"Impact of the COVID-19 pandemic on the economic development of EU countries"

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IMPACT OF THE COVID-19 PANDEMIC ON THE ECONOMIC DEVELOPMENT OF EU COUNTRIES

Abstract

One of the essential consequences of the COVID-19 pandemic is a slowdown in eco-nomic development, which is reflected in an integrated way by the Gross Domestic Product per inhabitant of the country. However, its dimensions are not the same for individual countries of the European Union, so it is crucial to determine what circum-stances led to this phenomenon. Therefore, the purpose of this study is to determine individual EU countries' losses caused by the COVID-19 pandemic and the circum-stances they depended on.

Correlation-regression analysis was used, which made it possible to calculate what ef-fect the countries' economic development level and the intensity of its positive changes on the eve of the COVID-19 pandemic had on the losses incurred. In 2018, it was found that this relationship is very strong (the value of the correlation coefficient r equals 0.8 and 0.7, respectively). The study's results highlighted the regularity – eco-nomic development slowed down the least in those countries where it was in the best condition, and the positive development changes were the most intense. It was found that in the ten most developed EU countries, economic growth slowed down because of the COVID-19 pandemic by approximately 2.3%, and in the rest of the countries – 5.1%. According to the slow-down of economic development, insensitiveness was ap-proximately 3.45 and 5.46%.

Keywords	pandemic, economic growth, correlation-regression analysis
JEL Classification	H12, O47

INTRODUCTION

The World Health Organization declared the global COVID-19 pan-demic on March 11, 2020, so sufficient time has elapsed since its in-ception. It is now possible to analyze its consequences in a general way. They have been manifested in various aspects: development of finan-cial losses; their dependence on the geographical location of countries; impact on social, environmental, health processes, etc. The overall re-sult of these changes is a slowdown in the pace of economic develop-ment (EP). Perhaps because the consequences of COVID-19 have been uneven across countries, studies are prevalent which examine the sit-uation of different countries from one country to another. Analysis of the impact of the pandemic on their economic development (Lourenço & Rua, 2021), financial markets (Tooze, 2020), people's psychological state ecology (Sarkodie & Owusu, 2021), crude oil markets (Chen et al., 2021; R. Li & S. Li, 2021; Sarkodie & Owusu, 2021), and cryptocurren-cies (Kielmann et al., 2022). A number (Sarkodie et al., 2021) of studies are devoted to the assessment of national governments (Huynh et al., 2021; Lim et al., 2021; Chen et al., 2021; Guo & Shi, 2021; Kaczorowska, 2021; Srhoj et al., 2021; Avanesova et al., 2021; Androniceanu, 2020; Streimikiene, 2022).

On the other hand, these studies do not reveal the general patterns of the impact of the COVID-19 pandemic on the countries' economic development, nor do they show the extent of these effects. On the eve of the COVID-19 pandemic, 2018–2019, the "starting positions" of countries were different: some are characterized by a high level of the EP, while others have a much lower level. Furthermore, the intensity of economic development differed from one country to another, while others were modest. Therefore, considering that the pandemic can last for several years, there is a question of relevance both in scientific and practical terms. It is vital to determine the impact of the COVID-19 pandemic on economic development of countries, depending on both the level of economic development achieved and the intensity on the eve of the COVID-19 pandemic.

1. LITERATURE REVIEW

The COVID-19 viral pandemic, which lasts more than 1.5 years from the COVID-19 virus, provides sufficient information to examine its impact on the development of countries. This is evidenced by a large number of studies on this topic in 2020–2021. Almost all of them examine the impact of the COVID-19 pandemic on the economic development of countries. To a lesser extent, the impact on social and environmental development is analyzed. This is not surprising because it depends primarily on economic development.

The main result of the impact of the COVID-19 pandemic is the slowdown in the economic development of countries, which is expressed in terms of changes in the Gross Domestic Product (GDP). Furthermore, the amount of losses caused by this negative process has been determined. For the European Union, it will amount to almost EUR 1 billion, or 6% of its GDP (Hafner et al., 2020), and the world economy can lose between 5 and 12.5 trillion dollars (Androniceanu, 2020; Avanesova et al., 2021).

