SUSTAINABLE COMPETITIVENESS: THE ROLE OF ENVIRONMENTAL PERFORMANCE IN ECONOMIC RANKINGS

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ABSTRACT

This study examines the relationship between competitiveness and sustainability, demonstrating a positive correlation between high national competitiveness and strong environmental performance. Using data from the Environmental Performance Index (EPI) and the IMD World Competitiveness Ranking, the analysis highlights those sustainable practices that contribute significantly to long-term competitive advantage. The results show that countries excelling in economic infrastructure, innovation, and governance often prioritize environmental policies, enhancing both competitiveness and sustainability. These findings underscore the importance of integrating sustainable practices into economic strategies to foster balanced and resilient growth.

Keywords: Competitiveness, Sustainability, 21st Century, Environmental Performance Index (EPI), IMD World Competitiveness Ranking, Resource-Based View (RBV), Economic Growth

JEL Codes: Q56, F63, O44, Q01, O11

1 INTRODUCTION

The intersection of competitiveness and sustainability has emerged as a critical area of study, as companies increasingly strive to achieve economic growth while addressing environmental and social imperatives. The literature reveals a growing convergence of these concepts, highlighting that long-term competitiveness is increasingly dependent on sustainable practices. This convergence between the two concepts is essential in contemporary business and economic discourse.

Competitiveness generally refers to a firm's ability to maintain an advantageous position in the market, whereas sustainability emphasizes the responsible use of resources to meet current needs without compromising future generations' ability to meet theirs. And is traditionally defined as a firm's capacity to maintain an advantageous position within a market by enhancing productivity, efficiency, and profitability (Porter, 1990). Sustainability, on the other

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hand, focuses on the long-term stewardship of resources, balancing present needs with the future welfare of society and the environment (WCED, 1987). Scholars argue that competitive advantage is increasingly derived from sustainable practices, as these address the social and environmental expectations that define modern markets.

The present article has as its main aim to investigate the current relationship between the two concepts and how sustainability contributes to maintaining and increasing the competitiveness of companies and countries. And is structured as follows: after this introduction, section 2 presents a literature review of the theoretical framework and the relation between the two concepts, considering the seminal papers and the state of the art, and the main contributions.

2 LITERATURE REVIEW

Early theories on competitiveness, rooted in classical economic thought, primarily focused on productivity and innovation as drivers of competitive advantage (Porter, 1990; Pereira, 2005). Porter's Diamond Model outlines key determinants of national competitive advantage, including factor conditions, demand conditions, related industries, and firm strategy. However, Porter's later work on the concept of "shared value" (Porter & Kramer, 2011) marks a shift towards a broader view, suggesting that firms can create economic value by addressing social and environmental challenges and is near the Resource Based View (RBV) (Barney, 1991; Penrose, 1958). This perspective is related to the business analysis framework for strategic management based on value, rarity, imitability, and organization (VRIO). Proposed by Barney (1991), VRIO is a form of internal analysis that evaluates all the resources and capabilities of a firm.

The RBV is a strategic framework that focuses on how a firm‘s internal resources contribute to sustaining competitive advantage. Recent scholarly work has expanded and critiqued this perspective, offering deeper insights into its applications and limitations. The integration with international business, developed by Peng (2001), examines the diffusion of RBV within international business research, highlighting its influence on areas such as multinational management and strategic alliances. The study underscores the RBV‘s role in understanding firm strategies across diverse markets. On the other side, addressing some critiques of RBV, Kraaijenbrink, Spender, and Groen (2010) provide a comprehensive review of critiques against RBV, addressing concerns about its theoretical underpinnings and practical applicability. They propose enhancements to strengthen RBV‘s explanatory power in strategic management. And a renewed RBV applied to contemporary contexts by Devinney, Schwalbach and Leitner (2022) introduced a renewal version of RBV by incorporating new contexts such as artificial intelligence and digitization. This work emphasizes the need for RBV to evolve in response to technological advancements and changing business environments. Considering some practical implications and applications, Bresser and Powalla (2012) investigate the practical applications of RBV, particularly through the VRIO framework, in strategic decision-making. Their research compares the effectiveness of theory-based tools with alternative heuristics, providing insights into the RBV‘s utility in managerial practice. These articles collectively advance the understanding of RBV by integrating it with international business strategies, addressing theoretical critiques, adapting it to modern technological contexts, and exploring its practical applications. They offer valuable perspectives for both scholars and practitioners aiming to leverage internal resources for competitive advantage.

