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Contact to corresponding author: Katarina Zvarikova, katarina.zvarikova@uniza.sk

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Katarina Zvarikova

University of Zilina, Slovakia

 orcid.org/0000-0001-5278-9275


Lubica Gajanova

University of Zilina, Slovakia

 orcid.org/0000-0001-9242-5898

Jakub Horak

The Institute of Technology and Business in Ceske Budejovice, Czechia

 orcid.org/0000-0001-6364-9745

Exploring CSR performance as a proxy for competitive advantage across sectors in the Central European countries

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Abstract

Research background: Corporate social responsibility (CSR) demonstrates that a business should be interested in broader social issues rather than on merely those impacting profit margins. Thus, enterprises across all sectors need to focus on the pillars of CSR, which can ultimately give them a competitive advantage. Previous research papers have focused mainly

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on the level of CSR in particular industries or how CSR activities are communicated in these industries.

Purpose of the article: The paper focuses on demonstrating the level of CSR performance in the chosen central European countries in the context of corporate earnings and specifying the impact of the economic sectors on the level of CSR performance, which is mapped by the environmental, social, and governance (ESG) score.

Methods: This study used the ESG score, an indicator of the level of CSR performance, and financial and accounting data of 490 publicly traded enterprises from Central Europe. It also applied correlation analysis, the Kruskal–Wallis test and cluster agglomerative hierarchical clustering.

Findings & value added: The results have proved that the CSR performance of central European enterprises is positively associated with the level of corporate earnings in all NACE sectors. This knowledge broadens the existing literature on this topic. The study also revealed statistically significant differences in the development of the CSR concept across the sectors. Then, cluster agglomerative hierarchical clustering identified the groups of sectors with homogenous approaches to CSR. This provides information on the homogeneity or heterogeneity of CSR performance across different industries, which is useful information not only for investors and other stakeholders, but also for researchers.

Introduction

History remembers many failures of companies in their efforts to maximise profit; thus, if they want to be competitive, they need to shift their emphasis from maximising profits to sustainability and optimisation (Gillan *et al.*, 2022; Wen *et al.*, 2022). This is the key reason why corporate social responsibility (CSR) is gaining increasing prominence at the transnational or national levels. This concept goes beyond the limits of profitability of growth rate as importance is given to different aspects of social accountability and positive impact on society at large, rather than only to more significant profit (Vrabцова & Urbancova, 2021). Nevertheless, one of the primary goals of every business is to make a profit (Metzker *et al.*, 2021). The CSR concept also accepts this statement, claiming that companies do not have to give up their primary goal when focusing on socially responsible business and that social benefit and profit maximisation are not two conflicting goals, but rather ones that complement each other (Man *et al.*, 2021). The activities that the company develops to support the society in which it operates create and support its good reputation (Chouaibi & Chouaibi, 2021). CSR plays an important role in corporate brand perception, business success and perception (Benjamin & Biswas, 2022) and attractiveness to investors, employees and customers, which, as is well known, indirectly affects its better results, the company's value (Kim & Kim, 2021) and sustainabil-

ity, and helps a company to resist competitive pressures (Belas *et al.*, 2021a; Capestro *et al.*, 2024; Nastisin *et al.*, 2021).

The determination of the CSR concept is most commonly based on the triple-bottom-line approach, which emphasises three fundamental pillars: profit (economic level), people (social level) and planet (environmental level) (Macgregor Pelikanova *et al.*, 2024; Balcerzak *et al.*, 2023). Adherence to these pillars means socially responsible business behaviour, leading to sustainability and increasing competitiveness (Olah *et al.*, 2021; Dvorský *et al.*, 2023). The concept underlines the need for companies to focus on the individual pillars as well as their interconnection while stressing the principle of voluntariness beyond the obligations defined by law (Belas *et al.*, 2021b; Aleknevičienė & Stralkutė, 2023; Metzker & Zvarikova, 2021).

Many authors (May *et al.*, 2021; Streimikiene & Ahmed, 2021) who deal with sustainable and responsible business performance point to the superficiality of understanding CSR. They argue that a company implementing the principles of social responsibility is understood to be anyone who gives up part of its profits in favour of one of the stakeholders but no longer examines how it treats other stakeholders (e.g. employees) or how it makes a profit or whether it is doing business in a sustainable way (e.g. the change is symbolic, not considerable; Clementino & Perkins, 2022). Moreover, even when companies apply the principles of the concept, many do not know how to effectively inform their stakeholders, which results in a loss of competitive advantage arising from applying the principles of social responsibility (Mai *et al.*, 2021). Many studies have addressed the phenomenon of CSR communication (Matuszak & Rózanska, 2021; Olsanova *et al.*, 2022; Rüger & Maertens, 2023).

Another critical issue of implementing this concept is measuring a company's CSR performance based on mostly intangible results that are hard to measure (Ali & Kaur, 2021). Thus, companies must tackle the problem of effectively informing about their CSR performance and how to measure it. Many authors have agreed that the ESG score is the most suitable measure of a company's CSR level (Clementino & Perkins, 2021; Fahad & Busru, 2021; Wen *et al.*, 2022, Belas *et al.*, 2024). Gillan *et al.* (2022) consider ESG a more general term than CSR as it incorporates governance directly, while CSR incorporates it in the environmental and social pillars. Karwowski and Raulinajtys-Grzybek (2021) stress that, nowadays, merely environmental, social and corporate governance do represent the main risk factors. Despite the benefits of CSR, the comparability of ESG disclosures to measure the

ESG performance on financial returns and social repercussions remains a problem (Wen *et al.*, 2022; El Khoury *et al.*, 2021) as the assessments are primarily made on publicly available information (Clementino & Perkins, 2021).

