge that our sample size is seemingly problematic when evaluated according to the inverse square root method and gamma-exponential method considering real beta coefficients. Nevertheless, we proposed a reduced model, which depicts all critical relationships and is consistent with the full model presented in this article (i.e., the model reduction does not significantly affect the estimation of the magnitude and direction of the beta-robustness coefficients). The reduced model removes statistically non-significant relationships and the control variable "Size", and the strength of all relationships exceeds 0.2. For this reduced model, we calculated the minimum required sample size, and according to the inverse root method, the minimum sample size equals 155 observations, and according to the gamma-exponential method, the minimum sample size equals 142 observations.

It is, therefore, possible to summarise that the size of our sample (155 observations) is sufficient.

The basic descriptive statistics (using data for the latest available year at the time the survey was conducted, the majority of which are for 2017) of the respondents can be found in Table 1.

Table 1. Descriptive statistics of the respondents.

Descriptive Statistics	Assets (Thousands EUR)	Sales (Thousands EUR)
Mean	260,243	266,851
Median	49,532	57,248
Standard deviation	958,494	764,040
Skewness	8.06	6.88
Kurtosis	73.86	57.74

The same questionnaire was distributed in the Czech Republic and the Slovak Republic, and the data obtained are treated as one dataset in this article. In this context, it is useful to highlight that former Czechoslovakia split into two independent countries only on 1 January 1993, with each country becoming truly independent. Nevertheless, both countries are still closely intertwined in many ways, and many similarities prevail, which justifies the analysis of the data as one joined data set.

3.2. Data Analysis

Data in this article were analysed via a relatively new method called partial least square structural equation modelling (PLS-SEM), which is sometimes referred to as variance-based SEM [59,64].

It is possible to claim [60] that, until 2010, PLS-SEM was dominated by covariance-based SEM and that, since then, PLS-SEM has gained significant traction in the academic literature. This article uses SmartPLS [65] version 3.3.2 software to support the PLS-SEM analysis.

It is possible to summarise that CB-SEM and PLS-SEM are two different approaches to the same issue [66]. There are numerous differences between CB-SEM and PLS-SEM, with PLS-SEM being a causal modelling approach striving to maximise the explained variance of the dependent latent constructs [67]. Some scholars [60] advocate that PLS-SEM (compared to CB-SEM) can be used for smaller samples, has no distributional assumptions, and shows a high degree of statistical power. These properties favour the use of PLS-SEM over CB-SEM in the specific conditions of this study, in particular, because the data is not normally distributed, and the sample size is relatively small.

Consequently, this article employs the traditional PLS-SEM approach, in contrast to some studies which apply consistent PLS-SEM [28,68]. Consistent PLS-SEM imitates CB-SEM, and some authors advocate that "differences in parameter estimation between PLS-SEM and covariance-based SEM are generally quite small in settings commonly encountered in applied research" [69] (p. 570).

The procedure suggested by Hair et al. [60] is adhered to, according to which there are two principal steps in evaluating PLS-SEM results—the examination of the measurement model and the examination of the structural model. Hair′s methodology was employed and supplemented with other up-to-date methodological approaches (e.g., Kock and Hadaya [61]), because it can be considered to be the latest guidelines for using the PLS-SEM approach.

4. Results

4.1. Assessment of the Reflective Measurement Model

The assessment of the reflective model consists of four key steps, which include computation of outer loadings (Table 2), composite reliability and Cronbach′s alpha (Table 2), average variance extracted AVE (Table 2), Fornell–Larcker criterion (Table 3), and HTMT ratio (Table 4).

Table 2. Assessment of the measurement model.

