

SUSTAINABLE DEVELOPMENT AND COMPETITIVENESS: IS THERE A NEED FOR GCI RECONSTRUCTION?

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Received 23.11.2023.

Sent to review 04.12.2023.

Accepted 29.03.2024.

Original article



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JEL Classification: O10, O19

Doi: 10.2478/eoik-2024-0001

UDK: 502.131.1:316.334.5

ABSTRACT

Starting from competitiveness as the ability of an entity (company, sector, state) to successfully increase sales on the domestic and/or international market, and through a balance surplus to create growing revenues for its company and/or residents, i.e. the entire country, the concept of competitiveness should be transformed according to today's business conditions. Competitiveness was initially related to cost, and sales grew due to lower product prices, and later due to productivity and better product quality. Today's consumer is not only interested in price and quality, but also in environmental sustainability and social responsibility, and customers are looking for sustainable products. This paper investigates the relationship between the Global Competitiveness Index (GCI) and the Sustainable Development Goals (SDG) index on a sample of 27 member states of the European Union in the period 2007-2017, with the main goal and purpose of determining the direction and strength of the relationship and creating a platform for the necessity of redesigning the GCI. The impact of climate change on the GCI was examined by the Sustainable Development Index. For this purpose, Difference GMM was used. The results show that SDG12 (waste generation) hurts competitiveness, while SDG14 (maritime, ocean conservation) has a positive impact on competitiveness. This study contributes to the ongoing discourse on the intersection of competitiveness and sustainability, providing a foundation for future discussions and potential reconstructions of indices that reflect the changing global environment.

Keywords: competitiveness, sustainable development, GCI index, SDG index, European Union

1. INTRODUCTION

For many years, economic growth has not been the mainly priority of national economies, but sustainable growth, and the most widespread definition of that is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations General Assembly, 1987). The United Nations (UN) adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) in September 2015 as the world's roadmap for achieving sustainable development in this decade. The 2030 Agenda is a key document for the development of long-term economic strategies and roadmaps.

Some SDG goals are included indirectly in the calculation of the Global Competitiveness Index, while the environmental impact does not have a specific position in the methodology. In terms of climate impact as a result of poor environmental policies, financial losses from weather- and climate-related hazards would continue to rise. In this paper, authors investigate the relationship between climate change and competitiveness.

This paper is divided into six sections. Following the introduction, the first section covers the theoretical underpinnings of competitiveness at three different levels: micro, macro, and international. The “green transformation” of the European economy is examined in the third section, which also discusses the connection between green transformation and competitiveness. After a description of the data, outcomes, and methods, conclusions are made in the last part.

2. THEORETICAL APPROACH OF COMPETITIVENESS - MICRO, MACRO AND INTERNATIONAL REVIEW

Competitiveness is a very old term that has been attracting the attention of economists for hundreds of years, as well as a multidimensional category that is observed at different levels. Competitiveness is viewed through individual activities, at the level of a sector or company (micro), but also at the overall national economy (macro level). Globalization enables competitiveness at the international level. According to Škufflić (2005), competitiveness is examined at the micro, macro, and mezzo level, but it is always assessed how well some entity or state (which represents the sum of its entities) is able to sell its products and services on the domestic or international market, i.e., whether its importance is increasing or decreasing. Competitiveness, in general, can be defined as the ability to face competition on the world market, i.e., the ability to survive in the existing one and conquer new markets (OECD, 1998).

At the micro level, competitiveness is usually equated with a company’s market success, i.e., the dynamics of market share and positioning on the quality scale. At the macro level, competitiveness is a wider concept that encompasses growth, quality of life, and productivity. Foreign markets revenue generation necessary for improvement in the quality of life and standards of living, is only possible with competitive products, encompassing micro, macro, and international competitiveness.

At the beginning, competitiveness has been primarily connected with the costs of firms or countries, emphasizing wages as well as unit labour costs and productivity as main determinants. It is still often used today when new low-cost competitors enter to the (or a firm or industry), a concept mostly criticized by Krugman (1994A, 1994B). Concepts of price competitiveness viewed through the level of costs or in a broader approach (looking at costs and productivity through unit labor costs) become complicated when it is necessary to analyze all cost components (labor, capital, energy, taxes) together with all productivity components. Therefore, in recent literature, economists have investigated total factor productivity (Aigniger et al., 2013). Definitions of competitiveness vary. According to Šegota, Tomljanović, and Huđek (2017), long-term competitiveness involves an increase in economic efficiency and product quality, which is vital for improvement of the living standards. However, the competitiveness of enterprises in domestic and international markets depends on their capabilities and costs. Fagerberg (1988) notes that competitive countries not only increase real income but also create new jobs; hence, competitiveness is defined as the achievement of economic objectives (income and employment growth) with the prevention of a current account deficit. Additionally, Lovrinčević et al. (2008) highlight that globalization heavily influences competitiveness, requiring a global

perspective to compete with competitors worldwide, emphasizing high-value sectors and production.

2. 1. MICRO APPROACH TO COMPETITIVENESS

The micro approach to competitiveness focuses on measuring the competitiveness of individual companies, industries, and sectors. The competitiveness of an individual company can be measured in various ways, depending on the sector in which it operates, the size of the company, and other factors. When measuring competitiveness at the micro level, costs, sales, product quality, innovation, and human resources are the most commonly analyzed factors.

Krugman (1996, 1994) represents the extreme view according to which competitiveness is not applicable at the country level but only at the enterprise level. However, significant differences in economic development across countries at similar stages of economic development indicate the existence of successful and less successful countries. **Porter (1990)** is one of the most well-known authors who researched competitiveness from a micro perspective. He developed the concept of competitive strategy based on the analysis of five forces: the power of buyers, the power of suppliers, the threat of new entrants, the threat of substitute products, and competition among existing firms. Porter emphasized the importance of product and service differentiation and focusing on narrow market segments to achieve a competitive advantage.

Teece, in his 2014 study, highlighted the importance of a company's dynamic capabilities, i.e., its ability to quickly adapt to changing market conditions and actively pursue new opportunities. According to Teece, companies with high levels of dynamic capabilities are able to develop innovative products and services and successfully navigate market changes. **Markides and Williamson (2018)** researched competitiveness from the perspective of management strategy. They emphasized the importance of integrating management strategies to achieve a competitive advantage, including human resource strategy, production strategy, and marketing strategy. **Barney and Hesterly (2015)** focused on the role of resources and capabilities in achieving a competitive advantage. They emphasized the importance of managing a company's resources, such as human resources, technological resources, and financial resources, to achieve a competitive advantage.

The main conclusions of research on competitiveness from a micro perspective are that companies with high levels of competitiveness usually have a clearly defined strategy and vision, effective resource management, innovative products and services, a focus on quality and customer experience, and the ability to quickly adapt to changing market conditions. The importance of analyzing a company's environment, as well as analyzing its own strengths and weaknesses, is key to developing a competitive strategy.

In summary, the competence of an organization or country to produce and sell products/services that meet the quality of the markets at the same or lower prices and maximize returns on the resources consumed in producing them (**Maravilhas, S., Oliveira, S. G. 2018**).

2. 2. MACRO APPROACH TO COMPETITIVENESS

The macro approach to competitiveness focuses on measuring the competitiveness of an entire country or region, rather than individual firms. The macro approach encompasses a broader set of economic, political, social, and institutional factors that affect a country or region's ability to achieve high levels of economic growth, improve the quality of life of its citizens, and attract foreign investment. In the first OECD materials, competitiveness was divided into import, export, and overall competitiveness. In subsequent years, in the literature, can be found price and quality competitiveness, while in 2013, Karl Aiginger, Susanne Bärenthaler-Sieber, and Johan-

na Vogel divided competitiveness into price, quality, and outcome competitiveness. Therefore, initially, competitiveness focused on factor costs and productivity, and later on product quality. Quality competitiveness is focused on structure and capabilities, while outcome competitiveness, according to the [European Commission \(2001\)](#), means “the ability of an economy to provide its population with high and rising standards of living and high rates of employment on a sustainable basis.” Two main indicators used for outcome competitiveness are GDP per capita and unemployment indicators or sometimes employment. In this concept, social and environmental aspects have an important role.

