Competitiveness of the European Union Member States according to the Institute of Management Development index (IMD)

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Abstract
The competitiveness index of the Swiss Institute for Management Development (IMD International for Management Development), based in Lausanne, is calculated and published in the World Competitiveness Yearbook - the leading annual report published annually since 1989. Until 1995, the report was developed jointly by the IMD and the Index of Economic Freedom (IEF). IMD publishes the World Digital Competitiveness Ranking, which measures the ability of 64 economies to adapt to digital technologies and the readiness to search for new applications of digital technologies as a key factor of economic transformation in industry, the public sector and broadly understood social relations. The IMD index provides a general overview of the factors that determine the level of competitiveness. Currently, these factors are analyzed in four categories defining the competitiveness of the economy, i.e.: economic situation, government efficiency, efficiency of the public and economic sector, infrastructure.

To assess the competitiveness of EU Member States, taking into account the IMD index, rankings for 2010 and 2020 published by the World Digital Competitiveness Ranking were used. Research results indicate that the countries that achieved the best results in the IMD ranking are also leaders in the competitiveness ranking based on GDP per capita published by the European Commission.

Keywords: competitiveness, European Union member states, competitiveness report.

Introduction
The international competitiveness of an economy is defined as the ability of a country to achieve the greatest possible benefits related to the international division of capital and labor. The European Commission, while defining competitiveness, indicated that it is the possibility for a given country to achieve a stable growth of GDP per capita, and thus to provide citizens with a high standard of living, the possibility of performing a specific job, and thus reducing unemployment. The national economy is indicated as competitive in the international environment when, in the conditions of free trade and free flow of production factors, the pace of development in the long term is visible (Grynia, 2020). The competitiveness of EU member states is also defined as the ability to compete, i.e. increase the use of the productivity of production factors in order to improve the living conditions and welfare of EU citizens. The literature (Tusińska M., 2014) presents many definitions of competitiveness as an economic phenomenon related to the socio-economic development of the country.

The IMD index is a general approach to the factors that determine the level of competitiveness of the economy, taking into account four categories of factors determining the competitiveness of the economy, divided into five sub-factors that emphasize various aspects of competitiveness, i.e. the IMD index contains 20 sub-indexes. The value of the index...
is defined from 0 to 100. The higher the value, the higher the competitiveness of a given economy (Garelli S., 2015). This indicator draws attention to the separation of the quality of institutions through the quality and practices of legal institutions, competition regulations as well as a deeper analysis of the infrastructure sphere (quality of railways, roads, ports, and infrastructure investments). Currently, the IMD index is being developed for 64 countries (https://www.imd.org/wcc/world...02-12-2021).

The IMD Ranking is based on measuring progress in the following three areas:
- **knowledge**, including intangible infrastructure necessary for technology learning and research,
- **technology**, quantifying the landscape of digital technology development in the economy,
- “**Future Readiness**”, examining the level of preparation of the economy for digital transformation.

The IMD World Competitiveness Yearbook 2010, 2020 report presents the rules that a country should follow in order to be competitive and maintain a high level of international competitiveness. The most important rules include:
- creating a stable legal system,
- generating domestic savings and supporting domestic investments,
- creating an economic structure that is flexible to external action,
- creating appropriate conditions for foreign investments;
- investing in education;
- investing in infrastructure;
- reducing wage differences;

The above principles allowed (Adamkiewicz-Drwiłło G.H., 2014) to define the following statements related to the IMD index value:
- a country, despite having a high national income, may be a non-competitive country,
- a “poor” country with little resources can be a competitive country if it performs an effective transition process,
- international competitiveness should be examined in terms of hard and soft factors,

The listed hard factors are those that have a significant impact on the competitiveness of the economy and that can be analyzed in the short term. On the other hand, soft factors are related to the ability to implement specific strategies as a result of proper management. By observing the competition process, it can be indicated that soft factors are becoming more and more important. Soft factors are difficult to define, despite the fact that they are esoteric, in recent years they have gained great importance in models explaining the economic development of countries (Markusen, J. R., Strand, B., 2009).

The competitiveness index created by IMD - The World Competitiveness Yearbook is a competitive index compared to the Global Competitiveness Report - GCI. In the 1990s, these institutions published only one common indicator, however, as a result of methodological differences, various reports began to be developed. IMD (International for Management Development) is a more useful indicator than the previous one, as it consists of components that correspond to the various elements of the competitiveness analysis.

The IMD World Competitiveness Yearbook is a comprehensive annual report and a global benchmark on country competitiveness. It provides benchmarking and trends as well as statistics and survey data based on extensive research. It analyzes and classifies countries according to how they manage their competencies to achieve long-term value added creation. The competitiveness of the economy cannot be reduced only to GDP and productivity, since the activity of enterprises is significantly influenced by political, social and cultural factors. Therefore, member states should provide an environment with efficient infrastructure, institutions and policies that encourage the creation of lasting value by enterprises. These values are measured and reported by the IMD report.