Construct	Code	Outer Loadings	*p*-Value	Composite Reliability	Cronbach′s Alpha	Rho_A	Average Variance Extracted
EnvStrategy				0.900	0.873	0.877	0.534
	EnvStrategy_1	0.585	0.000				
	EnvStrategy_2	0.822	0.000				
	EnvStrategy_3	0.804	0.000				
	EnvStrategy_4	0.775	0.000				
	EnvStrategy_5	0.679	0.000				
	EnvStrategy_6	0.828	0.000				
	EnvStrategy_7	0.647	0.000				
	EnvStrategy_8	0.662	0.000				
EnvReporting				0.887	0.748	0.762	0.798
	EnvReporting_1	0.911	0.000				
	EnvReporting_2	0.874	0.000				
Size				0.870	0.705	0.726	0.770
	Size_1	0.850	0.000				
	Size_2	0.904	0.000				

Table 2. *Cont.*

Construct	Code	Outer Loadings	*p*-Value	Composite Reliability	Cronbach's Alpha	Rho_A	Average Variance Extracted
EMCS				0.944	0.935	0.937	0.545
	EMCS_1	0.769	0.000				
	EMCS_2	0.754	0.000				
	EMCS_3	0.748	0.000				
	EMCS_4	0.743	0.000				
	EMCS_5	0.786	0.000				
	EMCS_6	0.636	0.000				
	EMCS_7	0.717	0.000				
	EMCS_8	0.736	0.000				
	EMCS_9	0.770	0.000				
	EMCS_10	0.701	0.000				
	EMCS_11	0.771	0.000				
	EMCS_12	0.771	0.000				
	EMCS_13	0.668	0.000				
	EMCS_14	0.747	0.000				
EnvPerf				0.875	0.716	0.725	0.778
	EnvPerf_1	0.899	0.000				
	EnvPerf_2	0.864	0.000				
EconPerf				0.924	0.891	0.892	0.753
	EconPerf_1	0.876	0.000				
	EconPerf_2	0.833	0.000				
	EconPerf_3	0.902	0.000				
	EconPerf_4	0.860	0.000				

Table 3. Discriminant validity (Fornell–Larcker Criterion).

Construct	EMCS	EconPerf	EnvPerf	EnvReporting	Size	EnvStrategy
EMCS	0.738					
EconPerf	0.301	0.868				
EnvPerf	0.431	0.332	0.882			
EnvReporting	0.517	0.317	0.400	0.893		
Size	0.230	0.158	0.000	0.230	0.878	
EnvStrategy	0.744	0.210	0.346	0.488	0.141	0.730

Table 4. Discriminant validity (Heterotrait-monotrait Ratio, HTMT).

Construct	EMCS	EconPerf	EnvPerf	EnvReporting	Size
EMCS					
EconPerf	0.327				
EnvPerf	0.518	0.417			
EnvReporting	0.612	0.390	0.547		
Size	0.280	0.213	0.040	0.318	
EnvStrategy	0.805	0.243	0.419	0.588	0.184

The outer loadings measure item reliability, and their recommended values are, according to [60], over 0.708 (in such cases, a construct explains more than 50 per cent of the indicator's variance). Results show that this recommendation is fulfilled for the majority of indicators, and, as some outer loadings are lower (EnvStrategy_1, EnvStrategy_5, EnvStrategy_7, EnvStrategy_8, and EMCS_13), the value is not significantly lower than the recommended threshold. It is important to highlight that the value 0.708 is only a rule of thumb and specific conditions always have to be taken into account. The literature [59] recommends removing an indicator only in cases where its value is under 0.40. If the value

is between 0.40 and 0.70, additional considerations should be performed. After considering the specific conditions, it was determined to keep all the indicators in the model.

The composite reliability measures internal consistency reliability, and its recommended values should be between 0.70 and 0.90. Values over 0.95 may indicate a redundancy of items, which causes a decline in construct validity, according to [60]. Results in Table 2 show that this condition is fulfilled for all constructs. Cronbach's alpha is another measure of internal consistency reliability, which is considered to be less precise and more conservative than composite reliability. The value of Cronbach's alpha is lower than the value of composite reliability, and a true value is expected to be between the two values [60]. In this study, all constructs also meet the criteria regarding Cronbach's alpha.