Sustainability, on the other hand, draws from environmental science, ethics, and development studies, with frameworks like the Triple Bottom Line (Elkington, 1997), which advocates for the integration of social, environmental, and economic performance measures. Combining these perspectives, Hart (1995) introduced the "natural-resource-based view" of the firm, suggesting that sustainable resource management can be a source of competitive advantage.

2.1 Competitiveness through Sustainable Practices

The Sustainable Value Framework proposed by Hart and Milstein (2003) provides a strategic blueprint for aligning sustainability with business performance. This model emphasizes that sustainable development strategies can generate long-term profitability by fostering innovation, resource efficiency, and stakeholder engagement. By balancing environmental, social, and economic concerns, firms can achieve resilience and flexibility, essential for maintaining competitiveness in an evolving market.

Resource efficiency and strictly related to cost savings. Research indicates that sustainable practices such as energy efficiency, waste reduction, and resource conservation can lower operational costs and increase competitiveness. Studies by Schaltegger and Wagner (2011) have shown that firms adopting eco-efficiency measures often enjoy both environmental and economic benefits, suggesting that sustainability can drive profitability through efficiency.

Sustainability-driven innovation is another critical component of competitiveness, as innovation is a critical factor of competitive advantage (Pereira, 2005). The development of green products, circular economy models, and sustainable supply chains not only meets regulatory and consumer demand for sustainable solutions but also differentiates companies within their markets. A study by Nidumolu, Prahalad, and Rangaswami (2009) argued that sustainability challenges spur innovation, leading companies to rethink business models and design processes that contribute to lasting competitive advantage.

Sustainable practices can enhance brand reputation, build customer loyalty, and increase market share. According to Luo and Bhattacharya (2006), firms with strong corporate social responsibility (CSR) records tend to enjoy a "reputation premium", which can lead to improved financial performance. Consumers increasingly favor brands that demonstrate commitment to environmental and social issues, making sustainability a key differentiator.

2.2 Integrating Competitiveness and Sustainability in Strategy

Academic literature suggests several strategic frameworks for aligning competitiveness and sustainability. The Sustainable Value Framework (Hart & Milstein, 2003) provides a strategic approach that aligns sustainability with business performance, proposing that sustainable development strategies are beneficial not only to the environment but also to firm profitability and growth.

Ghisellini, Cialani, and Ulgiati (2016) indicate that circular economy models, which emphasize resource reuse and product life-cycle extension, can enhance competitiveness by reducing dependency on raw materials and minimizing waste. By adopting these principles, firms can achieve cost savings, enhance resource security, and build sustainable value chains, thus strengthening their market position and contributing to competitive advantage

The stakeholder's theory (Freeman, 1984) suggests that addressing the needs of all stakeholders—including customers, employees, suppliers, and the environment—can lead to stronger competitive positioning. By adopting this perspective, firms can mitigate risks, build stronger relationships, and enhance long-term viability.

The concept of dynamic capabilities (Teece, Pisano, & Shuen, 1997) has been extended to sustainability, where firms must continuously adapt and innovate to respond to changing environmental and social expectations. This view supports the notion that sustainability-oriented firms develop unique capabilities that enhance adaptability and competitiveness.

