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FACTORS OF SUSTAINABLE COMPETITIVENESS AT COMPANY LEVEL: A COMPARISON OF FOUR GLOBAL ECONOMIC SECTORS

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Abstract. Built on the premise that a company's competitiveness is given by its robust financial performance and the strength of its position on the market, but only under conditions of sustainability, this study aims to investigate the key factors of company competitiveness while considering sustainability issues. The two research objectives were: (1) to identify and analyze the key factors of sustainable competitiveness at company level (2) to find sector-related discrepancies regarding the identified factors. To achieve them, a horizontal analysis covering ten financial years (2012–2021) was performed on a sample of 1,449 companies from four global economic sectors (Consumer Cyclicals, Energy, Health Care, and Technology) – using Exploratory factor analysis (EFA) and ANOVA. Nine factors (both financial and non-financial) were found: liquidity, profitability, revenue efficiency, inventory management efficiency, ESG performance, receivables management efficiency, R&D efficiency, book value, and market value. Of them, ESG performance has emerged as an independent factor based on non-financial variables, its introduction into the research model being one of the study's novelties. Significant mean differences were found between the nine factors, depending on the sector, which allowed the ranking of sectors in terms of sustainable competitiveness, in descending order: Health Care, Technology, Consumer Cyclicals, and Energy.

Keywords: sustainable competitiveness, financial ratios, ESG scores, economic sectors, EFA, ANOVA.

JEL Classification: L10, M10, Q56.

Introduction

Competitiveness has always been a target for businesses, as it basically reflects a company's ability to strive and succeed in a specific market (Bhawsar & Chattopadhyay, 2015). However,

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competitiveness is not just a business-related concern; it is also a hot topic on the agendas of regions/nations seeking international leadership in specific industries/sectors (Wibowo & Nurcahyo, 2020). Therefore, in order for managers (and policymakers as well) to make well-informed, evidence-based decisions (aiming for competitive advantage), it is crucial to be aware of the factors of competitiveness and to constantly benchmark their targets and results against peers/industry average.

An ultimate indicator of performance – particularly in relation to competitors and as validated by the market (Chikán et al., 2022) – company competitiveness is a complex result of firm effect, industry effect and other effects (Singh, 2022), having competitive advantage at its heart (Farida & Setiawan, 2022). To ensure competitiveness – by increasing its level and maintaining it on the long run (Koev et al., 2020), companies must therefore consistently sustain their competitive advantage – which has become a critical task in a global environment that is more volatile and turbulent than ever.

Already elusive, company competitiveness faces yet another challenge, as sustainability has progressively morphed from an intellectual concern into an institutionalized global desideratum, proclaimed by international/global forums (van Vuuren et al., 2022), legitimized through regional/European policies (Eckert & Kovalevska, 2021), and formalized in national/local strategies (Biermann et al., 2022). Hence, the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) adopted at the highest UN level in 2015 as "a plan of action for people, planet and prosperity" to be carried out in a cooperative manner by all nations and stakeholders (United Nations [UN], 2015) have emerged as the global reference framework for the progress towards sustainability, while (re)bringing sustainability – specifically as encapsulated in the now-famous acronym ESG (Environment, Social and Governance) – to the top of companies' agendas, as a critical concern for them "to remain relevant and competitive in today's world"(World Economic Forum [WEF], 2022).

Both external pressures and internal drivers are shifting the search for (and the assessment of) company competitiveness by adding the sustainability dimension. Externally, companies must comply with new regulations (Tsalis et al., 2020), meet the new expectations of an increasing number of sustainability-aware consumers (Shao & Ünal, 2019), and pass the test of thorough scrutiny from a variety of other stakeholders (from media to investors) (Camilleri, 2020). Internally, companies must innovate (by developing sustainable products/processes/business models) for competitive advantage (Kneipp et al., 2019), develop dynamic capabilities (by continuously enhancing and strengthening the sustainability-related/driving resource base) to sustain competitive advantage (Bari, et al., 2022), create shared value (by rethinking the approach on markets, throughout the industry value chain, or within local clusters) to (re)connect with society (Porter & Kramer, 2011), or become good corporate citizens (with specific rights and correlated duties) to increase business legitimacy (Rendtorff, 2019). Whether it is considered a threat or an opportunity, sustainability – and the three pillars that build it (social, economic, and environmental) (Purvis et al., 2019) – can no longer be ignored by businesses.

Within this framework, the following research questions arise: (a) what are the factors that best capture company-level sustainable competitiveness? (b) are there factor-related differences between economic sectors? (c) how do the sectors differ in terms of their propensity towards sustainability?

Thus, this study aims to investigate the key factors of a company's competitiveness while considering sustainability issues. Adopting the sustainable competitiveness lens allows for the incorporation of new trends in both sustainable business development and sustainable finance when discussing company competitiveness. More specifically, it supports the idea that competitiveness achieved at any price, i.e., by transferring negative externalities to the company's (either present or future) various stakeholders, is not genuine competitiveness. Hence, sustainability provides the needed time-related dimension inherent to the SDGs, that more traditional approaches on competitiveness and competitive advantage lack. It incorporates the idea that "sustainability obliges firms to make intertemporal trade-offs to safeguard intergenerational equity" (Bansal & DesJardine, 2014), seeking to investigate how to promote "the business that is not focused solely on short-term profits and takes sustainability principles into account" (Vrabcova, et al., 2022).