M. Porter (1990) was the first economic theorist to define the concept of competitiveness at the macroeconomic level. As each country aims to achieve growing and high living standards for its citizens, the productivity of production factors is significant for the full realization of this goal. This means that it is necessary to distinguish between national economic competitiveness and firm competitiveness. Porter’s ([Porter, 1990](#)) research showed that national competitiveness is created by the interaction of: 1) factor conditions, 2) strategy, structure, and rivalry among firms in the industry, 3) quality of domestic demand, and 4) the existence of a group (cluster) of related supporting industries in the country. Government policy and actions have an impact on competitiveness.

Deepening Porter’s insights, [Lovrinčević et al. \(2008\)](#) mention Trabold’s four significant aspects of competitiveness: the ability to sell on the global market (export), the ability to attract investment (location), the ability to adapt the economy, and the ability to create and increase disposable income. They conclude that these different aspects constitute a certain hierarchy. Thus, the ability to achieve and increase disposable income, which is most often measured by GDP growth, is a broad indicator of the country’s competitiveness. The mentioned indicator depends on the other three elements, each of which is an independent aspect of competitiveness. According to this definition, three derived elements of competitiveness are directly measurable at the national level (GDP growth, export growth, and inflow of foreign direct investment). The speed at which the economy responds to changes in market conditions is difficult to be represented by only one indicator as well as the possibility that the economy recognizes new opportunities and economists use several indicators. In some analyses, competitiveness is sometimes depicted by data on the value of the research and development sector. These macroeconomic indicators, which according to theoretical works indicate the level of competitiveness encountered, are called “hard” statistical indicators in the work because they are available from standard statistical surveys conducted in all countries.

Recent macro-level competitiveness research has focused on different factors that affect national competitiveness. One such study ([Kaplinsky, 2020](#)) focused on the impact of global value chains on national competitiveness. The authors concluded that nations that are integrated into global value chains have greater competitiveness and higher growth.

[Hausmann and Hidalgo \(2014\)](#) developed the concept of economic complexity, which measures a country’s ability to create complex products based on its production structure. Their research shows that economic complexity is a key factor in the long-term economic growth and competitiveness of a country. The World Economic Forum ([WEF, 2017, p. 20](#)) defines competitiveness as “the set of institutions, policies, and factors that determine the level of productivity of a country” and publishes an annual report on global competitiveness that evaluates the competitiveness of countries based on 12 pillars. The latest report for 2021 shows that the most competitive countries are Switzerland, the United States, and Singapore. The WEF methodology for measuring the competitiveness of countries consists of 12 “pillars” that relate to different areas important for economic competitiveness. Under these pillars are three categories: basic

requirements, efficiency enhancers, and innovation and sophistication factors. The basic factors category covers institutions, infrastructure, macroeconomic environment, health, and primary education and they form the foundation of factor-driven economies. The second group of pillars in the efficiency enhancers category include higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, and market size and presents form the foundation of efficiency-driven economies. The last group of pillars in the innovation and sophistication factors category include business sophistication and innovation.

Data for each of these pillars are collected from various sources such as surveys of business people, statistical data, and other sources. The collected data are analysed and processed to produce a final competitiveness index for each country. The index is calculated on a scale from 0 to 100, with higher values indicating greater competitiveness.

The special edition of the WEF Global Competitiveness Report for 2020 focused on analyzing the impact of the COVID-19 pandemic on the competitiveness of countries worldwide. The report concluded that the pandemic significantly affected global competitiveness by reducing economic growth and worsening the business environment. Countries that effectively managed the pandemic, such as South Korea, Singapore, and Taiwan, were able to maintain a high level of competitiveness. The report also highlighted the importance of digitalization in maintaining competitiveness during the pandemic, with a focus on technologies like artificial intelligence, blockchain, and the Internet of Things. Additionally, the report noted that countries prioritizing green transition and sustainable development demonstrated greater resilience during the pandemic. The report emphasized the need for strengthening global cooperation and solidarity to mitigate the pandemic's impact and support the recovery of the world economy.

However, according to a study conducted by Šegota, Tomljanović, and Huđek (2017), the Global Competitiveness Index (GCI) may be an incomplete measure for ranking countries' macroeconomic competitiveness as it overlooks the efficiency of utilizing multiple inputs to achieve multiple outputs. The study suggests utilizing Data Envelopment Analysis (DEA) to evaluate the relative efficiency of countries, which could affect the final ranking.

In conclusion, a country's level of competitiveness depends on various factors, including the quality of institutions, education and expertise of the workforce, technological development, stability of the political environment, availability of capital, and quality of infrastructure, among others. Competitive countries typically possess quality public institutions, clear policies, a transparent and stable business environment, innovative and productive companies, and a high-quality education system. Achieving high competitiveness in the global exchange is not a static state but requires continuous improvement, technical and technological advancement, adaptation, and high flexibility within the entire economic system.

2. 3. INTERNATIONAL COMPETITIVENESS

The modern global economy, small or large, faces increasing interconnectedness through the exchange of goods and services, but also through the movement of capital and labor flows. The liberalization of international trade and financial flows, along with contemporary and affordable channels of distribution, significantly redefines competitiveness. Competitiveness, by definition, increasingly requires an international perspective, as countries need to compete with rivals from any region of the world. In addition to the World Economic Forum (WEF) methodology for determining competitiveness at the macro and international levels, there are several other methodologies and indicators used to assess international competitiveness. Some of the most commonly used methodologies include the following: 1) IMD World Competitiveness Index:

This index focuses on companies and their ability to compete in the global market. It consists of four categories: economic performance, infrastructure, business environment, and knowledge. 2) Doing Business Index: This index focuses on the business environment and regulations in countries. It consists of ten categories that measure a country's ability to facilitate business. 3) UNCTAD Export Competitiveness Index: This index focuses on countries' ability to export to the global market. It consists of five categories that measure competitiveness in exports. Indicators used in these methodologies include but are not limited to, the quality of infrastructure, business climate, education system, quality of institutions, innovation, macroeconomic environment, business costs, tax and regulatory levels, availability of financing, labor market conditions, and other relevant aspects for economic competitiveness.

Since 2012, the Global Sustainable Competitiveness Index (GSCI) has been calculated and tracked. It measures the competitiveness and sustainability of countries, based on 190 quantitative indicators derived from international organizations (World Bank, IMF, UN). This Index is a more recent indicator and seeks to reconcile competitiveness and sustainable development. The main determinants of that index are the ability to create and maintain inclusive wealth and a standard of living for all citizens in a globalized world. It consists of 6 related elements: natural capital (the given natural environment and climate, minus human-induced degradation and pollution), social capital, intellectual capital (the ability to compete in the globalized market through sustainable innovation), resource management (the ability to extract the greatest possible value from existing resources (natural, human, financial) and governance (the framework given, usually by government policies and investments, in which a national economy operates). Sustainable competitiveness means the ability of a country to meet the needs and basic requirements of current generations while sustaining or growing the national and individual wealth into the future without depleting natural and social capital (GSCI, (<https://solability.com/the-global-sustainable-competitiveness-index/the-index>)). Sweden is the leader in the Sustainable Competitiveness Index in 2022, followed by Iceland, Denmark, and Finland, while Norway is in 9th place and Germany in 15th. Between top 20 countries, all belong to Northern Europe and Baltic countries.

3. GREEN TRANSITION OF THE EUROPEAN ECONOMY

The green transformation began in the mid-twentieth century, but it became more intensely focused after the Kyoto Protocol, though some significant initiatives were signed even before that. The United Nations Framework Convention on Climate Change (UNFCCC) was established in 1992 to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference in the climate system (UNFCCC, 1992)..