It should be also stated that the scale and development of CSR activities vary across countries and sectors (MacGregor Pelikanova *et al.*, 2021). Kowalski (2022) indicates that some sectors are considered less socially responsible (gambling, natural resource extraction, and manufacturing), with eco-harmful behaviour (Flammer, 2013), and Sardanelli *et al.* (2021) even labelled some of them controversial. Nonetheless, all of them need to set a balance between returns for shareholders and the community's expectations to maintain their competitiveness.

The research gap thus results from the need for more general development of the topic in all sectors of the economy. Individual studies — either worldwide or within the European geographical area — have focused only on specific industries or on comparing related industries. Most studies have tackled the issue of CSR in controversial industries (Kilian & Hennings, 2014; Sardanelli *et al.*, 2021; Jansen *et al.*, 2024) or in industries with a substantial impact on the environment and society, such as the banking industry (Daszynska-Zygadlo *et al.*, 2021), hospitality (Dryglas *et al.*, 2023) or aviation (Rüger & Maertens, 2023). However, these studies do not provide a holistic view across all industries at the same time. Moreover, as Olsanova *et al.* (2022) emphasise, most of them are of American origin, and more extensive studies focused on European countries still need to be included.

Therefore, the paper focuses on demonstrating the level of CSR concept in the chosen central European countries in the context of the corporate earnings level and specifying the impact of economic sectors on the development of CSR performance. The level of CSR is mapped by the environmental, social and governance (ESG) score, which measures corporate exposure to long-term ESG risks (see Cayon & Gutierrez, 2021). Having information about the ESG score as a suitable CSR performance indicator can demonstrate to stakeholders, as investors or customers, that the particular enterprise is better equipped and more profitable and can more easily acquire capital and enhance competitive advantage. Although researchers are constantly focused on demonstrating a positive relationship between CSR and corporate earnings, a consensus still needs to be reached (Keong *et al.*, 2017). However, most studies support this positive relationship. The results

of our study expand the knowledge of this issue, which is valid for all NACE sectors. At the same time, the originality of the papers lies in the presentation of specific research in all sectors of the economy of the publicly traded central European enterprises, which is not so common owing to the sensitivity of the information provided by the CSR concept. We have not identified any research papers that provide information on the homogeneity or heterogeneity of CSR performance across different industries, particularly in Central Europe.

The paper is divided into the following sections. The literature review summarises previous studies published in the field, which led to the assumptions for formulating the hypotheses. The methodology section describes the dataset of enterprises, and the methodology followed to meet the study's main aim study. The results section offers the outputs of the realised analysis and calculations, further discussed in the context of other studies published worldwide.

Literature review

Regarding the influence of CSR on financial performance, Soana (2011) presents four possibilities of how CSR can affect financial performance: (1) a negative influence in the sense of Milton Friedman's criticism; (2) a positive effect confirming a direct connection with the improvement of financial results; (3) a mixed influence, where, beyond a certain limit, CSR no longer brings benefits; and (4) a financial performance that can be completely unaffected by the CSR concept. Currently, no scientific consensus has been reached as to whether a clear relationship exists between CSR and financial performance (Bruna & Lahouel, 2021). The academic sphere tends to claim that CSR has a positive rather than negative impact on financial performance. Friede *et al.* (2015) described the results of an analysis of more than 2,000 empirical studies and concluded that 63% of these studies report a positive impact on financial performance and only 8% a negative one, despite the costs related to CSR implementation (Pereira-Moliner, 2021; Schramm-Klein *et al.*, 2015).

Most studies focused on the relationship between CSR and corporate financial performance (CFP) are based on the ESG score (Clementino & Perkins, 2021). Most studies measured CFP by return on assets (ROA), return on equity (ROE) or firm value (Fahad & Busru, 2021). El Khoury *et al.* (2021)

agree that the correlation is mostly positive, but they point out that if the ESG is broken down into its three components, CFP is not equally affected by each pillar. The most relevant relationship is between CFP and the governance ESG score, and a weak correlation is between CFP and the environmental and societal ESG scores. Contrary to this study, Benjamin and Biswas (2022) researched the link between winning a CSR award and financial performance, claiming that the environmental ESG score is more important than governance. Moreover, research by Jaisinghani and Sekhon (2022) confirms the role of CSR disclosure when assessing financial performance, although it also reveals some discrepancies. A positive relationship is typical of CSR activities related to community and product development, while a negative one is observed with environmental and customer-related issues. Despite several studies presenting the relationship between profitability and CSR (e.g. Hamidu *et al.*, 2018; Panait *et al.*, 2020; Sibisi & Makka, 2021), the study by Hermawan and Mulyawan (2014) on a sample of Indonesian enterprises does not confirm these findings. However, it notes that most large enterprises are willing to disclose their CSR activities.