Accordingly, from our point of view, a company's competitiveness is given by its robust financial performance and the strength of its position on the market, but only under conditions of sustainability. Starting from this central idea of the study, we defined two objectives: O1 – to identify and analyze the key factors of sustainable competitiveness at company level; O2 – to find possible disparities across economic sectors in terms of the identified factors.

An impressive body of articles published during the last decade proves the high interest of academia for the broad topic. A SCOPUS search for 2012–2021 of titles, abstracts and keywords in two main areas, Business, Management and Accounting, and Economics, Econometrics and Finance, returned 6771 results when combined with more specific search terms [competitiveness and firm/company/business/corporat*]; 6,490 results when targeted at "financial performance"; 11,948 results for [performance and non-financial/ESG/sustainab*]; 34,391 results for ["consumer cyclicals"/energy/"health care"/technology and sector/industry]; and 92 results for [ANOVA and EFA/"exploratory factor analysis"]. None of these articles, however, explore sustainable competitiveness at company level by considering financial ratios and sustainability (ESG) scores to identify, using EFA, the key factors of sustainable competitiveness in the four sectors covered by this study. Nor do any explore possible disparities, or ascertain how sectors differ in terms of their propensity towards sustainability, by comparing the factors of sustainable competitiveness across economic sectors using ANOVA. By targeting the intersection of the above-mentioned facets – embracing both a comprehensive and objective perspective (starting from an impressive number of variables/factors, expressed in financial and non-financial metrics issued by the globally sanctioned Thomson Reuters Refinitiv Eikon, and then refining them), this study is filling a research gap, while also being of interest for practitioners. It adds to the debate on the interplays between competitiveness and sustainability, a field where "findings have been fragmented and inconclusive" (Hermundsdottir & Aspelund, 2021), while contributing to the growing body of literature integrating competitiveness and sustainability at business level (Danilevičienė & Lace, 2021) towards a new paradigm of sustainable competitiveness (Oliveira et al., 2022).

The remainder of the paper is structured as follows. A Theoretical Background section evaluates how the current state of research on sustainable competitiveness emerged from the more traditional approaches on (multi-layered) competitiveness, and identifies the contributions and limitations of the previous studies. A Methodology and Data section elaborates our

choices in research design (quantitative and explanatory) and data collection (source, sample, categories, timeframe). The Results and Discussion section introduces the research results and interprets them against the existing literature. The Conclusions present the main findings of the study, highlights its theoretical and practical implications, explains its limitations, and suggests directions for future research.

1. Theoretical background

Studying a company's competitiveness and more precisely, identifying its factors are topical issues at any moment, even more so as the dynamism of the global business environment can reconfigure these factors. Company competitiveness is part of a multilevel approach to competitiveness: at national, sectoral and company level, and the influences between these levels can be bi- and multi-directional.

However, although it is an intensively researched topic, there is still no unified definition of competitiveness at company level, nor a universally recognized methodology for measuring its factors. Accordingly, from our point of view, a company's competitiveness is given by its robust financial performance and the strength of its position on the market, but only under conditions of sustainability. The current challenge for a company is therefore to improve its market competitiveness, while balancing the interests of all stakeholders (Nicoletti et al., 2020; Herciu & Ogrean, 2018) in the long run.

An exact identification of all the factors and especially their quantification is difficult to achieve. Challenges arise due to differences between national economies, which influence the impact of macroeconomic factors; the lack of access to all data needed to calculate them; and difficulties in distinguishing the causal link between company and national competitiveness (Rusu & Roman, 2018). Therefore, the main purpose of this work is to identify the factors of competitiveness (together with their component variables) at company level while considering sustainability principles. These factors, of financial and non-financial nature are aimed to be relevant for all companies. Moreover, to ensure the study's replicability, the factors are based on public data sources.

The traditional approach to company competitiveness has a financial dimension (financial performance), an operational dimension (operational performance) and a dimension given by the market value of the company. The factors that influence competitiveness can be internal and external (related to the company's micro- and macroenvironment) to the company.

Most of the studies that focus on competitiveness at company level only address the financial perspective and analyze financial performance, because data is more easily accessible and is comparable between companies (Akben-Selcuk, 2016). A study conducted on 432 Czech companies in the manufacturing and construction industries identified Return on assets (ROA), Return on sales, Sales growth, and Assets growth to be representative financial factors of company competitiveness (Pokorná & Částek, 2013). In addition to those, the following factors have also been identified as crucial for a company's competitiveness: Leverage level, Return on equity (ROE), Fixed assets to total assets ratio, Liquidity ratio, Investments level, Export performance (Liargovas & Skandalis, 2010); company's age, its promotional budget, profitability, growth rate, and market share, as well as the industry's growth rate (Notta et al., 2010).