The environment is Earth's most valuable resource, and it has been under attack since the dawn of industrialization. Because the environment is a relatively non-renewable resource that has been poorly managed, the consequences are visible and are being paid for on a daily basis through climate change. Rainfall changes, frequent droughts, rising sea levels, and melting glaciers are just a few of the issues affecting the world economy today. Numerous floods, tornadoes, severe droughts, and other natural disasters cause financial and human losses. Some countries, particularly island countries, are more vulnerable than others due to their geographical location, regardless of how much they have contributed to environmental clean-up. Specifically, the consequences of environmental problems affect everyone, not just poor countries. Since the industrial revolution, greenhouse gas (GHG) emissions, mainly carbon dioxide (CO₂), have increased, causing an intensified greenhouse effect and ultimately leading to global warming (climate change). The process of industrialization occurred significantly faster in developed

countries, and they have contributed more to greenhouse gas emissions compared to less developed countries. However, over time, they have attempted to regulate this issue within their own countries and beyond, resulting in the relocation of polluting industries from developed to less developed countries. Polluters in consumption, in addition to polluters in production, are most prevalent in developed countries, primarily car drivers. Energy, industrial processes, product use, agriculture, forestry, land use, and waste are the sectors with the highest GHG emissions (IPCC, 2006).

Mbarek M.B. & all. (2016) examine the long-term causal relationship between renewable energy, CO₂ emissions, and economic growth in the four Mediterranean countries; including France, Spain, Italy, and Turkey over the 1980–2012 period. The results of Pedroni and Kao co-integration tests indicate a long-term relationship between these variables. This finding has vital consequences regarding energy and economic policy, as it suggests that renewable energy use do not seem to damage economic growth and development in these countries. The importance of including social responsibility and corporate governance to strengthen the competitiveness of companies, as well as to encourage their flexibility, research was conducted by Kuzmak and Kuzmak (Kuzmak and Kuzmak, 2023) on the economy of Ukraine. In addition to the inclusion of environmental, social and governmental goals in the evaluation of the state's performance, some authors have investigated this at the macro level as well as at the sectoral level. In their paper, Mastilo et al. (Mastilo et al, 2024) gave the literature review on the importance of the relationship between the environment and social responsibility, and the financial position and reputation of banks.

Although the greenhouse effect occurs naturally, human activities such as industrialization contribute to global warming and the associated temperature, humidity, wind speed, rainfall, soil dryness, and sea level anomalies.

3. 1. GLOBAL INITIATIVES

The Paris Agreement, Sustainable Development Goals, Task Force on Climate-Related Financial Disclosure, and United Nations Environmental Program Finance Initiative are the most important and influential global initiatives after the Kyoto Protocol, among others.

The Paris Agreement is a legally binding international treaty on climate change that was adopted by 196 Parties (but ratified by 189) at the United Nations Climate Change Conference (COP21) in 2015 but did not enter into force until 2016. Its primary goal was to keep “the increase in global average temperature to well below 2°C above pre-industrial levels,” but in recent years, world leaders have emphasized the importance of keeping global warming to 1.5°C by the end of this century (UN, 2015). The lower threshold is the result of research conducted by the UN Intergovernmental Panel on Climate Change, which revealed that exceeding the 1.5 °C threshold risks unleashing much more severe climate change effects, such as more frequent and severe droughts, heat waves, and precipitation (UN, Climate Change). The Paris Agreement establishes a long-term framework for global efforts for decades to come. It is the first step toward achieving net-zero emissions. The Agreement's implementation is also critical for achieving the Sustainable Development Goals. Climate Action (United Nations).

The 2030 Agenda for Sustainable Development, adopted by the members of the United Nations in 2015, is a joint platform for peace and prosperity for both people and the planet, now and in the future. At the center of that platform are 17 Sustainable Development Goals (SDGs), aiming to end poverty and improve health and education, and reduce inequality and achieve sustainable economic growth, which requires a healthy environment without climate change. Those 17 goals are (UN, 2015): 1. End poverty in all its forms everywhere; 2. End hunger, achieve food

security and improved nutrition, and promote sustainable agriculture; 3. Ensure healthy lives and promote well-being for all at all ages; 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all; 5. Achieve gender equality and empower all women and girls; 6. Ensure availability and sustainable management of water and sanitation for all; 7. Ensure access to affordable, reliable, sustainable, and modern energy for all; 8. Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all; 9. Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation; 10. Reduce inequality within and among countries; 11. Make cities and human settlements inclusive, safe, resilient, and sustainable; 12. Ensure sustainable consumption and production patterns; 13. Take urgent action to combat climate change and its impacts; 14. Conserve and sustainably use the oceans, seas, and marine resources for sustainable development; 15. Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and biodiversity loss; 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels and 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development. Some of the 17 goals are applicable exclusively at the state level, but some of the goals can and are implemented in the company's operations. Following global initiatives such as the OECD Guidelines for multinational enterprises, many countries have adopted legal regulations for company operations in their country. The OECD Guidelines for Multinational Enterprises are recommendations addressed by governments to multinational enterprises operating in or from adhering countries. They provide non-binding principles and standards for responsible business conduct in a global context consistent with applicable laws and internationally recognized standards. The Guidelines are the only multilaterally agreed and comprehensive code of responsible business conduct that governments have committed to promoting (OECD, 2011)

3. 2. THE EUROPEAN GREEN DEAL

The European Green Plan brings a strategy for making the EU's economy more sustainable due to the climate and environmental risks and transforming risk into opportunities across all policy areas. This plan ensures a just and inclusive transition for economies. The EU is attempting to overcome risks by transforming them into opportunities through the Green Plan. The EU aims to promote resource efficiency through the use of clean energy, a circular economy, and the prevention of environmental destruction and climate change, as well as to reverse biodiversity loss and reduce pollution. The circular economy, encompassing the social, environmental, and economic facets of sustainable development, presents a viable solution to mitigate the resource constraints and socio-environmental ramifications inherent in the prevailing linear economic model (Lin and Wei, 2023).

The European Union (EU) has fully committed to achieving the goals of the 2030 Agenda, which are reflected in numerous European working plans and roadmaps. Eurostat has been producing annual reports on the EU's progress toward the SDGs since 2017. This 2022 edition is the sixth in the series, analyzing the EU's progress toward the goals using the official EU SDG indicator set (Sustainable Development in the EU 2022, EC). The Green Deal Industrial Plan boosts Europe's net-zero industry's competitiveness while also hastening the transition to climate neutrality. It accomplishes this by fostering a more conducive environment for increasing the EU's manufacturing capacity for the net-zero technologies and products required to meet Europe's ambitious climate targets.

Although SDG goals are important for the country's overall economic growth and development, authors believe that some goals should be prioritized over others to achieve a sustainable level of competitiveness. Objectives that are important but underrepresented in the competitiveness index are highlighted. These are objectives 6,7,8,13,14,15. Regarding the previously identified goals that should be included in the competitiveness assessment, the EU made the most progress in reducing electricity consumption and switching to renewable energy sources, which is encouraging given that the energy sector emits the most CO₂ into the atmosphere. While the EU has already reduced its net greenhouse gas (GHG) emissions by about 31% since 1990, further progress will be required to meet the new 55% reduction target for 2030, especially given that GHG emissions are expected to rise again in 2021 as the economy recovers. Clean water, sanitation, and life on Earth have made the slowest progress. (EC, Sustainable Development in the EU 2022).

3. 3. COMPETITIVENESS AND CIRCULAR ECONOMY

As stated in the theoretical section of this paper, competitiveness is linked to profits on the micro level as well as national income on the macro level. Being competitive entails creating a marketable product, conquering the market better and faster than competitors, and increasing market share. Nowadays, when consumer awareness is changing and more and more efforts are being made to change through marketing activities, being competitive means producing a product that is in harmony with nature and does not harm nature in any of its production or consumption segments. Thus, competitiveness in recent times means a product that uses recycled inputs in its production, a product that has a complete plan from production to consumption to disposal, and a product that can be re-entered into production at the end of its useful life. Of course, it is critical to reduce the use of electricity as well as water in the manufacturing process to achieve the smallest possible water and carbon footprint in both production and consumption. A circular economy entails reusing resources, extending the life of products, and ensuring proper disposal after use.