The IMD World Competitiveness Rankings underline the long-term trend indicated in previous editions - each of the countries placed at the top of the ranking has a unique approach to competitiveness processes. The ranking provides a comprehensive description of the 64 economies selected on the basis of the
availability of comparable international statistics and cooperation with local partner institutions that contribute to the collection of survey data and ensure that all data is reliable, accurate and up-to-date. The World Competitiveness Ranking is based on 334 competitive criteria selected from comprehensive research using economic literature, international, national and regional sources, and feedback from the business community, government agencies and scientists. The criteria are regularly reviewed and updated as new theory, research and data become available and as the world economy evolves.

IMD World Competitiveness Online is a unique and comprehensive database of country competitiveness. It includes time series from the IMD World Competitiveness Yearbook, the leading annual report published by IMD since 1989, the IMD World Talent Ranking and the IMD World Digital Competitiveness Ranking.

The index developed by the Institute of Management Development (IMD) is a synthesis of all the described indicators of the dimensions of competitiveness. During the Covid-19 pandemic, the balanced dimension of competitiveness, which relates to the elimination of socio-economic exclusion and the environmental effects of economic activity, is of greater importance than before. One of the synthetic measures of sustainable competitiveness is the Social Progress Index (SPI). It takes into account three groups of factors describing the basic human needs, the principles of achieving well-being and the possibilities of personal development. The index does not include economic results, such as economic growth rates, which allows a direct comparison of social and environmental progress, without taking into account economic indicators.

Bearing the above in mind, the aim of the research was to assess the level of competitiveness of EU member states, taking into account the data published in the form of the IMD ranking, which measures the ability of EU countries’ economies in the field of adaptation of digital technologies and readiness to seek new applications of digital technologies as a key factor in economic transformation in industry, public sector and broadly understood social relations. The IMD report ranks countries according to how they manage their competencies to achieve long-term value added creation related to digital development.

As part of the research, the following research hypotheses were verified assuming that:

H1: The competitive position of the EU Member States defined in the IMD report is correlated with the ranking of countries based on the GDP per capita indicator.

H2: The competitiveness of the economically weakest EU Member States, defined in the IMD report in 2010 and compared to the ranking for 2020, has not improved significantly.

The article is structured as follows. The first two parts explain the essence of the undertaken research problem concerning the competitiveness of the EU economies and present the research assumptions. The next part presents the results of studies illustrating the indicators published in the form of IMD reports for 2010 and 2020 for individual Member States. With the use of statistical analysis, on the basis of indicators published in the form of an IMD report and the GDP per capita indicator, a ranking of EU countries was created, which determines the degree of adaptation of digital technologies and readiness to search for new applications of digital technologies. The synthetic measures calculated with their use made it possible to determine which countries are in the best, average and the worst situation in terms of implementing new digital technologies. The final part of the article presents conclusions and recommendations resulting from the research.

Material and methods

The empirical material used in the research concerned the 27 EU Member States as well as the EU’s position in relation to the world’s leading economies. The numerical data come from the reports of the Institute for Management Development (IMD) based in Lausanne, calculated and published in the World Competitiveness Yearbook - the leading annual
Report published annually. GDP per capita values were assessed on the basis of data published by Eurostat. A comparative analysis of the competitiveness of EU Member States based on the IMD rankings was performed for the years 2010 and 2020. To assess the competitiveness of EU Member States in terms of the capacity of EU economies in the field of adaptation of digital technologies, the coefficient of determination - R² - was used, which is a measure of the adjustment of the regression function to empirical data. It informs what part of the variability of the dependent variable Y (GDP per capita) was explained by the function of the independent variable X (IMD coefficient). The value of the determination coefficient is in the range (0; 1), the closer the value of this coefficient is to one, the more it indicates a more precise matching of the regression function to empirical data.

Graphical methods were used for the analysis and the basic characteristics were compared, i.e. arithmetic mean - the average level of the variable; median (middle value) - half of the measurements are below and the other half are above the median; the largest (maximum) and smallest (minimum) values.

In both the 2010 and 2020 rankings, the top three most digital nations are the USA, Singapore and Denmark. Scandinavian countries and Finland - traditionally seen as digital leaders - were in the top 10. The 2020 ranking is also viewed through the prism of the Covid-19 pandemic and how the maturity of economies in terms of digital technology applications will help to better deal with the effects of the pandemic and overcome the crisis it causes.

There is a positive and strong, but non-linear relationship between the Technical Progress Index (IMD) and GDP per capita. Even a small increase in GDP per capita in countries with a low GDP level translates into a relatively large improvement in technological progress. At the same time, as countries achieved higher levels of per capita income, the pace of change in IMD has slowed down.