In several more recent studies, by contrast, a company's competitiveness is a function of both financial and non-financial factors. A series of studies aim to identify as comprehensively as possible the financial and non-financial factors of competitiveness at company level (Vlachvei et al., 2016). The methods used to measure competitiveness vary depending on company size, smaller companies adopting simpler methods, while larger ones applying more complex methods with multiple dimensions and variables (Kožená & Chládek, 2012).

Some studies that analyzed company competitiveness had as starting point Michael Porter's "five forces" model or the "Diamond Model" (Mugo, 2020; Dobbs, 2014; Mahat, 2019; Tsai et al., 2021; Kharub & Sharma, 2017; Taçoğlu et al., 2019; Erboz, 2020). These models were applied on different samples of companies with the purpose of identifying a methodology to measure companies' competitiveness through its multiple dimensions (Chikán, 2008; Lalinský, 2008). Other studies have adapted the methodologies used by the World Competitive Yearbook and Global Competitiveness Index to measure national competitiveness at the company level by keeping the competitiveness' dimensions identified at the national economy's level (Cetindamar & Kilitcioglu, 2013). Márkus (2008) applied Porter's Diamond Model as a competitive analysis model to 500 companies from 6 different sectors of activity and of different sizes, and identified 4 representative factors of company competitiveness. These factors resulted after performing the factor analysis method with varimax rotation. Each factor consisted of a set of variables: factor 1 is made up of Sales revenue evolution and Number of employee trend; factor 2 contains Innovation, Organizational cooperation, and Demand; factor 3 consists of Age of the company and Qualified experts and factor 4 considers financial aspects. Using the same methodology as Márkus (2008), Chikán et al. (2022) examined 113 manufacturing companies from Hungary and built a Firm Competitiveness Index (FCI) consisting also of 4 variable-based factors named as Quality (factor 1), Delivery (factor 2), Flexibility of services (factor 3) and Adaptivity (factor 4). "Government Policies", "Factor Conditions", "Related and Supporting Industries" and "Cooperation and Innovation" are company competitiveness' factors that resulted from applying Porter's Diamond Model on 285 hospitality companies from Portugal (Nunes et al., 2018). Schmuck (2008) developed a Competitiveness Index containing 6 variables (participation in strategic alliances, marketing budget, R&D activities, labor force variation, changing of target markets, adapting to changes) after applying a survey on 199 companies from the South-Transdanubian region in Hungary and using regression as data analysis method.

Another group of studies built on the Nine Factor Competitiveness Model developed by Cho (Cho et al., 2008) consider the following dimensions of competitiveness: business context; demand conditions; related and supporting industries; factor conditions; workers; politicians and bureaucrats; professionals; entrepreneurs; chance events and tries to identify relevant and quantifiable factors for each dimension (Wibowo & Nurcahyo, 2020).

Another model for measuring company-level competitiveness is Assets – Processes – Performance (APP) which develops, exclusively from a theoretical point of view the dimensions of competitiveness and the factors that influence it. Although the model mentions more than 25 variables as being relevant, it does not provide actual ways to quantify them (Momaya, 2019).

An analysis of company competitiveness in Russia's industrial sector identified 4 dimensions: the influence of external factors of the company; the influence of internal company factors; product competitiveness; position on the market (Gerasimov et al., 2018). The merit of this study is to have defined explicit factors for each dimension and to have proposed a method of calculation for each factor. What is missing, however, is the application of this model to companies in the industrial sector to be tested, but it is an interesting topic for future research. A similar model was developed for Poland by Głód and Flak (2017); Flak and Głód (2015). Falciola et al. (2020) identified that the dimensions of a company's competitiveness are given by their ability to face competition (compete), to have access to essential market information (connect) and to adapt to market changes (change).

Other studies aimed to test individual factors to see if they have any influence on company competitiveness rather than create complex methodologies to measure competitiveness overall. An analysis of 871 SMEs in Spain identified that the adoption of information and communications technologies (ICT) favorably influences a company's competitiveness through the financial effects it generates: cost reductions and productivity growth (Barba-Sanchez et al., 2018). Thus, implementing digital transformation within companies helps their performance and competitiveness (Schrage et al., 2019; Petkovski et al., 2022). Also, a study analyzing 150 companies over two years found that "fostering a healthy degree of intracompany rivalry can help businesses enhance their competitiveness in the external market", since it creates an environment conducive to innovation and excellence (Hughes et al., 2021). Another extensive study showed a positive relationship between corporate governance and a company's competitiveness (Laksito & Ratmono, 2021). The existence of a positive and representative relationship between the innovations a company develops, especially those related to sustainability, and its competitiveness was also demonstrated (Sukumar et al., 2020; Skoludova & Kozena, 2015; Hermundsdottir & Aspelund, 2021).

However, the factors influencing company competitiveness are numerous and interconnected, the individual contribution of a single factor being often difficult to extract. Studies show that organization and management influence a company's competitiveness as well; companies with agile organization are more competitive than those with hierarchical, traditional organizational structures (Balog, 2020), and those that implement change management and ambidexterity register higher competitiveness scores (May & Stahl, 2017; Ogrean & Herciu, 2019). On the other hand, "value and rareness of resources and capabilities" (Baia et al., 2020), or "investment in intangible resources and capabilities" (Khan et al., 2019) also contribute to competitive advantage and competitiveness.