The Green Deal also includes the Circular Economy Package, which was adopted to increase global competitiveness, foster sustainable economic growth, and create new jobs. The Circular Economy Package is divided into two parts: first, EU Action Plans for the Circular Economy, with measures covering the entire product life cycle: from production and consumption to waste management and the market for secondary raw materials. The second section focuses on resource-intensive sectors with a high potential for circularity, to keep resources in economic cycles for as long as possible (European Commission, The EU Switch to Green Flagship Initiative).

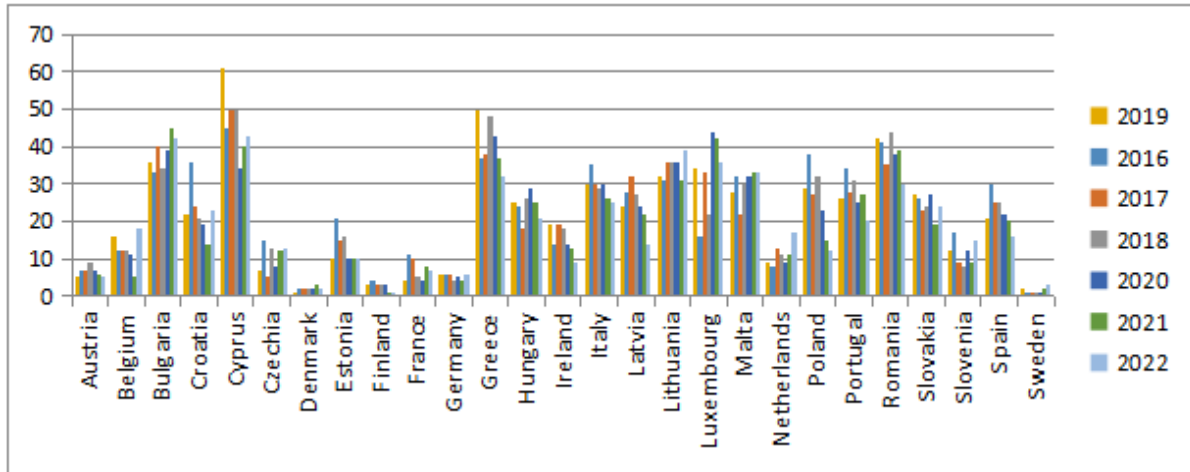
3. 4. SDG INDEX

In 2015, the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development, with the goal of eradicating poverty in all of its forms. The United Nations 2030 Agenda envisions “a world of universal respect for human rights and human dignity, the rule of law, justice, equality, and non-discrimination,” and the Agenda's 17 Sustainable Development Goals (SDG) and 169 targets aim to eradicate poverty in all forms and “seek to realize the human rights of all and achieve gender equality.” (According to the Council of Europe, <https://www.coe.int/en/web/programmes/un-2030-agenda>). Since 2015, the UN has published the new indicator SDG index, which ranks countries and assigns a monetary value to them. The EU countries are ranked in terms of achieving the SDGs in the table below.

Sweden, Finland, and Denmark improved the most in terms of achievement of the 17 goals, followed by Germany, France, and Austria, with Cyprus, Greece, Romania, and Bulgaria faring

the worst (figure 2). Luxembourg is a surprise among EU countries; despite being highly developed; the SDG index ranks that country among the bottom in terms of sustainability goals.

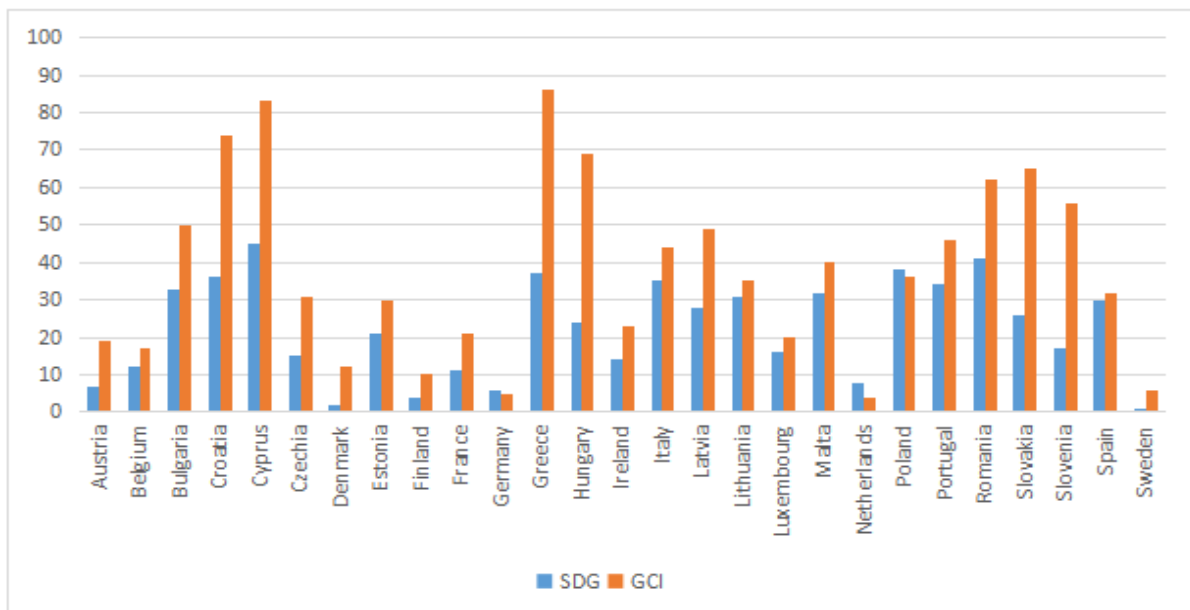
Figure 1. SDG index ranks the EU countries, 2015-2022



Source: <https://www.sdindex.org>

According to the achieved level of competitiveness as measured by the competitiveness index and the rank on the scale of achieved SDG goals, a significant disparity was observed in 2016, specifically in countries with a lower level of competitiveness. It can be concluded that a country with a higher level of competitiveness achieves better results in terms of poverty reduction, human rights, discrimination elimination, and so on, whereas this problem is much more pronounced in countries with a lower level of competitiveness. Croatia, Cyprus, Greece, Hungary, Romania, Slovakia, and Slovenia had the greatest disparity in 2016, while Germany and the Netherlands had the smallest.

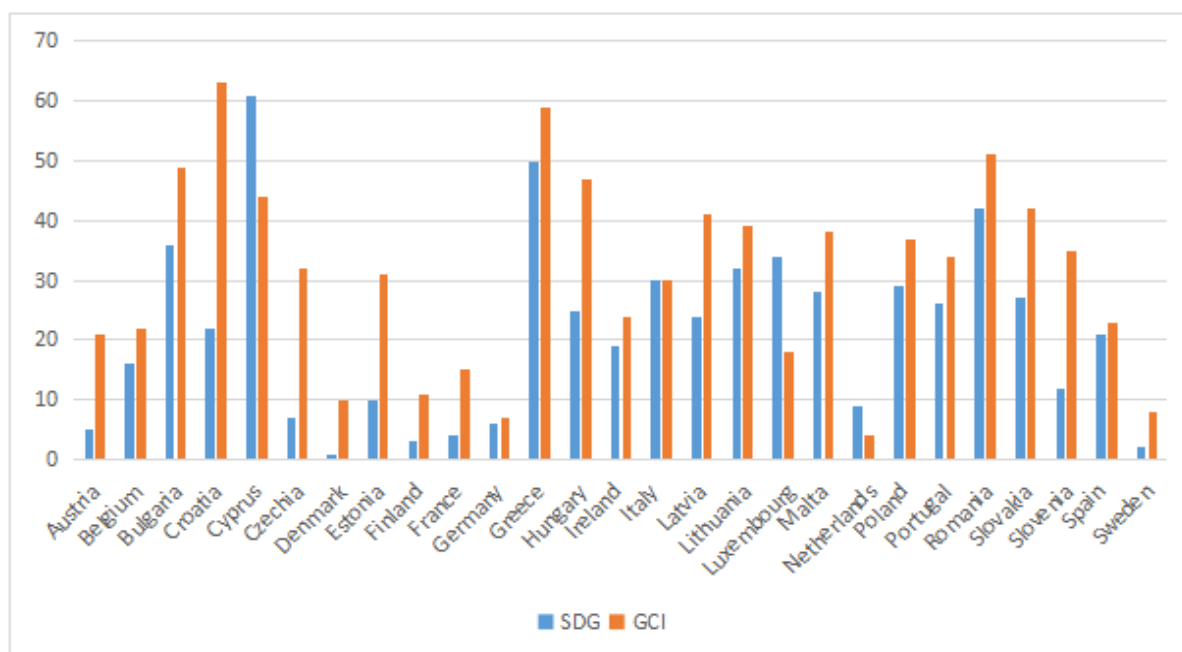
Figure 2. SDG and GCI rang for the EU countries, 2016