Customer orientation suggests another perspective, considering the influence of CSR implementation on company performance. Many studies have proven the positive impact of the concept on customer satisfaction and loyalty as significant competitiveness factors (Bargoni *et al.*, 2023; Fahad & Busru, 2021), a fortiori that this loyalty is based on identical values rather than on the price (Alhouti *et al.*, 2021). Another example of the positive impact of CSR on corporate finance is increasing investors' demand for CSR disclosure information to consider them in their investment decision-making (Gillan *et al.*, 2021). Particularly, potential investors increasingly use the ESG score to assess their investments. They assume that the company with a higher ESG score is more ethically sustainable and competitive, which makes these companies more attractive to investors (Clementino & Perkins, 2021) as they associate less risk with them (Gillian *et al.*, 2021). Chouaibi and Chouaibi (2021) even claim that the value of the stock market is strongly correlated with CSR practices.

This knowledge leads to hypothesis development:

H1: There is a positive relationship between the CSR performance of Central European companies, as measured by the ESG index, and the level of corporate profits.

Some authors have considered the issue of sectoral studies on CSR as not prominent (Feng *et al.*, 2017; Miranda *et al.*, 2016). However, research focused on investigating the relationship between CSR and financial performance has concluded that it depends on the type of industry in which the company operates (Kludacz-Alessandri & Cygańska, 2021). Fahad and Nidheesh (2021) also confirm the diversity in implementing CSR practices across individual industries based on their research results that the specifics of individual industries are reflected in the various levels of CSR disclosures. These conclusions are drawn because, even when using the same methodology, studies have revealed heterogeneous results between individual industries (Feng *et al.*, 2017; Kuzey *et al.*, 2021; Daszynska-Zygadlo *et al.*, 2016; Su *et al.*, 2020). El Khoury *et al.* (2021) claim that these differences can also be within industries that belong to one sector, while the differences are accentuated if we look through the lens of individual pillars.

The difference may be caused by the fact that the implementation of CSR varies by individual sector (Khan *et al.*, 2022; Olanipekun *et al.*, 2019; Weber *et al.*, 2014). Some sectors are associated with substantially increasing concerns about the sector's environmental and social impacts in recent years (Adamkaite *et al.*, 2022; Kludacz-Alessandri & Cygańska, 2021; Saeed *et al.*, 2021), and others have not been analysed in greater detail (Miranda *et al.*, 2016; Kludacz-Alessandri & Cygańska, 2021).

However, the literature review of previously published papers has shown that other studies have primarily focused on CSR issues in a specific sector and failed to provide a general overview of CSR development in the context of potential inter-sectoral associations. Therefore, this paper aims to address this research gap and prove the existence of sectors with homogeneous approaches to CSR.

H2: *Statistically significant differences in ESG score exist across sectors.*

H3: *Clusters of sectors with homogenous approaches to CSR performance exist in each analysed period.*

Within the researched geographical context, individual studies follow the global trend: they do not provide a comprehensive view of CSR issues across all individual industries, but focus only on selected areas. For example, Kilian and Hennings (2014) divided companies listed on the German stock exchange DAX-30 into only controversial and non-controversial in-

dustries. Their research proves that companies in controversial industries communicate more about their CSR activities. In their study, Kowalczyk and Kucharska (2020) focused on comparing the German and Polish construction industries and concluded that the implementation of CSR in this industry is mainly influenced by increasing pressure from stakeholders. This conclusion is also confirmed by the study of Sperkova and Skypalova (2024), which considers employees to be critical stakeholders in agriculture (specifically in the viticulture branch). Likewise, CSR is becoming a key topic in the dairy industry, as argued by Westerholz and Höhler (2022), with greater emphasis on CSR reporting by co-operatives than that by investor-owned dairies.

Another often-researched sector is the energy industry, which has a controversial negative environmental impact. As pointed out by Weder *et al.* (2019), who examined companies in several countries of the world, including Austria and Germany, although these companies have already implemented CSR, they often do not connect CSR projects with their core business activities. A different view of the division of industries is provided by Aparicio *et al.* (2023), who, based on a sample of European countries, divided industries into three groups – capital, consumption and others – while trying to include CSR metrics in the evaluation of business efficiency as they consider them important indicators of a company's performance.

In the Central European context, researchers are aware of the increasing interest of stakeholders in the involvement of companies in CSR activities (Belas *et al.*, 2021a; Metzker & Zvarikova, 2021; Rozsa *et al.*, 2021). From the point of view of the development of this issue in individual sectors, however, attention has mainly been given to the method of communication and external and internal pressures leading to the implementation of the CSR concept. In this context, our study represents a contribution not only in confirming the positive relationship between the level of CSR implementation (measured through ESG) and financial performance, but also in connecting all industries within the NACE classification.

Previous studies have struggled with the issues of differences in CSR reporting by individual industries, which were resolved in our study through the ESG score provided by the company Refinitiv. Another common problem is sample size as only a few key companies represent some types of industries. Using accounting information from all NACE industries provided us with a sufficient sample to consider the results statistically significant.

Methods

This paper aims to demonstrate the level of CSR concept in central European countries and specify the impact of economic sectors on the development of social responsibility. To provide relevant information about CSR activities, enterprises strive to issue numerical measures reflecting a wide range of environmental, social and governance topics. The ESG score, provided by the company Refinitiv (a subsidiary of the London Stock Exchange Group), is issued for publicly traded companies and measures CSR performance and is used as the main indicator of CSR development in the study.