The above review of the methodologies and models for assessing company competitiveness found that most consider financial indicators, market position indicators, and non-financial indicators (some of which are difficult to quantify objectively), but they do not address the issue of competitiveness from a sustainability standpoint. At a time when concentrated efforts are being made at the European Union level and beyond to regulate and implement the concept of sustainable finance, it is essential to approach company competitiveness in a framework of respect for the principles of sustainability.

Sustainable competitiveness at the company level is defined "as a real and/or potential ability of an economic entity more effectively than competitors to meet the needs of various

groups of stakeholders based on business model in which the economic efficiency of resource is used, technological development, investments and organization changes do not compromise the environmental integrity and the ability to meet the needs of future generations" (Salimova et al., 2018). Another definition of sustainable competitiveness emphasizes the need to obtain and maintain competitive advantage in the long term, "but simultaneously the company must observe the rules of sustainable development and also contribute to the creation of a social, ecological and economic environment" (Boziková & Snircová, 2016). Economic competitiveness ensures the company's prosperity, but for a long-term orientation and development, environmental and social aspects must also be ensured, thus ensuring the company sustainable competitiveness (Doyle & Perez-Alaniz, 2017; Despotovic et al., 2016).

Company competitiveness should therefore be tackled by taking into consideration the environment, social issues, and corporate governance in addition to the other traditional dimensions, just as national competitiveness does (Balkytė & Tvaronavičiene, 2010). Also at the national level, the frameworks regarding sustainable competitiveness follow the same approach and take into account both the economic performance of the country and the aspects related to sustainability, the three pillars of sustainability (Rajnoha & Lesnikova, 2022; Möbius & Althammer, 2020), with emphasis on the role of human capital in increasing the sustainable competitiveness of the country (Balkytė & Tvaronavičienė, 2011). While more intensive research on sustainable competitiveness addresses the national level, there are studies that support the need to develop a framework for approaching company competitiveness that also considers the dimensions of sustainability.

The new business models, which have as their objective the long-term competitiveness of the company, have integrated new concepts that must be addressed in this context: resilience, innovation and the principles of sustainability (Cavaco & Machado, 2015). Hsu, Ou, and Ou (2015) develop "a sustainable performance evaluation criteria and model for companies", comprising the measurements of companies' financial, credit risk, environmental and social responsibility and test it on Taiwan's high-tech listed companies by integrating grey relational analysis and an improved TOPSIS method. Aiming to "reveal and assess the possibilities of the industry's sustainable competitiveness in Latvia and Lithuania", Danilevičienė and Lace (2021) use the total factor productivity (TFP), return on equity (ROE) and comparative analysis, and rank the growth of sustainable competitiveness in different industries' in the two countries. Mou et al. (2022) propose a model to evaluate the sustainable development capacities of electric power companies, using seven dimensions (production safety, public relations and social welfare, shareholder rights protection, environmental sustainability, employee rights protection, scientific research innovation ability, and financial status), and test the results on 18 listed electric power companies. Using a questionnaire survey (applied to selected Czech organizations) and factor analysis (Vrabcova et al., 2022) identify "six factors, namely, the integrated management system, employee development, CSR reporting, the organizational structure for innovation development, succession planning, and knowledge continuity" as "Strategic Trends of Organizations in the Context of New Perspectives of Sustainable Competitiveness".

2. Methodology and data

Thomson Reuters Refinitiv Eikon (2022) has been used to collect the desired data. These data, which come in the form of financial ratios and sustainability/ESG scores, were retrieved either from the financial statements of the selected companies or from other publicly accessible sources (e.g., annual reports, NGO websites, and Corporate Social Responsibility reports). Moreover, the selected variables are metric variables (Grömping, 2009) and measure financial and sustainable performance specific for determining the company's competitiveness.

As regards the financial ratios, they were calculated either by Thomson Reuters Refinitiv Eikon's platform, or computed by the authors, covering a period of ten years (2012–2021). By using a horizontal analysis, the authors have assessed the financial performance of the sample companies over the past decade for observing trends and growth patterns and for comparing companies both at sample and at sector level.

In terms of sustainable performance, ESG and ESG Controversies scores were selected. The data for these variables have been also collected from Thomson Reuters Refinitiv Eikon's platform, which calculated them as scores between 0 and 100 using their proprietary methodology). Furthermore, the ESG score used in the current analysis has been split into three components: environmental (E), social (S), and corporate governance (G). The ESG score levels and description are shown in Table 1.

Table 1. ESG score (source: own construction based on Thomson Reuters Refinitiv Eikons' ESG guideline)

Range	Meaning
0–25	Companies score a poor level of ESG performance, transparency regarding reporting and public information on ESG data
>25–50	Companies score an acceptable level of ESG performance, transparency regarding reporting and public information on ESG data
>50–75	Companies score a good level of ESG performance, transparency regarding reporting and public information on ESG data
>75–100	Companies score an outstanding level of ESG performance, transparency regarding reporting and public information on ESG data

Additionally, the ESG Controversies score was used alongside ESG score to complement the measurement of sustainable performance. Likewise, ESG Controversies score is a variable calculated and provided by Thomson Reuters Refinitiv Eikon. It is defined as "a score that measures a company's exposure to environmental, social and governance controversies and negative events reflected in global media" (Thomson Reuters, 2017). Its values vary between 0 and 100 (100 meaning that companies have no controversies) and depends partially on market capitalization (small, medium, and large). The study takes into consideration variation across economic sectors', for which the ESG Score (calculated by Thomson Reuters) has different weights for the ESG Pillars, as presented in Table 2.