2.3 Challenges in Achieving Sustainable Competitiveness

Despite the apparent benefits, firms face significant barriers in integrating sustainability with competitiveness:

I. Cost and Investment Requirements: Sustainability initiatives often require upfront investments in technology, training, and infrastructure, which may impact short-term profitability. Not all firms have the capital or incentives to adopt sustainable practices fully, particularly in highly competitive industries with thin margins.
II. Regulatory and Market Constraints: Variability in environmental regulations and market conditions can create uncertainty, complicating the alignment of competitiveness and sustainability strategies. Inconsistent standards and the lack of a global regulatory framework can limit firms' ability to standardize and scale sustainable practices.
III. Greenwashing and Authenticity Risks: Firms that attempt to project a sustainable image without substantive actions (greenwashing) risk damaging their reputation and customer trust. A study by Delmas and Burbano (2011) found that such deceptive practices can backfire, leading to consumer skepticism and competitive disadvantages for genuinely sustainable firms.

2.4 Recent Trends and Future Directions in Research

Recent research suggests a shift towards a more integrated view of competitiveness and sustainability. For instance, attention has turned to sustainable finance, where investment funds increasingly evaluate companies based on Environmental, Social, and Governance (ESG) criteria, linking capital availability to sustainable performance (Friede, Busch, & Bassen, 2015). Digitalization is also playing a key role; digital technologies, such as blockchain, AI, and big data, enable firms to track, measure, and optimize sustainable practices, enhancing transparency and accountability in supply chains.

Future Directions: Emerging areas of research explore the potential for sustainability to become a foundational aspect of competitive advantage. Scholars such as Bansal and DesJardine (2014) suggest that rather than viewing sustainability as an isolated component, firms should integrate it across all levels of strategy, enabling them to respond to societal pressures and shifting stakeholder expectations.

3 METHODOLOGY AND DATA

Competitiveness and sustainability are critical metrics for assessing the economic and environmental health of nations. Various indices provide insights into these areas, highlighting global and European standings. Some of these, the most well-known, are:

a) For global competitiveness: The World Economic Forum's Global Competitiveness Index (GCI), which evaluates the competitiveness landscape of economies worldwide. The latest available data indicates that Singapore ranks first, followed by Switzerland and Denmark. These rankings reflect factors such as infrastructure, macroeconomic
b) For the European competitiveness: The IMD World Competitiveness Ranking. Within Europe, countries like Switzerland and Denmark consistently perform well in competitiveness rankings. The IMD World Competitiveness Ranking 2024 places Switzerland second and Denmark third among 67 economies, highlighting their robust economic performance and efficient governance structures. (IMD World Competitiveness Center, 2024).
c) For global sustainability, the Environmental Performance Index (EPI) assesses the environmental health and ecosystem vitality of countries. In the 2024 EPI, Estonia achieved the top position, reflecting significant progress in reducing emissions and

enhancing environmental policies. Denmark, previously a leader, ranked 10th, indicating challenges in maintaining its earlier environmental performance levels (Yale Center for Environmental Law & Policy, & Center for International Earth Science Information Network, 2024).

In Europe, considering European sustainability, several countries demonstrate strong commitments to sustainability. The 2024 EPI highlights Estonia's leading position, with Luxembourg and Germany also performing well. These rankings underscore effective environmental policies and practices within these nations (Yale Center for Environmental Law & Policy & Center for International Earth Science Information Network, 2024).

These indices provide valuable insights into how countries balance economic competitiveness with environmental sustainability, offering benchmarks for policy development and international comparisons.

Given sustainability by EPI scores that reflect environmental health and ecosystem vitality, the IMD Competitiveness Rank assesses economic performance, government efficiency, business efficiency, and infrastructure. Analysing the relationship between national competitiveness and environmental sustainability reveals a positive correlation, indicating that countries excelling in competitiveness often demonstrate strong environmental performance.

Many applied studies highlight a significant correlation between Competitiveness and Environmental Performance. These studies have shown that nations ranking high on the Global Competitiveness Index (GCI) also tend to perform well on the Environmental Performance Index (EPI). An empirical analysis done by Santos and Siquiera (2014), based on a canonical correlation analysis examining the relationship between competitiveness and environmental sustainability, found a significant interrelation between these dimensions. The study analysed indicators from both the EPI and GCI across 117 countries, revealing that strong environmental performance is associated with higher competitiveness. Esty and Charnovitz (2012) explored the empirical association between environmental performance and national competitiveness, emphasizing that countries with better environmental performance often occupy top positions in global competitiveness indices. Dima *et al.* (2018) investigated the influence of the Global Competitiveness Index on economic performance, concluding that factors such as innovation and environmental sustainability are significant determinants for enhancing an economy's competitiveness. Zhang *et al.* (2021) investigated how environmental performance impacts competitiveness and economic growth, highlighting that those nations with high human development indices are better able to balance environmental sustainability with economic competitiveness.