Convergent validity (the extent to which the construct converges to explain the variance of its items) is measured by AVE with a suggested value of 0.50 or higher, indicating that the construct explains at least 50 per cent of the variance of its items [60]. In this study, all constructs meet the criteria regarding AVE.

Discriminant validity was traditionally assessed by the Fornell and Larcker criterion, according to which the square root of each construct's AVE should be greater than its highest correlation with any other construct [59].

Results depicted in Table 3 also imply that the Fornell and Larcker criterion is fulfilled (results are the only boundary for the construct EMCS), and discriminant validity is acceptable. It is important to highlight that Fornell and Larcker criterion is, nowadays, criticised [59], and, as the main criterion for discriminant validity, HTMT is recommended.

The threshold value for the HTMT criterion is 0.90 (or a more conservative value of 0.85). Values higher than these threshold values suggest insufficient discriminant validity [60]. The results in Table 4 confirm that there are no problems with discriminant validity, even according to the conservative threshold value of 0.85.

4.2. Assessment of the Structural Model

According to the results in Section 4.1, the reflective measurement model assessment is satisfactory, and it is, therefore, possible to assess the structural model. Prior to the assessment of the structural model, it is necessary to check for collinearity to make sure that regression is not biased [59,60].

In this specific case, it is necessary to evaluate the following groups of predictor constructs for collinearity: (i) EnvStrategy, EnvReporting, and Size as predictors of EMCS, (ii) EnvStrategy, Size, and EMCS as predictors of EnvPerf.

The results in Table 5 imply that all VIF values are below the threshold of 5, and it is possible to conclude that collinearity among the predictor constructs is not an issue.

Table 5. Collinearity statistics (variance inflation factor, VIF).

Construct	EMCS	EconPerf	EnvPerf
EMCS			2.325
EnvPerf		1.000	
EnvReporting	1.360		
Size	1.057		1.058
EnvStrategy	1.314		2.247

It is, therefore, possible to proceed to the assessment of the structural model, which includes computation of R^2 (explanatory power), Q^2 (predictive power), and evaluation of the statistical significance and relevance of path coefficients. The explanatory power of the model is expressed by R^2, and values of this criterion (together with path coefficients) can be found in Figure 2.

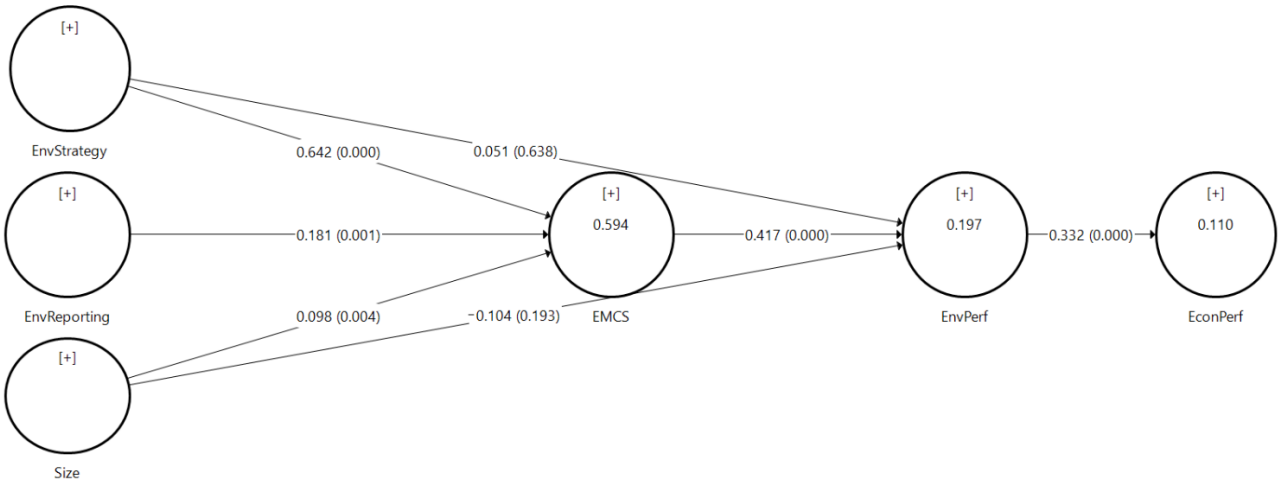

Figure 2. Evaluation of the structural model.