Companies from four economic sectors were considered for analysis (Consumer Cyclicals, Energy, Health Care and Technology, as classified by the Thomson Reuters Business

Classification (TRBC) methodology, 2022). Based on data availability, the sample resulted comprises 1,449 companies. All considered companies are publicly listed companies and provided the needed data for the analyzed period (2012–2021).

Table 2. The weights of the ESG Score Pillars, by economic sector (source: Own construction based on Thomson Reuter's Eikon platform)

Economic sector	Environmental Pillar Score (Weight, %)	Social Pillar Score (Weight, %)	Governance Pillar Score (Weight, %)	ESG Score (Weight, %)
Consumer Cyclicals	19.1	42.6	38.3	100
Energy	34.5	42	23.5	100
Health Care	22.7	46.3	31	100
Technology	23.1	49.3	27.6	100

The current study is part of a bigger research project that aims to find solutions to increase the smart and sustainable competitiveness of businesses by integrating new and emerging technologies into business practices. Consequently, the selection of the four sectors is in line with both the project's objectives and the research areas it focuses on. More specifically, the sectors cover several STEM industries, including Technology as common thread and enhancer of competitiveness (through spillover effects), Health Care and Energy as topical sectors (due to the tremendous global challenges they recently faced), and Consumer Cyclicals as a barometer sector for the broader economy.

The database has been edited as follows: the authors have collected financial and non-financial data for the companies from the economic sectors mentioned above. Public traded companies compose the database, and it first consisted in 24,691 companies (Consumer Cyclicals – 8,951; Energy – 2,440; Health Care – 5,340; Technology – 7,960). To obtain consistent and relevant results, we have cleaned up the database. We eliminated companies without data, resulting in a database with 1,449 companies (Consumer Cyclicals – 546; Energy – 264; Health Care – 213; Technology – 426), and also cut 2 variables out of the initial 35 due to the lack of observations that could prevent the proper use of factor analysis. Also, to meet the linearity assumption of factor analysis and because of the variables' skewness, logarithmic transformation (with natural logarithm) was applied to the used variables, a common transformation used in social science analysis (Babones, 2016).

To achieve the first objective, O1 – to identify and analyze the key factors of sustainable competitiveness at company level, a factor analysis has been conducted in IBM-SPSS v.26. Having many initial variables (33), exploratory factor analysis (EFA) was applied as a data analysis technique and principal component analysis as a variable reduction method. This data analysis method is designed to study the interdependencies between several variables which characterize a certain phenomenon by reducing them with a minimum loss of information.

For the second objective, O2 – to find possible disparities across economic sectors in terms of the identified factors, one-way ANOVA was performed to test the following hypotheses: H1 – The chosen economic sectors differ significantly considering the identified factors; H2 – Some economic sectors have a higher propensity towards sustainability.

3. Results and discussion

The factor analysis produced robust results, with few factors and maximum common variance, after the exclusion of 11 variables.

The KMO value is 0.684, exceeding the threshold of 0.5, such that the sample can be considered adequate for factor analysis. Also, Bartlett's test of sphericity is significant ($\chi^2(231) = 91747.41$, $p < 0.05$) meaning that the correlation matrix is not an identity matrix.

Nine factors were retained because they met the retaining criterion of having an Eigenvalue > 1, see Table 3. The nine extracted factors explain 81.03% of total variance. Out of the nine factors, the first four factors account for 50.65% of total variance (factor 1 – 18.03%, factor 2 – 13.92%, factor 3 – 10.20%, factor 4 – 8.48%). The remaining five extracted factors explain 30.38% of total variance. The relative importance of the first three factors is equalized after rotation (12.32%, 12.11%, and 11.18%), followed by the other six factors (9.30%, 8.60%, 8.21%, 7.32%, 6.34%, and 5.60%), thus, optimizing the factor structure.

Table 3. Rotated component matrix (source: own research in IBM-SPSS v.26)

	Component								
	1	2	3	4	5	6	7	8	9
LN_CashRatio	.901								
LN_ValueAdded								.709	
LN_ROCE		.791							
LN_MarketBook-Ratio		.635							.557
LN_RORC							.860		
LN_Price-InnovationRatio							.913		
LN_EScore					.714				
LN_SScore					.805				
LN_GScore					.737				
LN_BookValue-Share								.895	
LN_AvgInventory-Days				.993					
LN_AvgReceiv-ablesRatio						.928			
LN_ AvgReceivables-CollectionDays						.912			
LN_CurrentRatio	.929								
LN_QuickRatio	.932								
LN_Inventory-Turnover				–.993					
LN_Operating-Margin			.844						

End of Table 3

	Component								
	1	2	3	4	5	6	7	8	9
LN_NetProfit-Margin			.845						
LN_CashFlow-Margin			.911						
LN_ROA		.798							
LN_ROE		.863							
LN_PriceTo-Earnings									.928
Eigenvalues	3.968	3.063	2.246	1.867	1.710	1.635	1.226	1.098	1.015
Initial % of Variance	18.036	13.921	10.209	8.484	7.771	7.433	5.573	4.992	4.615
Rotated % of Variance	12.328	12.117	11.184	9.306	8.604	8.212	7.327	6.347	5.609

Notes: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. a. Rotation converged in 6 iterations.