For the empirical analysis in this paper, to examine the relationship between competitiveness and sustainability, data from the Environmental Performance Index (EPI) and the IMD World Competitiveness Ranking were used. The EPI is published every two years, and in 2024 it was not been published yet. The IMD Competitiveness Rank is annually published, being the most recent edition published in 2024. So, considering this data constraint, the period considered was the years 2022 and 2024. Analysing the way the sustainable performance was verified in 2022, reflected in competitiveness two years after, like it was an investment made in 2022 to be reflected in the competitiveness two years after. A Pearson correlation analysis was applied to a better analysis.

The sample of countries was based on the choice of the 20 best-ranked countries in the EPI index in 2022, for a comparison with their positions in the IMD Competitiveness Rank in 2024. This intends to analyse the sustainable competitiveness in terms of the role of environmental performance reflected in a lagged way in economic competitiveness rankings.

4 RESULTS

Table 1 illustrates the relationship between national competitiveness and environmental sustainability data, using the 2022 Environmental Performance Index (EPI) and the 2024 IMD World Competitiveness Ranking for the 20 selected countries.

The data collected were inserted into the Stata software to calculate the correlation between the positions of the 20 countries in the two rank's indicators.

This data analysis shows a positive correlation between these two dimensions, demonstrating that the relationship between environmental sustainability and national competitiveness is moderately aligned, suggesting that countries with higher environmental performance (lower EPI ranks) tend to have better competitiveness rankings (lower IMD ranks) (Table 1 and Figure 1). The Pearson correlation coefficient between the EPI ranks (2022) and IMD Competitiveness ranks (2024), for the top 20 countries, is 0.521, which indicates a moderate positive correlation, with a p-value of 0.018, indicating that the correlation is statistically significant. This correlation between competitiveness and sustainability has been increasing over time.

The analysis reveals a moderate positive relationship between competitiveness and sustainability, this given by the EPI. Countries with higher competitiveness rankings, such as Switzerland, Denmark, and Singapore, consistently demonstrate strong environmental performance, reflected in their EPI scores.

Tab. 1 Countries' ranked position between national competitiveness and environmental sustainability

Country	EPI Rank (2022)	IMD Competitiveness Rank (2024)
Denmark	1	3
United Kingdom	2	29
Finland	3	11
Malta	4	36
Sweden	5	6
Luxembourg	6	12
Slovenia	7	40
Austria	8	25
Switzerland	9	2
Iceland	10	13
Spain	11	30
Estonia	12	31
Portugal	13	33
France	14	31
Germany	15	24
Ireland	16	7
Cyprus	17	37
Italy	18	41
Slovakia	19	50
Latvia	20	38

Sources: 2022 Environmental Performance Index (EPI), IMD World Competitiveness Ranking 2024