Interpretation of the results of R^2 calculation is rather straightforward—the higher the R^2, the better, nevertheless values above 0.90 may indicate overfit. There are also some rules of thumb regarding the value of R^2, although it is necessary to be extremely cautious about their application. For example, the authors of [60] suggested that 0.75 is substantial, 0.5 moderate, and 0.25 weak. At the same time, they stressed that acceptable values of R^2 are based on context and vary significantly across disciplines. Results in Figure 2 indicate that R^2 for construct EMCS equals 0.594, R^2 for construct EnvPerf equals 0.197, and R^2 for construct EconPerf equals 0.110. Section 5 will show that this pattern is logical and that these values are acceptable in our field.

For an assessment of the predictive power of the model, R^2 is not entirely correct [60], and computation of criterion Q^2 is needed. Regarding the data in this study, the following values were obtained: Q^2 = 0.316 (EMCS), Q^2 = 0.137 (EnvPerf), and Q^2 = 0.079 (EconPerf). The results provide support for the model's predictive relevance.

After the assessment of the model's explanatory and predictive power, it is possible to evaluate the relevance and statistical significance of the path coefficients and the corresponding hypotheses. Direct path coefficients and their respective *p*-values can be found in Figure 2.

Not only does Table 6 display hypotheses regarding direct effects, it also provides an evaluation of hypotheses regarding indirect effects, which are of great significance. It is possible to summarise that all hypotheses except H1 are supported by the results.

Table 6. Evaluation of hypotheses.

Hypothesis	Hypothesis Description	Coefficient/Specific Indirect Effect	Supposed Sign	*p*-Value	Evaluation
H1	EnvStrategy→EnvPerf	0.051	+	0.638	rejected
H2	EnvStrategy→EMCS	0.642	+	0.000	supported
H3	EnvStrategy→EMCS→EnvPerf	0.268	+	0.000	supported
H4	EMCS→EnvPerf	0.417	+	0.000	supported
H5	EnvReporting→EMCS	0.181	+	0.001	supported
H6	EnvReporting→EMCS→EnvPerf	0.076	+	0.012	supported
H7	EnvStrategy→EMCS→EnvPerf→EconPerf	0.089	+	0.004	supported
H8	EnvReporting→EMCS→EnvPerf→EconPerf	0.025	+	0.046	supported

5. Discussion

The results of this study provide several insights that can be important for academia and practice.

First, it was found that the inclusion of environmental topics into corporate strategy per se does not have a statistically significant impact on environmental performance (H1). This finding may be of interest for practice because it informs managers that incorporating environmental issues into strategy without the implementation of other tools (EMCS) does not bring any significant improvement of environmental performance. On the other hand, some studies [30] provided support for the positive influence of ES on environmental performance. Similarly, study [28] found a positive and statistically significant influence of ES on environmental performance. Seemingly, the results of our study and the results of [30] and [28] are contradictory, but we advocate a different interpretation. Specifically, we propose that this conflict is due mainly to a different operationalisation of the construct "environmental strategy", which, in our study, does not include ISO certification, environmental investments, and environmental performance measurement.

Second, the results of this study support the hypotheses regarding the positive and statistically significant influence of ES on EMCS (H2) and ER on EMCS (H4). Research [30] also provided significant support for the positive influence of ES on the use of environmental management accounting (here understood as similar to EMCS). Policymakers should note that, based on the findings regarding ER, requirements on reporting may positively influence the implementation of plans, programs, structures, and systems that constitute EMCS.