To verify the formulated hypotheses, these methodological steps were followed:

1. Research sample. The ESG score was measured for 575 central European companies (no companies from Slovakia, Croatia and Baltic states were included owing to missing ESG information) within the analysed period of 2020–2022 (chosen central European companies are depicted in Table 1). However, after the removal of unavailable financial and accounting data, the final dataset consisted of 490 companies. It is worth mentioning that most of the removed companies were banks or financial institutions (NACE K) as these enterprises of public interest are obliged to report their CSR activities (but not their financial reports). All the companies in the dataset are considerably large, public limited companies from eight central European countries. Of the total number of analysed enterprises, more than 48% are from Germany, 31.4% from Switzerland, 7.3% from Luxemburg, 6% from both Austria and Poland and a minimal representation (each less than 1%) from Czechia, Hungary and Slovenia.
2. Causality analysis. Following previous literature on the CSR concept and corporate profits (Wang, 2014; Wu *et al.*, 2021), the linear correlation coefficient is used to assess the potential link between earnings before tax and interest / corporate net income (earnings after taxes) and the CSR performance of companies from Central European countries, as indicated by their ESG score.
3. Normality test. The normality of the sample was verified using the Shapiro–Wilk and Kolmogorov–Smirnov tests with no proof of normal distribution. Thus, to test hypothesis H2, the Kruskal–Wallis test (non-parametric one-way analysis of variance [ANOVA]) was used to identify the differences in CSR performance across the sectors (hypotheses

tested at the 5% significance level). The test revealed significant differences across sectors; therefore, the multiple pairwise comparison by Dunn-Bonferroni post hoc tests was run.

4. Cluster analysis. This analysis aims to find and identify homogeneous subgroups (clusters) of the monitored set of enterprises in different economic sectors (classified by NACE). Generally, sectors within a cluster are typically based on a specific ESG score level. Sectors in different clusters have varying levels of ESG scores. The principle of clustering is the computation of distances between the objects. In this paper, Ward's method and squared Euclidean distance were used. This type of distance is used if a progressively higher weight should be given to further objects:

$$d_{ij} = \sum_{k=1}^K (x_{ik} - x_{jk})^2, \quad (1)$$

where d_{ij} is the distance between objects; K is the number of quantitative variables; x_{ik} is the value of the k -th variable for the i -th object, and x_{jk} is the value of the k -th variable for the j -th object. Ward's hierarchical agglomerative clustering method is based on an analysis of variance — in other words, the minimum growth of the sum of the squares deviates from the average by adding a new object to the cluster — which leads to the formation of clusters of similar shape and size. The clustered sectors are then portrayed in the dendrogram to reveal homogenous patterns of indebtedness across the sectors.

Results

As the study's main aim is to explore CSR performance across sectors and identify inter-sectoral differences, the basic descriptive statistics of financial data of all researched companies, explaining their financial background and position, are summarised in Table 2. The composition of the dataset according to NACE classification is presented in Table 3.

Table 4 portrays the correlation between the socially responsible behaviour of central European publicly traded enterprises measured by ESG scores and the profits achieved in each analysed period.

The correlation coefficient of ESG score with corporate profits is significantly positive in all analysed periods, declaring a moderate correlation in

2021 and 2020 and a low in 2022. Thus, H1 was confirmed, and there is a positive relationship between the CSR performance of Central European companies, as measured by the ESG index, and the level of corporate profits. This result in the central European conditions declares that those companies with a sufficiently integrated CSR concept can expect good financial returns and vice versa. Additionally, it may be assumed that enterprises are increasingly aware of the importance of focusing on sustainability in business. Given the growing interest in ESG scores (Clementino & Perkins, 2021), it is relevant to note the decreasing correlation coefficient, which represents an intriguing phenomenon. The COVID-19 pandemic may have initiated this decline, causing social, financial, and personal impacts (Al-Zyoud & Ordonez-Ponce, 2022), negatively affecting many companies' financial performance. Another factor could be the growing competition among companies as they increasingly prioritise ESG score indicators (Bargoni *et al.*, 2023), potentially weakening the relationship between profit and ESG.

Although positive development is evident, the ESG score lags far behind in some sectors. As declared by Kowalski (2022) or Sardanelli *et al.* (2021), some industry social responsibility scores are negatively different from average — for example, natural resource extraction, construction and property development, real estate and property agents, banks and car and automotive brands. Thus, the Kruskal–Wallis test was run to reveal any statistically significant differences in ESG score across the sectors of central European countries. The results are summarised in Table 5.