What are the main reasons for the slowdown in economic development? The restrictive measures adopted by national governments to limit the spread of the virus have distorted the fundamental principles of global economic development, as economic cooperation, in particular through international trade, has been overshadowed by national interests and competition for scarce resources (Ibn-Mohammed et al., 2021). The pandemic has had a significant impact on the stability of oil and equity markets and on the price of cryptocurrencies, and has led to a stagnation in international trade and investment flows (Kielmann et al., 2022; Sarkodie et al., 2021). All this has forced

investors and politicians to reform their economic development strategies to avoid risks to oil, which plays a decisive role in global economic development and equity markets (Kielmann et al., 2022).

Literature sources also analyze the impact of the COVID-19 pandemic on economic development in a broader format, in the context of previous crises. For example, countries without SARS experience in 2003 were found to have suffered higher losses in the context of the 2020 pandemic than countries with this experience (Bissoondoyal-Bheenick et al., 2021).

The impact of the pandemic on economic development has proved to be significantly greater than the 2008–2009 financial crisis (Kheyfets & Chernova, 2020). On the other hand, it is argued that the impact of the COVID-19 pandemic on global economic development cannot be compared with the effects of other past pandemics, as economies were smaller and almost unrelated at that time (Leach et al., 2021; Barry, 2020). Furthermore, the exact SARS epidemic cost cheaper than predicted. In addition, it recovered relatively quickly (Keogh-Brown & Smith, 2008). Therefore, taking into account the differences between the environment in which the previous pandemic occurred and the COVID-19 pandemic the latter is likely to have far more significant consequences and will last much longer (Carracedo et al., 2021; Zhang & Hamori, 2021).

Changes in global enlargement have led to a debate on the impact of the COVID-19 pandemic on globalization processes. These changes have occurred not only in the economic sphere but also in the social sphere, with changes in the behavior of national societies. The pandemic has positively impacted the dynamics of information flows, in-

creased internet intensity, and enhanced the use of other communication tools, etc. On the other hand, these positive moments do not outweigh the stagnant trend in international trade, shrinking investment, and people's mobility. They, therefore, do not have a greater impact on globalization processes, nor do they affect the overall trend of the globalization index (Kheyfets & Chernova, 2020). In this situation, even thoughts of the end of globalization began to be expressed.

The impact of the pandemic on economic development has been uneven across continents and countries. Europe and America are hit hardest. Developed countries have provided comprehensive information on the state of play. This impacted investors' behavior, equity returns, and thus overall economic efficiency (Huynh et al., 2021). The COVID-19 pandemic has also been affected to varying degrees by country. In 2020, GDP per capita decreased by 10% in Spain, by 9% in Greece and Malta, and by 8% in Cyprus and Croatia compared to 2019. In the meantime, it even increased in Ireland, while in Lithuania, it remained the same. Employment in rural areas is most affected by the pandemic (Meadway, 2020), as well as the tourism sector (Esquivias et al., 2021; Song et al., 2021; Dudley et al., 2021) and the hospitality industry (Kostynets et al., 2021).

Countries have developed different strategies to localize the consequences of the pandemic. For example, the Australian government's policies focus on stimulating demand and supporting employment (Lim et al., 2021). In China, studies have shown that the COVID-19 pandemic affects production in five respects: business continuity, interruptions in capital creation and supply chains, reduced availability of labor, and the effectiveness of exit policies (Chen et al., 2021). On this basis, measures to promote economic development, including reducing value-added tax, are envisaged (Guo & Shi, 2021).

Meanwhile, the Polish government went on a different path. Instead of encouraging business, the aim was to reduce inequalities through the tax system, i.e., by introducing additional taxes on companies, in order to introduce wealth tax, etc. This has further worsened the business situation and did not create long-term assumptions for the

country's economic development (Kaczorowska, 2021; Konopczak & Łożykowski, 2021; Wroński, 2021). Croatia has introduced grants to female entrepreneurs to help businesses (Srhoj et al., 2021). Ukraine has continued to develop its competitive policy (Avanesova et al., 2021), labor productivity (Chugaievska et al., 2020), and educational programs focused on GDP growth (Samoliuk et al., 2021). Other countries have focused on the digitalization of the economy (Song et al., 2021; J. Taylor & R. Taylor, 2021; Aseeva & Budanov, 2020) and support for ICT and e-business environment (Remeikiene et al., 2021; Roshchyk et al., 2022).