Third, the results support the hypothesis regarding the statistically significant and positive direct relationship between EMCS and environmental performance (H4). This result accords with [17], who found a positive and statistically significant (at the 0.01 level) direct influence of environmental performance measures (here understood as similar to EMCS) on environmental performance.

More interestingly, there is also a significant positive indirect effect of strategy on environmental performance through EMCS (H3) and a not so strong yet positive and statistically significant indirect effect of environmental reporting on environmental performance through EMCS (H6). Combined, this indirect effect is 0.344. The explanatory power of the model is, in the case of environmental performance, acceptable (R^2 = 0.197). The results provide support for the view that improving environmental performance requires managers to support environmental reporting and, still more significantly, the inclusion of environmental topics into corporate strategy by utilising EMCS.

Fourth, the environmental performance has a positive influence on economic performance, which is in accordance with [15–17]. The indirect effects of environmental strategy and environmental reporting on economic performance, through EMCS and environmental performance (hypotheses H7 and H8), is positive and statistically significant, but otherwise weak (in total 0.089 + 0.045 = 0.134). As far as we know, the influence of environmental reporting on economic performance has not been investigated recently. Environmental reporting can be interpreted as an expression of the commitment of management to environmental issues and, if this interpretation is accepted, it is possible to compare the results of this study with [31], which confirmed the influence of environmental commitment on financial performance. Nevertheless, the strength of the influence, as found in our study, is, compared to [31], relatively weak (albeit statistically significant). This can be explained by the fact that the authors of [31] understood the term "environmental commitment" substantially broader than the voluntary external ER.

The explanatory power of the model is, in the case of economic performance, relatively weak (R^2 = 0.110), which is a disappointing but not unexpected result because economic performance is affected by so many influences. Nevertheless, considering the field of research, the explanatory power for economic performance is acceptable as, for example, study [17] reported a still lower R^2 value of 0.031. The similarity of results underscores the fact that economic performance is influenced by many variables (for example, Wu et al. [70] stressed the moderating role of firm type), and it is not probable that high levels of R^2 could be achieved in the researched area.

Finally, size of the company (control variable) has a statistically significant but weak influence on the implementation of EMCS. It means that larger companies implement EMCS to a higher degree, which is an expected result. The weakness of this influence underscores the fact that, both in the Czech Republic and in the Slovak Republic, all analysed companies are, by population, considered as important subjects with significant social responsibility (for a more detailed explanation see Section 3.1) and, therefore, experience similar pressures to address sustainability in their management systems.

6. Conclusions

The central topic of this article is the effect of various factors on environmental performance and, ultimately, on economic performance. By studying both direct and indirect (mediated) relationships between the constructs "EnvStrategy", "EnvReporting", "EMCS", "EnvPerf", and "EconPerf", we answer the request of previous studies [28] for further research into these relationships.

Several hypotheses were formulated, and all were supported by our results except a hypothesis regarding the statistically significant positive influence of environmental strategy on environmental performance.

These results imply both academic and practical consequences, both of which were discussed in Section 5. Our research contributes to the prior literature by providing additional evidence regarding the influence of environmental strategy, environmental reporting, and EMCS on environmental performance and economic performance. Moreover, our research was conducted in two post-communist countries in Central and Eastern Europe, which is still relatively unresearched, and our results corroborate results from other geographic regions. Regarding practical consequences, the empirical results of this study encourage managers to search for synergies between environmental strategy, environmental reporting, and environmental management control systems to increase environmental performance and, ultimately, economic performance.

This article has several limitations. First, the standard limitations of a survey-based approach could not be avoided. Second, despite significant efforts to increase the number of responses, it managed to collect only 155 responses. On the other hand, it is not possible to say in general that a sample size of 155 observations is "small" or insufficient. Reinartz et al. [66] recognise small samples having under 100 observations and large samples having over 250 observations, and our sample size is, therefore, neither small nor large. It is true that a larger sample would increase confidence in the generalisability of our results, but the sample size is fully sufficient for the application of the PLS-SEM method. Third, mostly subjective opinions of respondents (self-assessment) were investigated, but this was necessary due to the lack of hard data. Finally, the comparison of our results with other studies (as well as the mutual comparison of other studies) is not straightforward and has to be interpreted with extreme caution due to differences in model frameworks and the operationalisation of constructs.