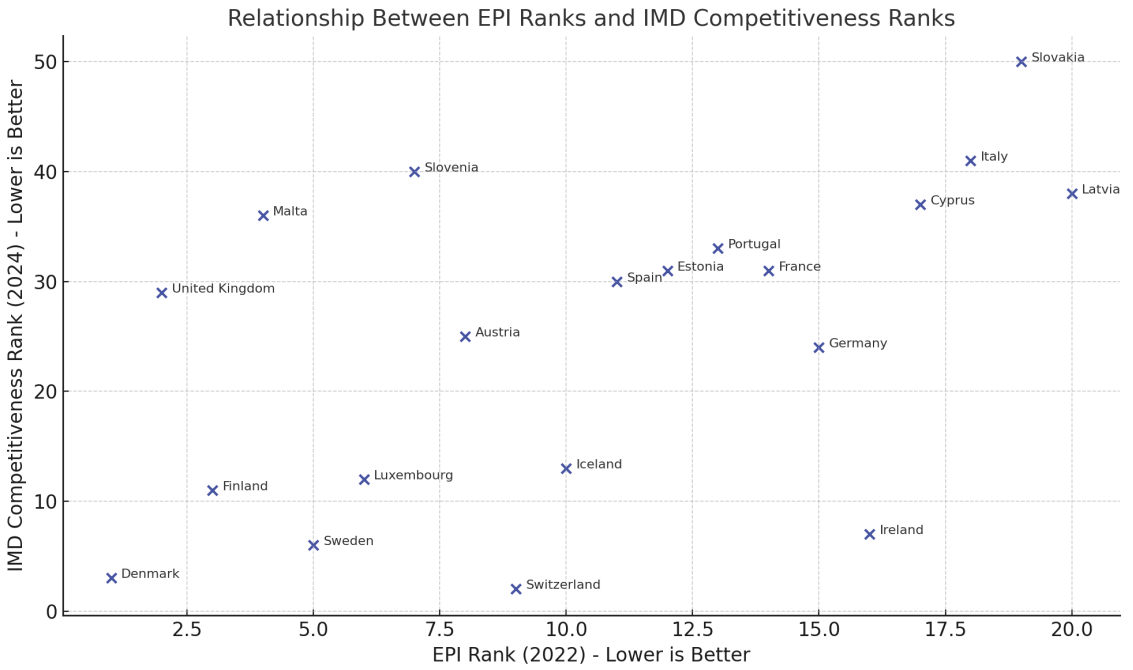

Fig. 1: Competitiveness versus Environmental Performance
Sources: 2022 Environmental Performance Index (EPI), IMD World Competitiveness Ranking 2024

- This relationship suggests that nations excelling in economic infrastructure, innovation, and governance (key components of competitiveness) often prioritize sustainable practices and policies. The alignment underscores the potential for integrating environmental performance as a strategic driver of competitiveness, emphasizing that economic growth and environmental sustainability can complement rather than conflict with one another.
- These findings highlight the importance of fostering policies that balance economic and environmental objectives, demonstrating that competitiveness and sustainability are mutually reinforcing goals for long-term national development and for the sustainable economic growth of nations.

5 DISCUSSION AND CONCLUSIONS

Countries with high competitiveness rankings, such as Switzerland, Denmark, and Singapore, consistently demonstrate strong environmental performance, as reflected in their EPI scores (Environmental Performance Index, 2022; IMD World Competitiveness Center, 2024). This finding aligns with previous research, which has shown that nations excelling in economic infrastructure, innovation, and governance—key components of competitiveness—often prioritize sustainable practices and policies (Porter & van der Linde, 1995; Atici *et al.*, 2021).

The alignment between competitiveness and environmental sustainability underscores the potential for integrating environmental performance as a strategic driver of national competitiveness, emphasizing that economic growth and environmental sustainability can be complementary rather than conflicting objectives (IMD World Competitiveness Center, 2024; Yale Center for Environmental Law & Policy, 2022). This perspective is further supported by studies indicating that robust institutions, effective governance, and innovation capacity are strongly associated with both higher competitiveness and better environmental outcomes (Atici *et al.*, 2021; Porter & van der Linde, 1995).

The literature on competitiveness and sustainability indicates that the positive relationship between Competitiveness and Sustainability is increasingly intertwined in the 21st century. While traditional views positioned them as potentially conflicting objectives, contemporary research reveals that sustainable practices can contribute significantly to competitive advantage by driving efficiency, fostering innovation, and enhancing brand loyalty. However, significant challenges remain, particularly in aligning short-term financial goals with long--term sustainability outcomes. Continued research and strategic innovation are essential for firms seeking to achieve sustainable competitiveness, which is likely to become a defining feature of successful businesses in the years to come. As well, additional research on these topics must be developed, for example, a regression analysis and a Granger causality model, in addition to correlation analysis, with the purpose of showing causality between the two indicators.

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