The non-parametric test confirms H2 — ESG score is statistically different across the sectors, which was proved in each analysed year. However, the results do not provide any information on which sectors are different from the others. To determine which sectors are mutually different, Dunn's post hoc tests with Bonferroni corrections were conducted (Table 6). As stated by Dinno (2015), this correction can modify the level of rejection as it divides alpha by the total number of tests and requires a smaller p-value to reject the testing results. The results of post hoc tests present the same output in each period: the most significant differences in the level of the ESG score are between NACE K (financial and Insurance Activities) and C (manufacturing), K and H (transport and Storage). This difference primarily concerns the impact, especially in scenarios where environmental harmlessness could occur, with C and H identified as the primary culprits (Ritchie & Roser, 2020) and K as an environmentally neutral sector (Ben Fatma & Chouaibi, 2021). There is also a significant difference within the monitored

period between K and J (information and communication) and K and G (wholesale and retail trade). The differences in CSR levels across the mentioned industries likely stem from varying legal requirements. The K industry is strictly regulated, obliging companies to create CSR reports, resulting in a higher ESG score. However, the remaining two sectors achieve a lower score due to insufficient CSR level (Long *et al.*, 2020). The sectors with the most similar ESG scores based on p-values during the whole monitored period are NACE J and D (Supply of electricity and gas). Likewise, the differences between NACE S (arts, sports, and recreation) and H (transport and storage) and between G and D started to become similar over the monitored time as the ESG median of the couples is very alike. Even in the conditions of the central European countries, many companies are aware of the trend of being green and socially responsible and are beginning to take a proactive approach to environmental issues regardless of the industry in which they operate (Joo *et al.*, 2019). As declared by Socoliuc *et al.* (2020), the analysis of the socially responsible concept in enterprises according to the NACE classification can be helpful for stakeholders to identify relevant enterprises by taking into consideration the sectoral vulnerabilities and risks associated with the market. Thus, through cluster analysis, the existence of the clusters of sectors with homogenous approaches to CSR performance in each analysed period was verified (Fig. 1a-c).

The analysis of the dendrogram — in particular, periods — has showed that six clusters of sectors were formed in 2020 and 2022 and five sectors in 2021. We conducted an analysis of the level of CSR performance using Ward's method for creating clusters, which relies on dispersion analysis. This method leads to the formation of metal clusters of approximately the same shape and size; in addition, it tends to remove small clusters (Gajdosikova *et al.*, 2024). *Hypothesis H3 was confirmed as the central European companies showed homogeneous practices in CSR activities across the economic sectors.* Moreover, the clusters of sectors are only slightly different in individual periods. Some economic sectors are always grouped together, which determines their mutual approach in CSR activities: (i) sectors B, H and S; (ii) C and J; (iii) G and L; and (iv) K, N and R. Two sectors, A (agriculture) and I (accommodation and food), are mostly grouped alone, except for 2021, when they are grouped based on their specific nature and perception of sustainability.

Discussion

Interesting outputs were revealed by analysing the sample of 490 publicly traded central European enterprises in the context of their CSR performance. According to NACE, these findings contribute to the existing literature on the correlation between financial performance and CSR levels and enhance understanding of industries with similar CSR performance. The data from the analysed years has demonstrated a positive correlation between CSR performance and achieved profits, aligning with Kamaliah's findings (2020), who showed an effect of profitability on CSR disclosure and CSR on firm value. Our central-European study confirmed differences across economic sectors by running the Kruskal–Wallis test, presenting different distributions of ESG scores across the categories of NACE in all analysed periods. Nonetheless, through Ward's hierarchical agglomerative clustering method, the clusters of sectors with homogeneous approaches to CSR performance were identified, which may show a sign of accountability to investors. Schwertner and Sohn, (2024) underline the importance of CSR activities, business practices and ethics in investment decisions as investors are more concerned with where their money is invested.

The findings achieved in the central European environment are discussed in the context of the last approaches to CSR performance. Kaul and Luo (2018) observed that the CSR concept could result in financial benefits primarily related to the core business activities. The significant impact of profitability on CSR is also recorded by Wu *et al.* (2021), who proved that the effect is the same for all types of enterprises in terms of size. Implementing the CSR concept is not only necessary for companies operating in socially sensitive sectors with a negative impact on the environment. As shown by the Kruskal–Wallis test this dimension also affects internal business operations. The reason may be the European directive, which imposes a non-financial reporting obligation on the transparent behaviour of enterprises related to social and environmental issues. This is imposed on large public-interest entities — listed companies, insurance companies or banks (most of them belong to the NACE sector K). These enterprises need to include, in their management report, a non-financial statement that includes information in the range necessary to understand the development, behaviour, position and impact of the corporate activities relating to minimum environmental, social and employment issues, respect for human rights and the fight against corruption and bribery (Ahmad *et al.*, 2022).

However, the manufacturing sector may cause severe damage to the land, water and air, resulting in massive environmental pollution (Cherian *et al.*, 2019; Goyal & Kumar, 2017). The harmfulness of the transport sector is also evident; the main barriers are the development of low-carbon and sustainable logistics services (Govindan *et al.*, 2021). Arimany-Serrat *et al.* (2019) confirmed the negative effect of the transport sector on the environment (CO₂ emissions) and showed substantial challenges in CSR activities. The results of these studies underline the discrepancies between the sectors and confirm the outputs of multiple pairwise comparison.