Source: <https://www.sdindex.org> and <https://www.weforum.org/reports?utf8=✓&query=global+competitiveness+report>

The analysis of these two indicators in 2019 (the most recent year for which the GCI index was available) revealed a significant difference for Croatia, the Czech Republic, Hungary, Estonia, and Slovenia, with Germany having the lowest.

Figure 3. SDG and GCI rang for the EU countries, 2019



Source: <https://www.sdgindex.org> and <https://www.weforum.org/reports?utf8=✓&query=global+competitiveness+report>

Based on the data presented thus far, it can be concluded that a lower level of competitiveness is associated with lower success in addressing poverty, hunger, discrimination, and other sustainability goals. Furthermore, taking into consideration the GCI's composition and its 12 pillars, there is insufficient data on environmental and climate changes, which have a huge impact on poverty, hunger, and other sustainability issues through extreme weather changes and disasters with huge hazards and catastrophic consequences. In accordance with the foregoing, the paper investigates the relationship between environmental protection and the level of competitiveness using appropriate regression models.

4. INCLUSION OF „GREEN“ COMPONENTS IN THE CALCULATION OF THE GLOBAL COMPETITIVENESS INDEX

Climate change is primarily caused by the emission of greenhouse gases, as well as environmental and water pollution, as previously stated. The global competitiveness index does not include any of the indicators evaluated through the 17 SDG goals. Taking everything into consideration, it is estimated that the existing index with 3 units and 12 pillars will need to be upgraded with one more unit, which is the impact on the environment, for which several pillars will need to be designed. The fourth unit could be called environmentally friendly economics, and it should consider several pillars:

- amount of drinking water consumed;
- electrical energy consumption and the share of renewable energy in total energy consumption;
- CO₂ emissions;

- percentage of forested areas;
- total waste and percentage of recycled waste.

It should be noted that some of these indicators are included in the GSCI, but that index does not have elements of the GCI, so we believe that it is more correct to revise the GCI by adding one unit, than to define a new indicator from the ground up, as was done with the GSCI. Given that the aforementioned elements are largely incorporated into individual SDG goals, an econometric assessment will be performed in the following section of the work to determine whether there is a connection between individual SDG goals and GCI and how strong it is, if it exists. Because of their aggregation and multidimensionality, it is highly unlikely that the aggregated SDG targets will have a large explanatory power of the GCI.

5. DATA AND METHODOLOGY

The aim of this study was to examine how climate change affects competitiveness in the 27 European union member states. This study uses the variables depicted in the literature review section. Competitiveness is measured with the World Economic Forum's Global Competitiveness Index (GCI) obtained from Global Competitiveness Reports for the period 2007-2017. GCI score is provided only for the periods 2007-2017, after which the methodology of the score calculation changed. Our research is, therefore, confined to the period 2007-2017.

Independent variables in the model are obtained from the United Nation's Sustainable Development Index. The United Nation's Sustainable Development Index is divided into 17 subindices. Each subindex encompasses several indicators that jointly compose the index score. Seven index scores of importance for this study correspond with the seven Sustainable Development Goals (SDGs): SDG6, SDG7, SDG8, SDG12, SDG13, SDG14 and SDG15. SDG6 index score incorporates the following measures: (i) share of population using at least basic sanitation services, (ii) share of freshwater withdrawals from available freshwater resources, (iii) share of anthropogenic wastewater that receives treatment, (iv) scarce water consumption embodied in imports (m³ H₂O eq/capita), (v) share of population using safely managed water services, and (vi) share of population using safely managed sanitation services. SDG7 index score includes: (i) share of population with access to electricity, (ii) share of population with access to clean fuels and technology for cooking, (iii) CO₂ emissions from fuel combustion per total electricity output (MtCO₂/TWh), and (iv) share of renewable energy share in total final energy consumption. SDG12 index score is composed from: (i) municipal solid waste measured in kg per capita per day, (ii) electronic waste in kg per capita, (iii) production-based SO₂ emissions in kg per capita, (iv) SO₂ emissions embodied in imports in kg per capita, (v) production-based nitrogen emissions in kg per capita, (vi) nitrogen emissions embodied in imports in kg per capita, (vii) exports of plastic waste in kg per capita, and (viii) non-recycled municipal solid waste in kg per capita per day. SDG13 index score incorporates the following measures: (i) CO₂ emissions from fossil fuel combustion and cement production in tCO₂ per capita, (ii) CO₂ emissions embodied in imports in tCO₂ per capita, (iii) CO₂ emissions embodied in fossil fuel exports in kg per capita, and (iv) Carbon Pricing Score at EUR60/tCO₂. SDG14 index score includes: (i) share of mean area that is protected in marine sites important to biodiversity, (ii) Ocean Health Index: Clean Waters score, (iii) fish caught from overexploited or collapsed stocks as a percentage of total catch, (iv) share of fish caught by trawling or dredging, (v) share of fish caught that are then discarded, and (vi) marine biodiversity threats embodied in imports per million persons. Finally, SDG15 index score is based on: (i) the share of mean area that is protected in terrestrial sites important to biodiversity, (ii) the share of mean area that is protected in freshwater sites important to biodiversity, (iii) Red List Index of species survival, (iv) permanent deforestation,

and (v) terrestrial and freshwater biodiversity threats embodied in imports per million persons. SDG8 index score is a control variable. SDG8 index score includes measures such as : (i) adjusted GDP growth, (ii) unemployment rate as percentage of total labor force aged 15 and over, (iii) employment-to-population ratio, and (iv) youth not in employment, education or training (NEET) as a share of population aged 15 to 29. SDG8 affects competitiveness as competitiveness is the ability to increase consumption and production measured as gross domestic product. Two additional instrumental variables were used: (a) the share of industry in gross domestic product and (b) government effectiveness (World Bank, 2023). Instrumental variables are assumed to be exogenous in our models. The share of industry in gross domestic product is not part of any of the SDG index scores, but it affects both competitiveness and the climate change. The measure of government effectiveness captures the excellence in policy creation and execution, as well as the trustworthiness of the government's dedication to these policies. It is obtained from the World Bank dataset (2023), which have used the Kaufmann et al.'s (2010) Worldwide Governance Indicators. The government effectiveness measure influences both competitiveness and climate related policies and their execution with a country.

Statistical analysis was done with a statistical software package STATA 17. All data were transformed into logarithmic form to account for discrepancies between the datasets. Descriptive statistics of the transformed variables are given in Table 1.