The review shows that most of the studies on the pandemic examine its impact on individual aspects of development, government crisis response measures, etc. However, in assessing the global nature of the COVID-19 pandemic, it is also essential to analyze the general patterns of its impact. For this reason, first of all, it is necessary to choose an indicator of countries' economic development.

In order to prove this first, it is necessary to select an indicator reflecting the economic development of the countries. It, as a phenomenon, belongs to processes characterized by the highest level of complexity. This means that, in reality, these processes are manifested in a large number of aspects of the most diverse nature. In turn, the latter is also complex, as they integrate lower-level aspects within themselves. This situation presupposes two fundamental approaches to the assessment of the economic development. In one case, the EP indicator proposes to take the aspect with the highest degree of integrity; otherwise, the aim is to combine the lower-level aspects reflecting economic development into a single aggregate size or index. Literature sources indicate both viewpoints' positive and negative sides (Gedvilaitė, 2019; R. Li & S. Li, 2021). In the first case, the country's EP indicator generally uses domestic product per capita (GDP) (Moldan et al., 2012; Brizga et al., 2014; Kozyreva et al., 2017), and second, multi-criteria measurement methods (Gedvilaitė, 2019; Volkov, 2018; Oželienė, 2019; McLaren et al., 1998; Mally, 2018; Strezov et al., 2017). The positive sides of GDP as an indicator of the country's economic development are the possibility to evaluate processes according to a unified methodology and the availability of information on the level of development

achieved. Its limited complexity can be attributed to the negative, as it reflects more aspects of the country's economic development and does not fully appreciate others, e.g., part of the product developed in the social sphere. On the other hand, a unified calculation methodology makes it possible to compare countries.

The positive side of the EP evaluation is that it is possible to incorporate the desired number of indicators into the model and thus achieve the complexity of the aggregate index close to the complexity of the object being assessed. The greater this compliance, the more adequate the assessment. On the other hand, the possibility of using this method is limited by the absence of a single evaluation methodology, i.e., EP assessment models used in individual countries differ from one country to another, both in terms of the number and composition of indicators. In addition, there is limited access to the information necessary to calculate the values of the sub-indicators. Another aggravating circumstance is high calculation costs since the importance of indicators is usually determined based on expert assessments (Gedvilaitė, 2019; Volkov, 2018; Oželienė, 2019; Hwang & Yoon, 1981). For these reasons, international assessments of economic development are based exclusively on GDP (Jurevičienė et al., 2020; Lisiński et al., 2020; Brizga et al., 2014; Jędrzejczak-Gas & Barska, 2019; Kozyreva et al., 2017).

2. AIM AND HYPOTHESES

The aim of the paper is to determine individual EU countries' losses caused by the COVID-19 pandemic and the circumstances they depended on.

The empirical results from previous studies allowed assuming the following research hypotheses:

H1:   *COVID-19 pandemic has had a negative impact on the economic development of the EU members, but the influence was different for each member.*

H2:   *The impact of the COVID-19 pandemic on the scale of economic development depended on the intensity of this enlargement on the eve of the crisis.*

3. METHODOLOGY

The test methodology must enable the hypotheses raised to be confirmed or rebutted. In particular, it needs to be quantified that the pandemic has had a negative impact on the economic development of countries.

In this case, the magnitude of the impact of the COVID-19 pandemic on the country's economic development will be reflected in the ratio of the pandemic to the GDP of the previous year, i.e., 2020 and 2019:

$$K_j = \left(1 - \frac{GDP_{j20}}{GDP_{j19}}\right)100, \qquad (1)$$

where K_j = % of the impact of the COVID-19 pandemic on the economic development of a country depending on its level; GDP_{j20} = the GDP of the j country in 2020; GDP_{j19} = same in 2019.