Finally, it was proved that some economic sectors have a homogenous approach to CSR activities. Their common features have also been presented in other studies declaring the correctness of the results achieved. The complexity of agriculture and its challenges in CSR (e.g. natural resource management, innovation and technology, livestock development, and welfare of animals) have been subjects of interest in several studies (Coppola *et al.*, 2020; de Olde & Valentinov, 2019; Nazzaro *et al.*, 2020; Panait *et al.*, 2020). The hospitality industry, known for its outsized environmental impact, has also been integrating sustainable development and green choices to attract socially active customers (Kalyar *et al.*, 2021; Koseoglu *et al.*, 2021). Pereira-Moliner *et al.* (2021) associate the implementation of CSR with reducing costs and differentiating hotels, which improves their reputation, as an essential part of their competitiveness. As previously mentioned, owing to the impact on the environment and local communities and the negative effects of sectoral projects (Pons *et al.*, 2021), the most damaging sectors B of mining and quarrying (Wozniak & Jurczyk, 2020; Phiri *et al.*, 2019; Singal, 2021; etc.) and H transporting and storage (Arimany-Serrat *et al.*, 2019), together with a sector S (other services) are clustered homogeneously. Introducing impactful CSR programs in these sectors is key for lower financial risks and higher investment returns (Jenkins & Yakovleva, 2006). Sectors C (manufacturing) and J (information and communication) form a cluster, which may be explained by their mutual interconnection of both different manufacturers of hardware and spare parts and high production of CO₂ emissions (Ritchie & Roser, 2020). The lack of money and skills for CSR implementation, management commitment and the consumers' passive attitude are the main barriers (Goyal & Kumar, 2017), in line with our finding of a positive correlation between corporate profits and CSR concept. Moreover, both sectors face the challenges of considering sustainability and green systems for their production and services. Shahzad *et al.*

(2020) explored the relation between CSR activities and green innovation in the manufacturing industry. They claimed that the dimensions of CSR positively relate to environmentally sustainable development. For the cluster of sectors G (wholesale and retail trade) and L (real estate), the mean value of ESG score in the given horizon is 44, resp. 41 points. Both sectors have substantial room for improvement. Based on the results of their study, Dahlin *et al.* (2020) concluded that real estate enterprises with a significant commitment to CSR should use a business model with a holistic and long-term approach to CSR and financial performance. A positive finding is that this sector is interested in reporting and advocating for the demands of various stakeholders (Huang *et al.*, 2017). While contractors focus primarily on environmental impact, CO₂ emissions, and biodiversity, real estate developers deal with green building designs and environmental assessments of construction sites. The last group of sectors with a homogeneous approach to CSR activities within the analysed horizon was determined to include the K (financial and insurance activities), R (arts and entertainment activities), and N (administrative and support service activities) sectors. It is possible to present this cluster as one of public interest with minimal environmental impact. Not surprisingly, they belong to the same cluster. Ben Fatma and Chouaibi (2021) concur, asserting that specific legal regulations and environmental harmlessness often exclude financial institutions from CSR studies. They recommended using the ESG score to disclose important governance mechanisms and CSR determinants as the financial sector plays a fundamental role in society (Al-Zyoud & Ordonez-Ponce, 2022) and generates firm value from CSR performance (Kuzey *et al.*, 2021).

Conclusions

CSR means that enterprises respect the needs of all stakeholders when making a profit and building a competitive market advantage. The importance of corporate earnings was also verified in this research as the results of the correlation analysis show that the CSR performance of central European enterprises, measured by the ESG score, is positively associated with the level of corporate earnings in all industries. The role of economic sectors in which the enterprises operate is crucial, as some enterprises negatively impact society and the environment. Investors tend to exclude them from their portfolios owing to harmful effects. However, some sectors are

welcomed as an investment to reduce the degree of portfolio diversification. Using the dataset of 490 publicly traded companies, this study found statistically significant differences in the development of the CSR concept across sectors. Thus, the CSR performance level analysis across sectors can demonstrate to stakeholders, investors and customers that the particular enterprise is better equipped and more profitable and that it makes it easier to acquire capital and enhance competitive advantage. Underlining this important point, agglomerative hierarchical clustering was used to group sectors with homogenous approaches to CSR. The individual clusters show that the industries within one cluster are at the same level regarding CSR performance (measured by ESG), while they differ in their level of CSR. The results reveal an almost similar cluster of sectors in each monitored period, which may help stakeholders identify responsible businesses. Many studies have confirmed that information about CSR has become an essential part of information that reduces uncertainty in investors' decision-making and positively affects other stakeholders, such as employees, customers and the supply chain. If we compare this information between individual clusters, we obtain another critical piece of information. The analysis of CSR development in all economic sectors may have several practical implications for investors and stakeholders whose intention to invest is significantly influenced by the green business of enterprises. As the business performance of enterprises with higher levels of ESG score, and thus with developed CSR concept, positively affects their financial status, economic growth and competitiveness, corporate financial performance and the level of earnings achieved are the impetus for further research – particularly, how the enterprises from different sectors and with varying environmental impact manage their earnings. Our results may serve as a tool for investors in their decision-making as their interest in companies with better CSR levels increases owing to their credibility.

Even though this study has focused on all publicly traded enterprises of the Central European area, whose CSR data measured by ESG scores are available, not all the sectors are equally represented, which may affect the robustness of the conclusions. Another limitation of the study is the central European region, which restricts the generalisation of the conclusions to other geographical areas. Therefore, future studies will concentrate on the entirety of Europe, allowing the results to be applied to regions with diverse cultural and economic development. The COVID-19 pandemic impacted the examined time period, posing an additional limitation. There-

fore, future research will expand the analysis to a longer timeframe to prevent short-term fluctuations from distorting the results. Further research will address the inconsistent knowledge about the impact of individual ESG pillars on the financial performance of companies. It aims to expand knowledge by examining all NACE groups simultaneously. This continuous investigation will contribute to a deeper understanding of the dependence between CSR and corporate performance while providing a more comprehensive view of how different sectors adjust to evolving sustainability requirements.