It is possible to advocate that this article contributes to still insufficient contingency-based research on factors influencing the use of the environmental management control system and, consequently, environmental performance. Although the literature on corporate social responsibility is ample, the majority of previous studies addressed only a limited set of factors influencing EMCS and environmental performance, and studies containing a single, complex model are scarce. This study examines three variables potentially influencing the use of environmental management control systems and addresses both the direct and indirect influence of these factors on environmental performance. Another contribution consists of the investigation of broadly defined EMCS, instead of more narrow environmental management accounting (EMA), which was investigated in previous studies, and the inclusion of environmental reporting as an expression of the commitment of management to environmental issues in the model. Our research, thus, enhances knowledge of the investigated subject provided by previous research by applying a slightly different operationalisation of constructs and a complex research model. Moreover, our research

is aimed at two countries located in Central and Eastern Europe, which is a relatively under-researched region.

Further research can be based on overcoming the aforementioned limitations, e.g., through large-scale surveys, through the analysis of a longer time series, and through focusing on specific industries. Another possible way is qualitative. The results in this article show that the integration of an environmental strategy, environmental reporting, and environmental management control system has a positive influence on environmental performance. Some researchers [49] highlighted that it is important to investigate how companies should integrate these components. A qualitative investigation into this question has the potential to provide significant, relevant insights both for academia and practice. Yet another interesting under-researched question is related to the approaches and views of managers on the compatibility of economic and social and environmental goals. Study [51] found that managers do not perceive these goals to be in conflict, yet formal systems of corporations usually strongly prefer economic performance, whereas social and environmental issues are promoted primarily by informal systems. It is reasonable to expect that the analysis of these issues through the lens of actor-network theory and through the paradox perspective could provide important insights [51]. Yet another interesting under-researched question is related to the approaches and views of managers on the relationship between CSR and Industry 4.0 [71–73].

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Appendix A

Table A1. Measurement instrument.

Code	Description	Scale
EnvStrategy_1	Please indicate if your company addresses environmental issues in its strategy	1 = No, only according to legislation 2 = Yes, perceived as a strategic topic, but neither discussed nor formulated 3 = Yes, formulated as part of the strategy, but not discussed across the company 4 = Yes, formulated as part of the strategy and discussed across the company 5 = Yes, it is the key strategic priority across company

Table A1. *Cont.*

Code	Description	Scale
EnvStrategy_2	Indicate which option best characterizes the approach of your company to utilization of key performance indicators in the area of utilized materials, recycled materials and energy consumption	1 = No KPI 2 = KPI are measured 2,5 = Irrelevant area for our company 3 = KPI are measured and compared with planned or past values 4 = KPI are measured and compared also with competitors
EnvStrategy_3	Indicate which option best characterizes the approach of your company to utilization of key performance indicators in the area of impact of products on environment	
EnvStrategy_4	Indicate which option best characterizes the approach of your company to utilization of key performance indicators in the area of water withdrawals	
EnvStrategy_5	Indicate which option best characterizes the approach of your company to utilization of key performance indicators in the area of impact on biodiversity	
EnvStrategy_6	Indicate which option best characterizes the approach of your company to utilization of key performance indicators in the area of emissions, effluents and waste	
EnvStrategy_7	Indicate which option best characterizes the approach of your company to utilization of key performance indicators in the area of impacts from product distribution and employee travel	
EnvStrategy_8	Indicate which option best characterizes the approach of your company to utilization of key performance indicators in the area of environmental responsibility of suppliers	
EnvReporting_1	Does your company issue information on environmental issues beyond the minimal legal requirements within annual report?	1 = No 2 = No, but we assume to do so from the next year 3 = Yes, the amount of information is up to one page 4 = Yes, the amount of information is over one and up to five pages 5 = Yes, the amount of information is over five pages
EnvReporting_2	Does your company issue a standalone corporate responsibility report as a separate document available from your web pages?	1 = No 2 = No, but we assume to do so from the next year 3 = Yes, the report does not follow any internationally recognized standard 4 = Yes, the report follows an internationally recognized standard (e.g., GRI) but is not audited by a third party 5 = Yes, the report follows an internationally recognized standard (e.g., GRI) and is audited by a third party
Size_1 Size_2	Assets in thousands EUR Sales in thousands EUR	numeric