The Rotation Component Matrix shows for each of the nine extracted factors the load of each variable (variables which load higher than 0.3 were kept). For example, variables "LN_QuickRatio", "LN_CurrentRatio" and "LN_CashRatio" load highly in factor 1 (0.932, 0.929, and 0.901) compared with the load in other factors, which means they make a bigger contribution to factor 1 than to the other factors. The only variable that has a high load in two factors (2 and 9) is "LN_MarketBookRatio", which makes sense, given that Market-to-book ratio is strongly related to ROCE ratio (return on capital employed) and with Price-to-Earnings ratio. In this case, the variable "LN_MarketBookRatio" has a bigger contribution to factor 2 than to factor 9.

Figure 1 includes the extracted factors and their corresponding variables and could explain different aspects of the competitiveness from both financial and non-financial perspectives. Several studies consider some of these factors as focal points in explaining a company's competitiveness. For summarizing these studies, an Appendix has been added at the end of the paper that includes authors of the studies, factors of company's competitiveness, the used methodology and the main results. The purpose of this Appendix is to present some articles from the relevant literature that support our findings related to the key factors of sustainable competitiveness at company level.

Several one-way ANOVA with contrast tests for each of the nine resulted factors were performed to see whether the factors differ between the four economic sectors (Consumer Cyclicals, Energy, Health Care, and Technology), the results being shown in Table 4.

In Table 4 the pairs of sectors which differ statistically based on the factors' means are highlighted with grey. It can be asserted that for the factors 4, 6, 7 and 9, the mean differences are significant between all sectors. The other factors differ statistically for either five (factors 1, 2 and 3), four (factor 5) or three (factor 8) pairs of sectors. Thus, H1 is partially confirmed: the chosen economic sectors differ significantly according to most of the identified factors.

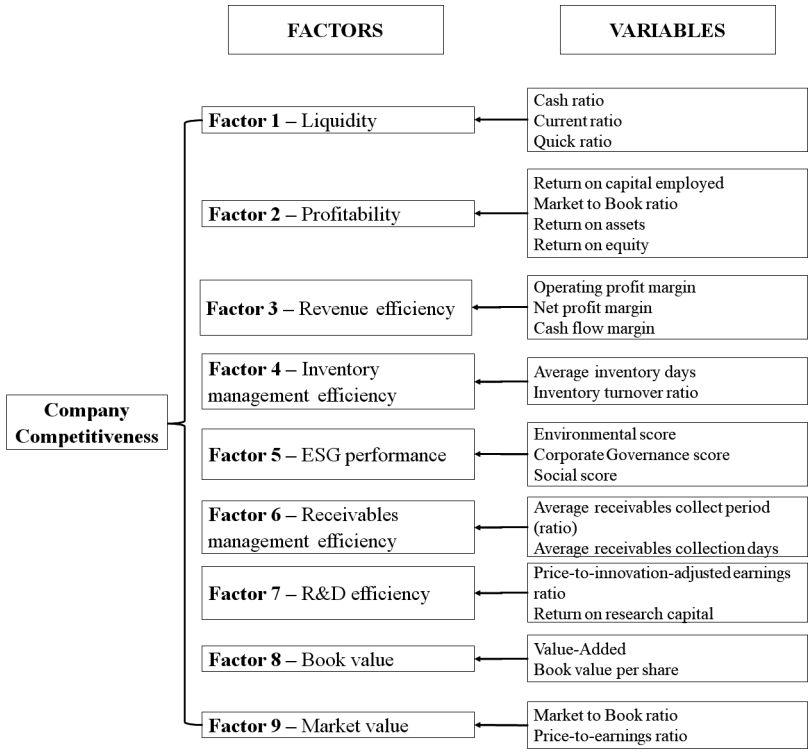

Figure 1. Representation of the variables and factors of company competitiveness (source: own research)

Table 4. Contrast tests results (source: own research in IBM-SPSS v.26)

Factor 1 (variables Cash, Current, and Quick ratios)				
	1	2	3	4
1		.563	.000	.000
2			.000	.000
3				.000
4				

Factor 2 (variables ROCE, Market-to-book, ROA, and ROE ratios)				
	1	2	3	4
1		.000	.003	.666
2			.000	.000
3				.001
4				

Factor 3 (variables Operating profit, Net profit, and Cash flow margins)				
	1	2	3	4
1		.000	.000	.000
2			.280	.000
3				.000
4				

Factor 4 (variables Average inventory days and Inventory turnover ratio)				
	1	2	3	4
1		.000	.000	.000
2			.000	.000
3				.000
4				