Results and discussion

The IMD 2020 report shows little change in the top ten economies compared to 2010. The US and Singapore retained their positions and several countries swapped their positions. At the top of the ranking were economies with the ability to develop and effectively use talent in the field of digital technologies, an effective and friendly regulatory environment, and the ability to quickly adapt and implement new technologies (referred to as “Future Readiness”).

Innovation, digitization, social benefits and social cohesion are key to economic performance in the 2020 rankings, led by Switzerland (1st), Sweden (2nd), Denmark (3rd), the Netherlands (4th) and Singapore (5th). In the IMD 2020 Competitiveness Ranking, the economies of the EU countries with the best results are characterized by a different degree of investment in innovation, diversified economic activity and supporting public policy. The strength in these areas prior to the Covid-19 pandemic enabled these economies to more effectively counter the economic effects of the crisis.

The competitiveness of EU countries in 2020 according to the IMD 2020 ranking was at a higher level than in the 2010 ranking in terms of adaptation of digital technologies and readiness to search for new applications of digital technologies as a key factor of economic transformation in industry, the public sector and broadly understood social relations. In 2010 and 2020, all EU Member States saw an increase in the IMD index, which meant an increase in the adaptation of digital technologies and the readiness to search for new applications of digital technologies. The value of the index is defined from 0 to 100. The higher the value, the higher the competitiveness of a given economy. The highest index value in 2020 was recorded in Denmark (96.013), Sweden (96.016), the Netherlands (92.567), Austria (83.127), and the lowest in Croatia (52.045), Slovakia (53.261), Romania (53.668), Bulgaria (56.295) (Fig. 1).
Data published for 2010 and for 2020 on IMD rankings place Poland in 18th place in the EU in terms of economic competitiveness - ahead of Latvia, Italy, Hungary, Bulgaria, Greece, Romania, Slovakia and Croatia. The Nordic countries are the European leaders in terms of competitiveness regarding the adaptation of digital technologies. Three of them - Denmark, Sweden and Finland - were in the top five of the ranking. The Netherlands and Ireland are also among the most competitive European economies. Among the Member States, the highest (worst position) in the ranking were: Romania, Croatia, Bulgaria and Slovakia. (Fig. 2).

Fig. 1. IMD Competitiveness Index for EU Member States for 2010 and 2020

Source: file:///C:/Users/alwal/Downloads/digital_2020%20(1).pdf

Fig. 2. Position in the IMD ranking of individual EU Member States in 2010 and 2021 (64 positions in total)

Source: file:///C:/Users/alwal/Downloads/digital_2020%20(1).pdf (lowest position - best, highest position - worst).
In 2021, according to the IMD ranking in the field of adaptation of digital technologies and readiness to search for new applications of digital technologies as a key factor of economic transformation in industry, the public sector and broadly understood social relations, the best position among the analyzed group is taken by the United States (10th place in the world), followed by Germany (17th place in the world) and China (20th place in the world). Poland, with 39th position in the world ranking, is only ahead of India and Ukraine in this group.

The analysis of the dynamics of changes in the IMD index and GDP per capita for EU Member States confirmed that the increase in GDP per capita was followed by an increase in the IMD index informing about the progress in digitization and innovation in the economy. For all EU Member States, the increase in digitization was accompanied by an increase in GDP per capita. (Fig. 3).

Conclusions

The IMD report assessing the digital competitiveness of countries, beyond digital technologies, also identifies indicators for technology and science infrastructure, which are also assessed and listed in general rankings. Successive country digital competitiveness rankings (post-2010) incorporate ever newer criteria to measure the ability of countries to adopt and discover digital technologies that transform government practices, business models and society in general.

The analysis of IMD reports performed with the use of statistical methods made it possible to verify the adopted research assumptions. The research confirmed the increase in the digital competitiveness of EU countries between 2010 and 2020. The competitive position of the EU Member States defined in the IMD report is correlated with the ranking of countries based on the GDP per capita indicator. The analysis of the dynamics of changes in the IMD index and GDP per capita for EU Member States confirmed that the increase in GDP per capita was followed by an increase in the IMD index informing about the progress in digitization and innovation in the economy. For all EU Member States, the increase in digitization was accompanied by an increase in GDP per capita. The competitiveness of the economically weakest EU Member States, defined in the IMD report in 2010 and compared to the ranking for 2020, has not improved significantly. The highest places in IMD competitiveness rankings are taken by countries from outside the EU, as well as the most economically developed EU countries (Sweden, Finland, Denmark, Germany). The most competitive countries listed in the IMD ranking are also taking the highest places in other competitiveness rankings published by international institutions (HDI, RCI, IEF). The last places in the IMD ranking are: Indonesia, Ukraine, Mongolia, Peru and Venezuela, i.e. these countries not only have low talent rankings, but do not invest in developing the talent at their disposal. In the group of EU Member States, the highest positions in the digital ranking (the worst digital competitive positions) are the positions taken by: Romania, Bulgaria, Slovakia.

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