The nature and extent of the impact of the pandemic on the EP in a country, depending on the level achieved, can be determined based on the following correlation-regressive analysis model:

$$K_j = f\left(GDP_{j19}\right). \qquad (2)$$

If the correlation factor turns out to be sufficiently high, the more economically developed countries have suffered less from the COVID-19 crisis.

In order to determine the impact of the COVID-19 pandemic on the economic development of countries depending on its intensity, it is necessary, in particular, to calculate the indicator reflecting it:

$$R_j = \frac{GDP_{j19}}{GDP_{j18}}100, \qquad (3)$$

where R_j = the extent of the impact of the COVID-19 pandemic on the economic development of a country, in % depending on its intensity; GDP_{j18} = j country's GDP, 2018.

The extent of the pandemic's impact on the EP can again be determined based on the following correlation-regressive analysis model:

$$K_j = f\left(R_j\right). \qquad (4)$$

If it turns out that the correlation coefficient r is sufficiently high, the pandemic has been less affected by countries whose economic development was more intense on the eve of the crisis.

4. RESULTS AND DISCUSSION

On the basis of the methodology, both hypotheses of the impact of the pandemic on the economic development of the European Union countries have been verified.

Table 1. Impact of the COVID-19 pandemic on the EU economic development, %

Source: Compiled by authors based on Eurostat.

Order No.	Country	Gross domestic product per capita, EUR			K_j, %	R_j, %
		2018	2019	2020		
1	Austria	43.60	44.78	42.30	5.5	2.7
2	Belgium	40.29	41.46	39.11	5.6	2.9
3	Bulgaria	7.99	8.78	8.75	0.3	9.9
4	Czech Republic	19.85	21.14	20.12	4.8	6.5
5	Croatia	12.70	13.34	12.17	8.7	5.0
6	Cyprus	24.63	25.27	23.40	7.4	2.6
7	Denmark	52.18	53.37	53.60	0.5*	4.5
8	Estonia	19.66	21.22	20.44	3.6	7.9
9	Germany	40.48	41.51	40.12	3.3	2.5
10	Finland	42.32	43.48	42.94	1.2	2.8
11	France	35.13	36.14	34.04	5.8	2.9
12	Greece	16.75	17.11	15.49	9.4	2.1
13	Ireland	67.08	72.36	73.59	1.7*	7.9
14	Italy	25.59	29.98	27.78	7.3	1.3
15	Latvia	15.13	15.90	15.43	2.9	5.1
16	Lithuania	16.25	17.47	17.51	0.3*	7.8
17	Luxembourg	98.64	102.2	101.64	0.5	3.6
18	Hungary	13.91	14.95	13.94	6.7	7.5
19	Malta	25.96	26.92	24.63	8.5	3.7
20	the Netherlands	44.92	46.88	45.87	2.1	4.4
21	Romania	10.50	11.51	11.29	1.9	9.6
22	Slovenia	22.13	23.17	22.01	5.0	4.7
23	Slovakia	16.41	17.22	16.77	2.6	4.9
24	Spain	25.77	26.43	23.69	10.3	2.6
25	Sweden	46.26	46.39	45.85	1.1	0.3
26	Poland	12.96	13.90	13.64	1.8	7.3
27	Portugal	19.95	20.80	19.66	5.4	4.3

Note: ∗ in these countries, the EP was higher in 2020 than in the 2019 enlargement.

Estimates of the impact of the COVID-19 pandemic on economic development in EU countries were based on its status in 2018–2019, i.e., in the pre-crisis and crisis period (Table 1). Values have been calculated based on formulas (1) Kj and (3) R_j. The correlation-reflection analysis was performed using formulas (1) and (4). The results are shown in Figures 1 and 2 and Table 2.

Table 2. Results of a correlation-regressive analysis of the impact of the COVID-19 pandemic on economic development in EU countries

Source: Authors' elaboration.

| Title	Regression equation	Correlation coefficient r
Impact of the COVID-19 pandemic on economic development in EU countries depending on their level	$K_j = 0.0012BVP^2_{j19} - 0.0789BVP_{j19} + 9.181$	$r = 0.788$
Impact of the COVID-19 pandemic on economic development in EU countries depending on its intensity	$K_j = 0.1319R_j^2 - 2.545R_j + 11.744$	$r = 0.681$

Table 1 shows that due to the COVID-19 pandemic, economic development losses in EU countries ranged from 0% to 10% of their GDP. Thus, the losses in some countries are quite significant, and this confirms the first hypothesis.