Factor 5 (variables Environmental, Social and Corporate Governance scores)				
	1	2	3	4
1		.364	.000	.000
2			.000	.000
3				.856
4				

Factor 6 (variables Average receivables collect period (ratio) and Average receivables collection days)				
	1	2	3	4
1		.000	.000	.000
2			.000	.000
3				.012
4				

End of Table 4

Factor 7 (variables Price-to-innovation-adjusted earnings and RORC ratios)					Factor 8 (variables Value-Added, and Book-value per share)					Factor 9 (variables Market-to-book and Price-to-earnings ratios)				
	1	2	3	4		1	2	3	4		1	2	3	4
1		.000	.000	.000	1		.000	.861	.345	1		.000	.000	.000
2			.000	.000	2			.001	.001	2			.000	.000
3				.015	3				.576	3				.000
4					4					4				

Based on the ANOVA results (t-values), the sectors were ordered for each of the 9 factors (Table 5) by attaching a value of 4 to the highest ranked sector (highest t-value of the factor) and a value of 1 to the lowest ranked sector (lowest t-value of the factor). By creating these hierarchies, a ranking of the considered economic sectors according to their sustainable competitiveness is proposed.

In terms of propensity towards sustainability (H2), the Technology sector leads with a mean value of 0.1019 (standardized values) for factor 5 (containing the ESG variables). It is followed by the Health Care (0.0971), Energy (–0.0647) and Consumer Cyclicals (–0.0861) sectors. According to the upper and Table 5 results, it can be asserted that the chosen sectors can be grouped in two clusters: a first one (Technology and Health Care) which is more inclined towards sustainability and a second one (Energy and Consumer Cyclicals) characterized by significant lower values for sustainability than the first cluster.

Table 5. Sustainable competitiveness ranking by sector (source: own research)

Sector/ Factor*	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Average	Ranking**
Health Care	4	4	4	4	3	4	1	3	4	3.44	I
Technology	3	2	2	1	4	3	2	2	3	2.44	II
Consumer Cyclicals	2	3	1	3	1	1	3	4	2	2.22	III
Energy	1	1	3	2	2	2	4	1	1	1.89	IV

Notes: *From 1 (lowest) to 4 (highest), dimension score for each sector; **From I (highest) to IV (lowest), sustainable competitiveness ranking by sector.

The results indicate that the Health Care sector has the highest rank in terms of sustainable competitiveness, followed by the Technology sector, Consumer Cyclicals sector, and finally by the Energy sector.

The study's findings confirm, on the one hand, earlier findings that financial factors (ROA, ROE, liquidity ratios, etc.), continue to be a crucial dimension of competitiveness at

company level because they enable comparisons of companies' financial performance across sectors/industries (Liargovas & Skandalis, 2010; Notta et al., 2010; Pokorná & Částek, 2013; Akben-Selcuk, 2016). On the other hand, the non-financial indicators also proved to be an important dimension when analyzing corporate competitiveness (Vlachvei et al., 2016). While prior research took into consideration different indicators for the non-financial dimension of company competitiveness (Márkus, 2008; Tsai et al., 2021; Cetindamar & Kilitcioglu, 2013; Dobbs, 2014; Mahat, 2019; Mugo, 2020), the current study approached this dimension by considering sustainable performance, namely the ESG score. In terms of the data analysis method, factor analysis comes as a primary tool used in previous studies to assess company-level competitiveness. Besides the fact that this study's results confirm previous research, it adds a novel perspective on the non-financial dimension, focusing on the sustainable part of it.

Conclusions

The purpose of the paper was to investigate the key factors of competitiveness at company level while considering sustainability issues. Following a horizontal analysis, over a period of ten financial years (2012–2021) and on a sample of 1,449 companies from four economic sectors (Consumer Cyclicals, Energy, Health Care and Technology) covering all geographic regions, we identified 22 variables and 9 factors of a financial and non-financial nature as representative of a company's sustainable competitiveness.

The financial variables have the highest loads in eight out of nine factors (factor 1, 2, 3, 4, 6, 7, 8 and 9) and explain 72.46% of the total variance of sustainable competitiveness. These financial variables describe company performance from the perspective of liquidity, profitability, leverage, asset management and market value.

The non-financial variables have the highest load in Factor 5, which explains 8.6% of the total variance of sustainable competitiveness. The non-financial variables are represented by the components of the ESG score – Environmental, Social and Corporate Governance. This is one of the novel elements of this study since we are not aware of other studies that consider ESG as a representative factor of company-level competitiveness. The factor analysis shows that out of the 3 components of the ESG score, the Social variable has the highest load (.805) within Factor 5, followed by the Corporate Governance variable (.737) and the Environmental variable (.714).

Regarding the potential disparities between the economic sectors in reference to the extracted factors, we found that these differences exist and generate different levels of competitiveness between sectors. Another novel element of the study is represented by the ranking of the economic sectors according to their sustainable competitiveness. In this regard, the Health Care sector ranks first in terms of sustainable competitiveness, followed by the Technology sector, the Consumer Cyclicals sector, and finally the Energy sector. Moreover, the Technology sector leads in terms of propensity towards sustainability, followed by the Health Care, Energy and Consumer Cyclicals sector.