Table A1. *Cont.*

Code	Description	Scale
EMCS_1	Please indicate if your company has formalized plans and programs for utilized materials, recycled materials and energy consumption	Measured on scale from 1 = no plans and programs to 5 = plans and programs are prepared systematically for all operations. Answer "irrelevant area for our company" was on the basis of data analysis considered as a middle value. 1 = No plans and programs 2 = Plans and programs are prepared rarely 3 = Plans and programs are prepared repeatedly (irrelevant) 4 = Plans and programs are prepared systematically for particular operations 5 = Plans and programs are prepared systematically for all operations
EMCS_2	Please indicate if your company has formalized plans and programs for impact of products on environment	
EMCS_3	Please indicate if your company has formalized plans and programs for water withdrawals	
EMCS_4	Please indicate if your company has formalized plans and programs for impact on biodiversity	
EMCS_5	Please indicate if your company has formalized plans and programs for emissions, effluents and waste	
EMCS_6	Please indicate if your company has formalized plans and programs for impacts from product distribution and employee travel	
EMCS_7	Please indicate if your company has formalized plans and programs for environmental responsibility of suppliers	
EMCS_8	Please indicate if your company has a formalized structure and systems for utilized materials, recycled materials and energy consumption	Measured on scale from 1 = no formalized system to 5 = a comprehensive system for company in run. Answer "irrelevant area for our company" was on the basis of data analysis considered as a middle value. 1 = No formalized system 2 = No formalized system, implementation considered 3 = Fragments of a system exist 4 = An incomplete system in run 5 = A comprehensive system for company in run
EMCS_9	Please indicate if your company has a formalized structure and systems for impact of products on environment	
EMCS_10	Please indicate if your company has a formalized structure and systems for water withdrawals	
EMCS_11	Please indicate if your company has a formalized structure and systems for impact on biodiversity	
EMCS_12	Please indicate if your company has a formalized structure and systems for emissions, effluents and waste	
EMCS_13	Please indicate if your company has a formalized structure and systems for impacts from product distribution and employee travel	
EMCS_14	Please indicate if your company has a formalized structure and systems for environmental responsibility of suppliers	
EnvPerf_1	Express degree of agreement with statement "Overall, in the area of environmental management, we are doing better than the rival companies"	1 = Strongly disagree 2 = Disagree 3 = Same as rivals 4 = Agree 5 = Strongly agree
EnvPerf_2	Express degree of agreement with statement "Overall, our products/services are more environmentally friendly than similar products of the rival companies"	

Table A1. *Cont.*

Code	Description	Scale
EconPerf_1	Rate the organisation's performance over the past 5 years against the indicator "revenue development", with respect to the sector in which the organisation operates	1 = Well below average in sector 2 = Below average in sector 3 = Average in sector 4 = Above average in sector 5 = Well above average in sector
EconPerf_2	Rate the organisation's performance over the past 5 years against the indicator "market share development", with respect to the sector in which the organisation operates	
EconPerf_3	Rate the organisation's performance over the past 5 years against the indicator "operating profit development", with respect to the sector in which the organisation operates	
EconPerf_4	Rate the organisation's performance over the past 5 years against the indicator "return on assets development (operating profit/assets)", with respect to the sector in which the organisation operates	

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