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All data generated or analyzed are included in the published article. The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation. The raw anonymized data can be provided by emailing the primary author.

Author contributions

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Annex

Table 1. The percentage of enterprises according to the country of origin

NACE classification	Percent
Germany	48.2
Switzerland	31.4
Luxemburg	7.3
Austria	5.7
Poland	6.1
Hungary	0.8
Czech republic	0.2
Slovenia	0.2

Table 2. Descriptive statistics of financial data of all companies

	debtors	stock	current liabilities	non-current liabilities
mean (th. €)	645,618.45	679,506.16	2,326,170.90	3,050,548.03
median (th. €)	91,698.94	74,623.24	265,528.37	284,034.95
std. dev. (th. €)	1,857,308.46	2,864,674.51	10,407,342.40	13,154,462.53
CV (%)	2.88	4.22	4.47	4.31
	depreciation	tangible fixed assets	intangible fixed assets	EBIT
mean (th. €)	402,677.14	1,889,528.69	1,819,121.01	375,925.79
median (th. €)	43,800.76	169,441.24	87,399.17	50,822.84
std. dev. (th. €)	1,625,596.21	6,478,894.68	7,534,177.28	1,558,165.41
CV (%)	4.04	3.43	4.14	4.14
	EAT	total assets	current assets	sales
mean (th. €)	270,883.37	8,351,551.29	2,887,862.60	5,228,971.08
median (th. €)	33,009.67	1,171,334.85	449,128.38	795,901.50
std. dev. (th. €)	1,241,079.35	32,074,239.10	11,988,605.79	17,164,898.69
CV (%)	4.58	3.84	4.15	3.28

Notes: EAT – Earnings after taxes, EBIT – Earnings before interest and taxes

Table 3. The percentage of enterprises according to NACE

NACE classification	Percent	NACE classification	Percent
A	0.4	J	10.8
B	1.8	K	4.3
C	50.4	L	4.7
D	3.9	M	4.1
F	1.8	N	1.6
G	8.4	Q	1.4
H	3.5	R	1.2
I	0.4	S	1.2

Table 4. Correlation analysis

		EBIT	EAT
ESG Score	2022	0.251**	0.220**
	2021	0.379**	0.361**
	2020	0.439**	0.426**

** . Correlation is significant at the 0.01 level (2-tailed).

Table 5. Hypothesis test summary

Null Hypothesis	p-value			Decision
	2022	2021	2020	
The distribution of ESG Score is the same across categories of NACE in each monitored period.	0.045	0.036	0.042	Reject the null hypothesis.

Table 6. Pairwise comparisons of NACE

Sample 1-Sample 2	p-value			Sample 1-Sample 2	p-value		
	2022	2021	2020		2022	2021	2020
K-R	0.484	0.348	0.440	L-B	0.378	0.206	0.176
K-N	0.339	0.161	0.158	L-C	0.094	0.276	0.382
K-I	0.529	0.301	0.958	L-S	0.205	0.351	0.406
K-L	0.070	0.013	0.023	L-H	0.060	0.138	0.133
K-M	0.052	0.022	0.044	L-A	0.334	0.591	0.419
K-F	0.091	0.020	0.014	M-F	0.872	0.600	0.380
K-J	0.004	0.002	0.006	M-J	0.598	0.701	0.774
K-Q	0.087	0.104	0.168	M-Q	0.752	0.992	0.951
K-G	0.005	0.001	0.002	M-G	0.605	0.608	0.471
K-D	0.018	0.009	0.016	M-D	0.657	0.721	0.675
K-B	0.025	0.002	0.002	M-B	0.476	0.186	0.142