To sum up, the study contributes to the advancement of knowledge in the field of sustainable competitiveness, shedding light on the inner factors of sustainable competitiveness at company level and the differences across economic sectors in terms of the extracted fac-

tors, and thereby allowing for the ranking of sectors by their sustainable competitiveness. The study also brings some practical implications for decision-makers at business/company level and policy-makers at regional/national levels aiming for sustainable competitiveness in specific industries/sectors, as it provides them either with evidence-based information to support their decisions (particularly in reference to the four sectors that made the object of the study), or with an instrument to be further used for both internal analysis and competitive benchmarking (regardless of the sector).

The study also has some limitations that might be covered by future research. Firstly, the results cannot be generalized to other economic sectors, as they proved to be idiosyncratic. Therefore, the same research methodology (or a different one) may be applied to examine the representative factors of sustainable competitiveness in other sectors. Secondly, although the study covers ten years, the results may have been influenced by that decade's sustainability-related contingencies. This suggests a need for replication of the study to test the time-related robustness of its results. Thirdly, these results are consistent only with Thomson Reuters Refinitiv Eikon's (methodology and) data on ESG performance scores. It would be useful for future studies to use data from another provider to compare and contrast the results. Fourthly, the study has not tested causality or the structural relationships between variables. The key factors here are analyzed as descriptors of sustainable competitiveness at company level, not as determinants of them, calling for further causal analysis.

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Author contributions

R-AȘ, DMM and MȚ conceived the study and were responsible for the design and development of the data analysis. R-AȘ and MȚ was responsible for data collection and analysis. R-AȘ and MȚ were responsible for data interpretation. DMM and CO prepared literature review. MH wrote the first draft of the article. MH and CO were responsible for final conclusions.

Disclosure statement

The authors declare no conflict of interest.

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APPENDIX

Summary of literature sources related to the company's competitiveness factors

Literature sources	Factors of company competitiveness	Methodology	Results
Liargovas and Skandalis (2010)	Liquidity Profitability	Panel regression analysis	A competitiveness measurement model based on Return on sales, return on Assets, Return on Equity.
Pokorná and Částek (2013)	Profitability	Cluster analysis, Sequential Floating Forward Selection	The main factors that influence firm competitiveness are the traditional financial indicators.
Akben-Selcuk (2016)	Profitability	Regression analysis	The results suggest that "several firm specific factors are significant in explaining variations in the financial performance and competitiveness".
Falciola et al. (2020)	Revenue efficiency	Factor analysis, Regression based sensitivity	The dimensions of a company's competitiveness are given by their ability to compete, to connect, and to change.
Márkus (2008)	Revenue efficiency R&D efficiency	Porter's Diamond Model, Factor analysis method with varimax rotation	The study shows that "the companies in larger towns and larger companies with richer resources tended to have greater competitiveness. These results confirm our preliminary hypothesis that the positive agglomeration effect is relevant".
Chikán et al. (2022)	Inventory management efficiency; Receivables management efficiency	Hierarchical regression analysis	The results show a positive impact of the dynamic production capabilities on the firm's perceived competitiveness.
Möbius and Althammer (2020)	ESG performance	Factor analysis combined with a variance-based structural equation model	The paper shows that "favorable ecological, social, and economic environments can jointly contribute to facilitating long-term sustainable competitiveness outcomes".
Laksito and Ratmono (2021)	ESG performance R&D efficiency	Structural Equation Model	The paper concluded that "it is necessary to utilize the development of information technology and the application of good corporate governance to increase the company's market competitiveness which will impact on improving company performance".
Hermundsdottir and Aspelund (2021)	ESG performance R&D efficiency	Systematic literature reviews	Most of the reviewed articles in the study "find that sustainability innovations have a positive effect on firm competitiveness".

End of Appendix

Literature sources	Factors of company competitiveness	Methodology	Results
Rajnoha and Lesnikova (2022)	R&D efficiency	Linear regression, Multiple linear regression, and ANOVA	The conclusion outlines "the direction from improved competitiveness through higher economic performance reinforcing R&D expenditure and high-tech employment to better sustainability and well-being".
Sukumar et al. (2020)	R&D efficiency	Generalized method of moments model	The results of the study "provide empirical evidence that there exists a strong, positive link between corporate innovations and corporate competitiveness".
Nunes et al. (2018)	R&D efficiency; Inventory management efficiency; Receivables management efficiency	Structural equation model	The factors that contribute most directly to competitiveness are "government policies", "factors conditions", "related and supporting industries" and "cooperation and innovation".
Blendinger and Michalski (2018)	Book value	Empirical analysis	The paper shows "how long-term value-added driven competitiveness is widely adopted by German DAX 30 corporations and how it can be measured".
García-Zambrano et al. (2018)	Market value	Simple linear regression model	The authors stated that the "investment in the human capital dimension has a higher impact on the market value of the company, and therefore, on the overall value of the company".
Lytvyn et al. (2022)	R&D efficiency Market value	Theoretical analysis	According to the paper results "effective implementation of innovations, digitalization of business processes allows companies to increase their productivity, achieve the required level of competitiveness and take a stable position in the markets".