Figure 1 shows that the higher the level of economic development in the EU countries on the eve of the pandemic, i.e., 2019, the lower the losses of this enlargement (Table 1). This confirms the second hypothesis raised.

Figure 2 shows that the higher the intensity of economic development in the EU countries on the eve of the pandemic, i.e., 2018–2019, the smaller the losses of this enlargement were (Table 2).

The question arises as to why the impact of the COVID-19 pandemic has been lower in those countries with higher levels and intensity of economic development. The law of physics is known to everyone: mass is a measure of inertia. Applying this provision to socio-economic systems (SES) and processes suggests that a larger SES is characterized by higher inertia. The country's economic development indicator, Gross Domestic Product, is very complex in content, combining many aspects that reflect the EP. Each such aspect, while being an element of a single SES, is relatively autonomous and develops according to its own targeted strategy (of course, aligned with the overall objective of the system as a whole). The result of this development of all these aspects is the inertia

$$y = -0.0012x2 - 0.0789x + 9.1814$$
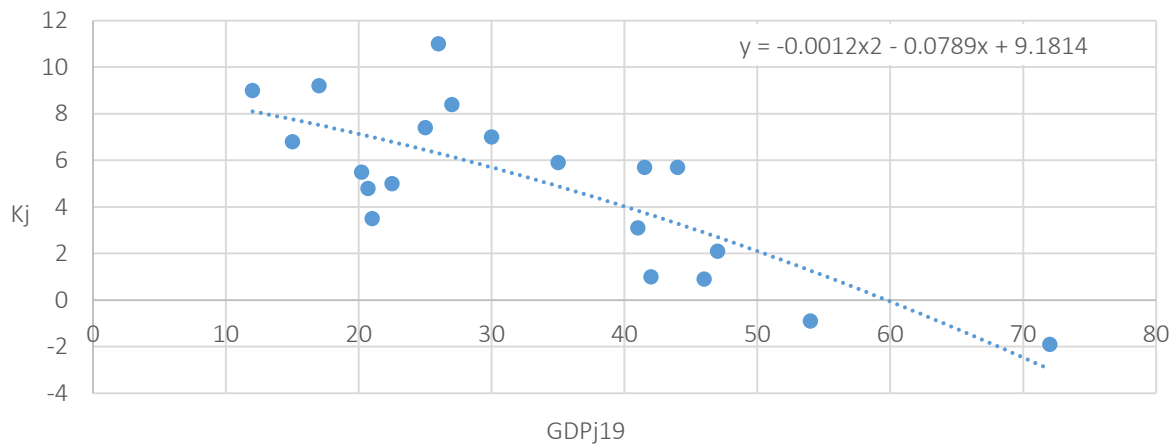
Figure 1. Impact of the COVID-19 pandemic on EU economic development depending on its level

$$y = 0.1319x2 - 2.5454x + 11.744$$
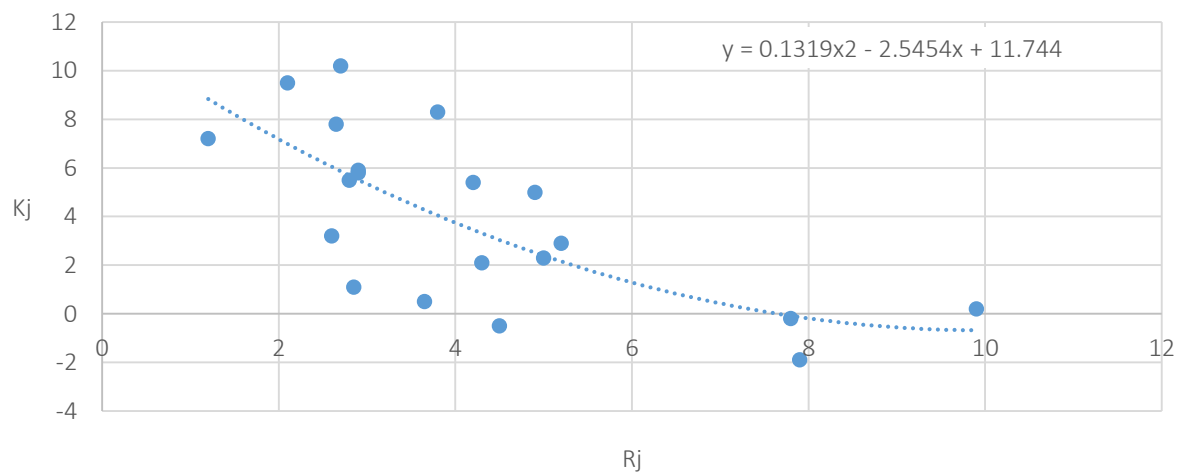
Figure 2. Impact of the COVID-19 pandemic on EU economic development depending on its intensity