Table 1. Descriptive statistics of the variables

Variable	Mean	Std. Dev	Min	Max
ln GCI	4.6512	0.0047	4.6430	4.6602
ln SDG6	5.2117	0.0407	5.1137	5.2733
ln SDG7	5.1621	0.0417	5.0137	5.2711
ln SDG8	5.1816	0.0384	5.0257	5.2405
ln SDG12	5.1238	0.0569	4.9890	5.2236
ln SDG 13	5.0920	0.0758	4.8929	5.2357
ln SDG14	5.0878	0.0655	4.9406	5.2453
ln SDG15	5.2003	0.0542	5.0764	5.2877
ln IND	4.8122	0.0483	4.7003	4.9323
ln GE	5.1965	0.0733	4.9666	5.2983

N = 297

Source: SDG index database and the WEF's Global Competitiveness Reports (2023), authors' calculations

Table 2. Correlation coefficients between the variables

	1	2	3	4	5	6	7	8	9	10
1	1									
2	0.4229**	1								
3	0.1497**	0.4934**	1							
4	0.6599**	0.2663**	0.3121**	1						
5	-0.7002**	-0.1927†	0.2141†	-0.3542†	1					
6	-0.6743**	-0.2107**	0.2887**	-0.4023**	0.8643**	1				
7	0.1809**	0.4115**	0.2662**	0.3074**	0.0673	-0.1231*	1			
8	-0.1422*	-0.0049	0.1434*	0.2207**	0.2099**	0.0358	0.5246**	1		
9	-0.0624	0.1963**	0.2006**	0.3527**	0.3569**	0.1946**	0.3970**	0.4316**	1	
10	0.8169**	0.3706**	0.1084†	0.5400**	-0.7747**	-0.7375**	-0.0326	-0.2165**	-0.2873**	1

Note: ** p<0.01, * p<0.05, † p<0.1.

(1) ln GCI, (2) ln SDG6, (3) ln SDG7, (4) ln SDG8, (5) ln SDG12, (6) ln SDG13, (7) ln SDG14, (8) ln SDG15, (9) ln IND, (10) ln GE

Source: SDG index database and the WEF's Global Competitiveness Reports (2023), authors' calculations

Diagnostic tests were performed on the variables of interest. Table 2 depicts correlation coefficients for the variables in the model. Majority of the variables are statistically significantly correlated; hence, the test for multicollinearity is performed. The conventional approach states that the variance inflation indicator should not be either larger than 5 or larger than 10. The highest variance inflation indicator in our model is 5.69 indicating multicollinearity might pose a problem. When the variable with the highest VIF, $\ln \text{SDG13}$, is removed from the model, variance inflation indicators of other variables fall below 2. As $\ln \text{SDG13}$ is crucial for examination of the effect of climate change on competitiveness, this study presents two models, with and without $\ln \text{SDG13}$.

Econometric analysis examined the relationship between competitiveness, measured with GCI score, and climate change, measured with SDGs index scores.

$$U = (GCI_{i,t}, \text{SDG}_{i,t}) \quad (1)$$

In this study the number of groups ($N = 27$) is larger than observed time periods ($T = 11$), $N > T$. Endogeneity in the model was tested and results indicate that endogeneity might be present in the model. Unit root tests were also performed on all variables in the model, and majority of the variables in the model become stationary when first differenced. In cases when $N > T$, the existence of within group cross-sectional dependence, and dependent variable with time lags in a model, a popular method of estimation is a dynamic model with a set of instrumental variables and generalised method of moments (e.g., Arellano and Bond 1991; Arellano and Bover 1995; Blundell and Bond 1998). Difference GMM is a dynamic panel data estimator that controls for endogeneity of the lagged dependent variable in a dynamic panel model, and in cases of correlation between the explanatory variables and the error term in a model, it controls for omitted variables bias and unobserved panel heterogeneity. In this paper, difference GMM is used as it builds a system of two equations, the original and the transformed one. It also uses orthogonal deviations, which minimize the data loss.

$$\begin{aligned} \ln Y_{it} &= \alpha + \varphi \ln Y_{it-1} + \beta \ln X'_{it} + \gamma \ln Z'_{it} + (\eta_i + \varepsilon_i) \\ &\text{for } i = 1, 2, \dots, N \text{ and } t = 1, 2, \dots, T \end{aligned} \quad (2)$$

where Y_{it} is a dependent variable of a member state i at time t , Y_{it-1} is a dependent variable of a with one lag period, X'_{it} is a vector of explanatory variables, Z'_{it} is a set of control variables, while η_i and ε_i are errors of residual differences of two orthogonal components with fixed effect and idiosyncratic shocks, respectively. The equation is a random walk model and Y_{it} is persistent. The difference GMM might be biased when T is short. Pooled OLS, fixed effects and difference GMM models were estimated to determine whether the difference GMM is an appropriate model. The results show that the difference GMM coefficient estimate is greater than fixed effects estimate indicating that the parameter estimate is not downward biased and that the difference GMM is an appropriate model. The analysis proceeds with the difference GMM. Finally, the two step difference GMM is used because of its efficiency and robustness to heteroskedasticity and autocorrelation in relation to one step difference GMM (Roodman, 2009).

6. RESULTS

This section presents the results of the analysis of the effect of climate change SDG indicators on competitiveness measured with the Global Competitiveness Index score. Four models are presented. Firstly, fixed effects and random effects panel data regressions with a dependent lagged variable are tested to inspect the effect of the climate change SDG indicators on compet-

itiveness (Sohag, Bamanga and Alam, 2018). Hausman test with p-value less than 0.05 implied that the fixed effect model was appropriate. Table 3 presents results of panel data regression with fixed effect and dependent lagged variable.

Table 3. Dynamic panel fixed effects model results

Variables	(S.E)	
	Model 1	Model 2
ln GCI _{t-1}	0.3311** (0.0551)	0.3403** (0.0564)
ln SDG6	0.0291* (0.0128)	0.0310* (0.0131)
ln SDG7	-0.0109 † (0.0063)	-0.0058 (0.0064)
ln SDG8	0.0259** (0.0070)	0.0182** (0.0069)
ln SDG12	-0.0362 (0.0238)	-0.0501* (0.0241)
ln SDG13	0.0140** (0.0038)	
ln SDG14	0.0040 (0.0030)	0.0057 † (0.0029)
ln SDG15	0.0009 (0.0048)	0.0019 (0.0049)
Intercept	2.9708** (0.3137)	3.0611** (0.3208)
R2	0.9697	0.9680
Adjusted R2	0.9654	0.9635
S. E. regression	0.0001	0.0001
Log likelihood	1537.495	1529.992
Akaike information criterion	-11.1296	-11.0814
Number of observations	270	270
Number of groups	27	27
Time periods	10	10
Probability (F-statistic)	0.0000	0.0000
Durbin-Watson	2.2212	2.2203

Note: Standard errors in parentheses. ** p<0.01, * p<0.05, † p<0.1

Model 1: fixed effects model with lagged dependent variable and ln SDG13, Model 2: fixed effects model with lagged dependent variable and without ln SDG13

Source: SDG index database and the WEF's Global Competitiveness Reports (2023), authors' calculations

Table 3 displays the results of fixed effects panel regression analysis in which Model 1 comprises all independent variables and Model 2 discards ln SDG13. Model 1 shows that ln SDG6

and \ln SDG13 statistically significantly and positively affect competitiveness, while \ln SDG7 negatively affects competitiveness on the 10 percent significance level. Model 2 illustrates that \ln SDG6 statistically significantly and positively affects competitiveness, while \ln SDG12 negatively. \ln SDG14 positively affects competitiveness on a 10 percent significance level.

Secondly, difference GMM is analysed to account for possible endogeneity within the dataset. Shapiro–Wilk W test for normal data has a significance value greater than 0.05 when \ln SDG13 is included, and less than 0.05 in case of no SDG13; hence, the residuals in our model are normally distributed when \ln SDG13 is included in the model. Breusch–Godfrey LM test for autocorrelation shows no presence of autocorrelation. Pesaran, Friedman and Frees tests for cross-sectional dependence show that p – values are greater than 0.05, indicating that a model with \ln SDG13 does not portray signs of cross-sectional dependence, while in case of no \ln SDG13 Pesaran test shows cross-sectional dependence but Friedman and Frees do not. As all three, in case with \ln SDG13, and two out of three, in case of no \ln SDG13, tests indicate no cross-sectional dependence, it is proceed with difference GMM.