Table 6. Continued

Sample 1-Sample 2	p-value			Sample 1-Sample 2	p-value		
	2022	2021	2020		2022	2021	2020
K-C	<0.001	<0.001	<0.001	M-C	0.190	0.244	0.287
K-S	0.015	0.011	0.021	M-S	0.264	0.322	0.347
K-H	<0.001	<0.001	<0.001	M-H	0.101	0.123	0.104
K-A	0.089	0.122	0.084	M-A	0.379	0.563	0.379
R-N	0.892	0.784	0.671	F-J	0.838	0.761	0.443
R-I	0.863	0.685	0.697	F-Q	0.883	0.670	0.452
R-L	0.626	0.495	0.474	F-G	0.835	0.848	0.675
R-M	0.542	0.548	0.560	F-D	0.848	0.812	0.590
R-F	0.509	0.352	0.237	F-B	0.639	0.497	0.616
R-J	0.327	0.377	0.421	F-C	0.479	0.859	0.757
R-Q	0.447	0.621	0.660	F-S	0.387	0.635	0.871
R-G	0.331	0.337	0.284	F-H	0.247	0.470	0.654
R-D	0.363	0.400	0.386	F-A	0.452	0.780	0.701
R-B	0.280	0.124	0.103	J-Q	0.999	0.794	0.799
R-C	0.154	0.183	0.209	J-G	0.989	0.850	0.560
R-S	0.164	0.200	0.220	J-D	0.989	0.959	0.826
R-H	0.082	0.097	0.089	J-B	0.683	0.233	0.154
R-A	0.252	0.385	0.258	J-C	0.272	0.261	0.256
N-I	0.931	0.817	0.489	J-S	0.376	0.403	0.401
N-L	0.715	0.688	0.810	J-H	0.148	0.144	0.098
N-M	0.615	0.753	0.919	J-A	0.476	0.648	0.423
N-F	0.571	0.481	0.417	Q-G	0.995	0.724	0.584
N-J	0.540	0.540	0.756	Q-D	0.994	0.788	0.716
N-Q	0.500	0.806	0.976	Q-B	0.771	0.288	0.222
N-G	0.363	0.482	0.536	Q-C	0.665	0.473	0.475
N-D	0.403	0.560	0.675	Q-S	0.493	0.403	0.404
N-B	0.307	0.173	0.194	Q-H	0.370	0.254	0.209
N-C	0.151	0.263	0.420	Q-A	0.522	0.589	0.397
N-S	0.176	0.273	0.374	G-D	0.998	0.927	0.820
N-H	0.079	0.136	0.177	G-B	0.694	0.288	0.241
N-A	0.275	0.478	0.380	G-C	0.332	0.437	0.771
I-L	0.911	0.981	0.381	G-S	0.386	0.463	0.584
I-M	0.847	0.945	0.426	G-H	0.165	0.202	0.214
I-F	0.791	0.839	0.228	G-A	0.481	0.690	0.530
I-J	0.696	0.945	0.356	D-B	0.722	0.304	0.261
I-Q	0.726	0.945	0.482	D-C	0.494	0.511	0.635
I-G	0.695	0.903	0.277	D-S	0.420	0.459	0.517
I-D	0.702	0.932	0.330	D-H	0.231	0.238	0.228
I-B	0.584	0.540	0.132	D-A	0.493	0.672	0.486
I-C	0.529	0.757	0.238	B-C	0.955	0.444	0.314
I-S	0.417	0.616	0.208	B-S	0.657	0.895	0.774
I-H	0.360	0.541	0.132	B-H	0.535	0.957	0.900
I-A	0.427	0.706	0.214	B-A	0.640	0.897	0.935
L-M	0.843	0.913	0.853	C-S	0.602	0.646	0.645
L-F	0.750	0.652	0.452	C-H	0.345	0.344	0.248
L-J	0.425	0.788	0.940	C-A	0.625	0.824	0.569
L-Q	0.644	0.930	0.847	S-H	0.964	0.921	0.834
L-G	0.438	0.683	0.590	S-A	0.872	0.969	0.793
L-D	0.513	0.794	0.802	H-A	0.883	0.916	0.878

Figure 1a. ESG clusters of sectors 2022 **Figure 1b.** ESG clusters of sectors 2021

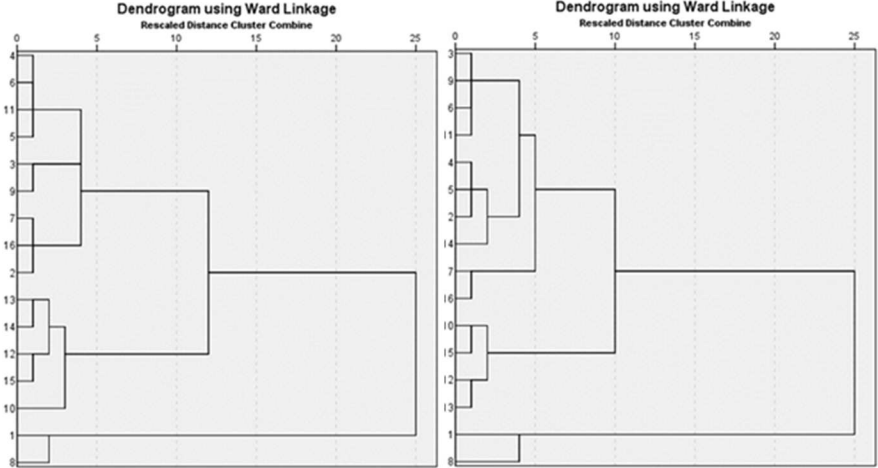
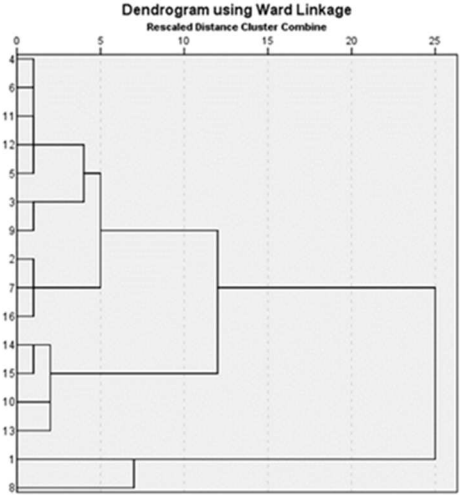


Figure 1c. ESG clusters of sectors 2020



Note: Numbers on the horizontal axis indicate the sectors, i.e. 1 is for NACE A, 2 for B, 3 for C, 4 for D, 5 for E, 6 for G, 7 for H, 8 for I, 9 for J, 10 for K, 11 for L, 12 for M, 13 for N, 14 for Q, 15 for R, 16 for S.