Instrumental variables of difference GMM are exogeneous to a model. They incorporate endogenous variables with time lags 2 to 4, dummy variables in the original model and supplementary variables that are not explicitly included in the model but contribute to explaining the model under analysis. In our models, supplementary variables include the share of industry in gross domestic product and government effectiveness. The Hansen (1982) test assesses the suitability of a model by examining whether certain restrictions are justified. The resulting p -values are ideally within the range of 0.1 to 0.3. The Hansen test checks the exogeneity of a subset of predictor variables in cases where factor loadings are either zero or not correlated with each other. Moreover, the p -values for the autocorrelation function according to Arellano and Bond should not be significant, meaning they should be greater than 0.05, as indicated by Roodman (2009). The results of dynamic panel GMM regression are displayed in Table 4. Model 3 portrays the results with \ln SDG13 and Model 4 without \ln SDG14.

All period dummy variables were used in the model at first. As the time period in our models is rather short ($T = 11$), and majority of period dummy variables were dropped from our model due to multicollinearity issues, there is an identification of structural breaks in the model to obtain the periods to be included in the difference GMM. Structural break test (Bai and Perron, 1998) showed there exists a structural break in the model in 2009. The result is meaningful as it presents a period when 2008 financial crises impacted the European union economies. Hence, the time period of dummy variable 2009 is included.

In both models 3 and 4 Hansen (1982) test overriding restrictions' p -value is within the range 0.1 – 0.3, indicating that our models are appropriately identified. Arellano- Bond test for autocorrelation in first differences, AR(1) and AR(2), is not significant in both models stating that the idiosyncratic error terms are not serially correlated. Hence, our models are appropriately undefined.

Table 4. Dynamic panel GMM regression results

Variables	(S.E)	
	Model 3	Model 4
$\ln GCI_{t-1}$	0.4054** (0.0850)	0.4315** (0.1023)
$\ln SDG6$	-0.0065 (0.0098)	-0.0220 (0.0296)
$\ln SDG7$	-0.0040 (0.0081)	-0.0165 (0.0187)
$\ln SDG8$	0.0198* (0.0078)	0.0077 (0.0082)
$\ln SDG12$	-0.0635* (0.0230)	-0.1100** (0.0328)
$\ln SDG13$	-0.0000 (0.0089)	
$\ln SDG14$	0.0073 † (0.0043)	0.0104 † (0.0045)
$\ln SDG15$	-0.0015 (0.0032)	-0.0028 (0.0045)
Year dummies	YES	YES
Number of observations	162	162
Number of groups	27	27
Number of instruments	25	25
Wald test	$\chi^2(17)=21.07$	$\chi^2(18)=21.13$
Hansen test overriding restrictions (p-value)	0.223	0.273
Hansen test excluding group GMM (p-value)	0.249	0.250
Hansen test excluding group GMM (p-value)	0.179	0.105
AR (1) p-value	0.284	0.278
AR (2) p-value	0.701	0.691

Note: Standard errors in parentheses. ** p<0.01, * p<0.05, † p<0.1

Model 3: including $\ln SDG13$, Model 4: without $\ln SDG13$

Source: SDG index database and the WEF's Global Competitiveness Reports (2023), authors' calculations

In Model 3 and Model 4 $\ln SDG12$ statistically significantly and negatively affects competitiveness, while $\ln SDG14$ positively affects competitiveness at the 10 percent significance level. $SDG12$ refers to waste generation and SO_2 and nitrogen emissions, all resulting from increased consumption or production. A 1 percent increase in $SDG12$ index score results in a decrease the competitiveness score for 0.06 – 0.11 percent, all other things equal. $SDG14$ refers to preser-

vation of maritime biodiversity and oceans. A 1 percent increase in SDG14 index score results with an increase in competitiveness for approximately 0.01 percent, all other things equal.

It is interesting to note that other index scores such as SDG6, SDG7, SDG13 and SDG14 do not affect global competitiveness index. This might imply that global competitiveness index does not account for issues dealing with climate change and its slow down.

7. CONCLUSION

In today's world of increasing globalization, the concept of competitiveness can be reduced to international competitiveness, which means the ability to sell products on the global market with the intention of increasing the share, i.e., at the national level, an increase in export shares and a balance of payments surplus with the potential to raise the standard of living and GDP per capita. Today's customer buys sustainable products and supports sustainable production, so companies and countries that want to perform better on the global market must take this into account, implying increased environmental awareness and social responsibility on the part of businesses. The relationship between the current competitiveness index and the existing SDG indices was investigated in this paper in order to determine how well they are represented and whether there is a need to redefine the GCI.

This study examined the effect of the environmental change on competitiveness. Competitiveness was measured with the World Economic Forum's competitiveness index score, while climate change was measured with the United Nations' Sustainable Development Index scores. SDG Index scores 6 (preservation of freshwater), 7 (the use of energy), 12 (waste generation), 13 (GHG emissions), 14 (maritime, ocean preservation) and 15 (biodiversity preservation) were of particular interest. The results have shown that the two SDG index scores have a statistically significant effect on Global Competitiveness Index Score: SDG 12 and SDG14. SDG12 negatively affects competitiveness, while SDG14 positively affects competitiveness while other SDG goals were not statistically significant (SDG 6; SDG 7; SDG 8; SDG 13; SDG 15). Given that sustainable production is always associated with higher production costs, it is understandable that the relationship is negative, especially given that price is still the most important determinant of competitiveness in the majority of European countries. It is clear that the aggregated sustainability goals have no effect on GCI, implying the need for future research to form a new unit with 5 pillars that will adequately capture the impact of the environment on competitiveness. Companies', sectors', and the national economy's competitiveness has evolved into sustainable competitiveness, which means gaining a larger market share, i.e., increasing GDP per capita without negatively impacting the environment, i.e., achieving growth without jeopardizing the basis of growth for future generations.

There are several limitations to this research. Firstly, the Global Competitiveness Index data are available for the periods 2007-2017, after which the methodology of the score calculation altered. The econometric analysis was confined to the period of data availability. Secondly, the econometric analysis was based on the difference GMM because $T < 25$ and $N > 25$ to control for endogeneity. As $N = 27$, i.e., slightly greater than 25, we also used fixed effects panel data regression with lagged dependent variable. Although difference GMM is commonly used in cases of dynamic dependent variable, small T and large N , independent variables that are not strictly exogenous, fixed individual effects, among others, adding supplementary instruments could result in different estimated. Thirdly, the SDG Index scores are compilation of climate change measures, making it difficult to pinpoint a specific indicator that contributes to the change in competitiveness. Future studies should examine how specific climate change indicators, rather than their compilation, affect competitiveness over longer time period.

REFERENCES

- Aiginger, K., Bärenthaler-Sieber, S. and Vogel, J. (2013). Competitiveness under New Perspectives. *Working paper 44*. WIFO, October 2013.
- Arellano, M. and Bond, S. (1991). Some tests on specification for panel data: Monte Carlo evidence and an application to Employment Equations. *Review of Economic Studies*, 58, 277-297. <https://doi.org/10.2307/2297968>
- Arellano, M. and Bover, O. (1995). Another look at the instrumental variable estimation of error-component models, *Journal of Econometrics*, 68, 29-51. [https://doi.org/10.1016/0304-4076\(94\)01642-D](https://doi.org/10.1016/0304-4076(94)01642-D)
- Bai, B. Y. J. and Perron, P. (1998). Estimating and Testing Linear Models with Multiple Structural Changes. *Econometrica*, 66(1), 47–78. <https://doi.org/10.2307/2998540>
- Barney, J. B. and Hesterly, W. S. (2015). Strategic management and competitive advantage: concepts and cases. Pearson.
- Blundell, R. and Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87, 115-143. [https://doi.org/10.1016/S0304-4076\(98\)00009-8](https://doi.org/10.1016/S0304-4076(98)00009-8)
- Dzemydaite G., Dzemyda I. and Galiniene B. (2016). The Efficiency of Regional Innovation Systems in New Member States of the European Union: A Nonparametric DEA Approach. *Economics and Business*, 28 (1), 83–89. <https://doi.org/10.1515/eb-2016-0012>
- Durand, M., Simon, J. and Webb, C. (1992). OECD's indicators on trade and international competitiveness. *OECD Economics Department Working Papers*, 120, <https://doi.org/10.1787/18151973>
- Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). (2006). Guidelines for National Greenhouse Gas Inventories, IPCC. IGS. Japan. [www. https://www.ipcc-nggip.iges.or.jp/public/2006gl/](http://www.ipcc-nggip.iges.or.jp/public/2006gl/)
- European Commission (2001). Competitiveness of European Manufacturing. DG Enterprise. Brussels. <https://doi.org/10.1787/708306180711>
- European Commission (2003). The EU Switch to Green Flagship Initiative. <https://www.switchtogreen.eu/the-eu-green-deal-promoting-a-green-notable-circular-economy/>
- Eurostat. (2022). Sustainable development in EU: Monitoring report on progress towards the SDGs in an EU context. EC, May. 2022. Luxemburg. <https://doi.org/10.2785/632786>
- Fagerberg, J. (1988). Industrial Competitiveness. *The Economic Journal*, 98 (391), 355–374. <https://doi.org/10.2307/2233728>
- Global Sustainable competitiveness index. <https://solability.com/the-global-sustainable-competitiveness-index/the-index>
- Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica: Journal of the econometric society*, 1029-1054, <https://doi.org/10.2307/1912775>
- Hausmann, R., and Hidalgo, C. A. (2014). The atlas of economic complexity: Mapping paths to prosperity. MIT Press.
- Kaplinsky, R. (2020). Global value chains and development: Redefining the contours of 21st century capitalism. Cambridge University Press.
- Kaufmann, D., Aart K. and Mastruzzi, M. (2010). The Worldwide Governance Indicators: Methodology and Analytical Issues. *World Bank Policy Research Working Paper No. 5430* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1682130
- Krugman, P. (1994). Competitiveness: A Dangerous Obsession. *Foreign Affairs*. 73(2), 28–44, <https://doi.org/10.2307/20045917>

- Krugman, P. (1994B), The fight over competitiveness: A zero sum debate: Response: Proving my point. *Foreign Affairs*, 73(4). 198-203. <https://doi.org/10.2307/20046820>
- Krugman, P. (1996). Making Sense of the Competitiveness Debate, *International Competitiveness. Oxford Review of Economic Policy*. 12 (3), 17–25. <https://doi.org/10.1093/oxrep/12.3.17>
- Kuzmak, O., Kuzmak O. (2023). Social Responsibility of Business towards Sustainable Development: Case of Ukraine. *Collection of Papers New Economy*, 1(1), 126-148. <https://doi.org/10.61432/CPNE0101126k>
- Lane, P. (1998). World trade survey: Why trade is good for you?, *The Economist, Special Issue*, 3rd October.
- Leko-Šimić, M. (1999). Međunarodna konkurentnost hrvatskog gospodarstva u okruženju tranzicijskih zemalja srednje i istočne Europe . *Market – Tržište*, 11 (10). <https://www.bib.irb.hr:8443/66351>
- Lin, K. Y. and Wei, S. H. (2023). Advancing the Industrial Circular Economy: The Integrative Role of Machine Learning in Resource Optimization. *Journal of Green Economy and Low-Carbon Development*, 2(3), 122-136. <https://doi.org/10.56578/jgelcd020302>
- Lovrinčević, Ž., Mikulić, D., Rajh, E. (2008). Comparison of Methodologies for measuring National Competitiveness – Competitive Position of Croatian Economy. *Ekonomski pregled-Economic Review*, 59(11),603–645. https://www.researchgate.net/publication/292493013_Comparison_of_methodologies_for_measuring_national_competitiveness_-_Competitive_position_of_croatian_economy
- Maravilhas, S, and Oliviera, S, G. (2018). Information Strategy: Implementing and Managing a Digital Strategy in a Portuguese Company in Jamil, G.E. 2018, Handbook of Research on Expanding Business Opportunities With Information Systems and Analytics; IGI Global
- Markides, C. C. and Williamson, P. J. (2018). Corporate strategy: A resource-based approach. Routledge.
- Mastilo, Z., Štilić, A., Gligović, D., Puška, A. (2024). Assessing the Banking Sector of Bosnia and Herzegovina: An Analysis of Financial Indicators through the MEREC and MARCOS Methods. *Journal of Central Banking Theory and Practice*, 13(1), 167-197. <https://doi.org/10.2478/jcbtp-2024-0008>
- Mbarek M.B. and all. (2016). How Effective Are Renewable Energy in Addition of Economic Growth and Curbing CO2 Emissions in the Long Run? A Panel Data Analysis for Four Mediterranean Countries. *Journal of the Knowledge Economy*,9, 754-7366. <https://doi.org/10.1007/s13132-016-0365-9>
- OECD Proceedings (1998). The Competitiveness of transition economies. Paris. WIFO i OECD
- OECD (2011). OECD Guidelines for Multinational Enterprises. <https://doi.org/10.1787/81f92357-en>
- Porter, M. (1990). The Competitive Advantage of Nations. The Free Press A Division of Macmillan Inc.. New York.
- Roodman D. (2009). How To Do xtabond2: An Introduction to “Difference” and “System” GMM in Stata. *The Stata Journal*, 9(1), 86-136. <https://doi.org/10.1177/1536867X0900900106>
- Sala-i-Martin, X. (2018). The global competitiveness index 2018. World Economic Forum.
- Sohag, K., Bamanga, U., and Alam, M. M. (2018). Stata command for time series analysis. <https://doi.org/10.13140/RG.2.2.13812.45444/1>
- Stepanenko, S., Kryukova, I., Khalin, S., Podsokha, A. (2023). Inclusive Investment in the Sustainable Development of the Agricultural Sector and Rural Areas of Ukraine. *Collection of Papers New Economy*, 1(1), 75-88. <https://doi.org/10.61432/CPNE0101075s>
- Sustainable Development Goals Index (2023). <https://www.sdindex.org>

- Šegota, A., Tomljanović, M. and Huđek, I. (2017), Contemporary approaches to measuring competitiveness – the case of EU member states. *Zbornik radova Ekonomski fakultet Rijeka*. Rijeka, 35 (1) 123-150. <https://doi.org/10.18045/zbefri.2017.1.123>
- Škuflić, L. (2005). Uzroci trgovinskog deficita Republike Hrvatske i mogućnosti njegova smanjivanja. *Ekonomski vjesnik*. Osijek. 18 (1 I 2), 45 – 58. <https://hrcak.srce.hr/file/294095>
- Teece, D. J. (2014). A dynamic capabilities-based entrepreneurial theory of the multinational enterprise. *Journal of International Business Studies*, 45(1), 8-37. <https://doi.org/10.1057/jibs.2013.54>
- Velloso, J.P.R. (1991). International competitiveness and creation of an enabling environment. In Haque, I. (ed) *International competitiveness: Interaction of public and private sectors*, Washington D.C.: The World Bank.
- UN General Assembly. (1987). Report of the world commission on environment and development: Our common future. Oslo. United Nations General Assembly, Development and International Co-operation -Environment.
- UN (2015), Sustainable Development Goals and Climate Action, <https://www.un.org/sustainabledevelopment/climate-action/>
- UN (2023a). Climate Change. <https://www.unfccc.int/process-and-meetings/the-paris-agreement>
- UN (2023b). Climate Action. [www. https://www.un.org/en/climatechange/paris-agreement](https://www.un.org/en/climatechange/paris-agreement)
- UN (1992) UNFCCC – United Nations Framework Convention on Climate Change, [www. https://unfccc.int/resource/docs/convkp/conveng.pdf](https://unfccc.int/resource/docs/convkp/conveng.pdf)
- World Bank (2023). World Bank Open Data. data.worldbank.org
- WEF (2020). *Global Competitiveness Report 2020–21*. New York. Oxford University Press.
- WEF (2017). *The Global Competitiveness Report 2016–2017*. https://www.academia.edu/32351313/The_global_competitiveness_report_2016_