of the development of the system that combines them. The larger the expansion potential of its individual parts, the greater the economic potential of the system as a whole, as reflected in GDP, and the more inert it is in its development. At the same time, it is less vulnerable and more resistant to shocks such as the COVID-19 pandemic.

The results proved that all two hypotheses were valid. Thus, indeed, the COVID-19 pandemic has had a negative impact on the economic development of the EU countries. This is not strange, as many studies so far have proved that different types of crises negatively impact economic growth in the territories in which they appear (Próchniak, 2011; Ahmad et al., 2016; Spash, 2021; Haller, 2012; Govdeli, 2022). It is also confirmed by those who indicate the importance of economic losses dur-

ing the COVID-19 crisis (Androniceanu, 2020; Avanesova et al., 2021) and the enormous scale of the effects of this crisis on economic development (Kheyfets & Chernova, 2020).

The second hypothesis was about the uniformity of effects on economic development. This seemed logical as different countries in the European Union base on different experiences with coping with the pandemic and have various healthcare systems (Asandului et al., 2014). Even outside of European Union, this dependency was noted, as countries without SARS experience in 2003 suffered much more than others (Bissoondoyal-Bheenick et al., 2021). Moreover, the ability to cope with a crisis depends on various factors, one of which is the financial market development level (Ahmad et al., 2016). Even though the countries within European

Union are guided by policies of convergence criteria (López-Bazo et al., 1999), they still vary significantly in their economic stability and ability to face a crisis (Hurduzeu & Lazar, 2015).

What about the impact of the COVID-19 pandemic on the scale of the EP? Did it depend on the intensity of this enlargement on the eve of the crisis? The results proved it is true. One idea why it looks so is that governments started to support SMEs through loan guarantee schemes, lower interest rates, profitable bank loans, and other forms of financing (Polishchuk et al., 2020). Moreover, the better state of EP in a particular country, the more it could have borrowed entrepreneurs (Caballero-Morales, 2021). In Croatia, it was not only borrowing but even introducing grants to female entrepreneurs (Srhoj et al., 2021). Additional financing for SMEs turned out to be the last chance for many; it helped businesses to operate in the long term and survive lockdowns (Le et al., 2020). Moreover, the states with higher economic development had better health systems (Ivinson, 2002), which helped shorten lockdowns and fight the pandemic quicker.

The COVID-19 pandemic challenged the EU member states on different levels of economic development. Not only were SMEs worse off, but the whole health system, educational infrastructure, and logistics faced uncertainty. As a result, governments used a policy focused on the survival of SMEs (Juergensen et al., 2020), which brought fruits in the short term. Nevertheless, to make economies grow, they shall be stimulated through networking, innovation, and internationalization.

Humanity has entered a new period characterized by shocks of various kinds. One of them is the fourth year of the ongoing COVID-19 pandemic. Its essential consequence is undesirable changes in economic development. Meanwhile, it is the main condition for the well-being of the country's population. There is no guarantee that after the end of this pandemic, humanity will not find themselves in a similar situation after some time, so it is important today to identify the causes on which the magnitude of the consequences depends. It is observed that they are not the same for different countries. The answer to why this is so can be given by comparing their economic condition before the pandemic with the magnitude of the consequences. This condition is reflected in the Gross Domestic Product per capita. It differed from the countries of the European Union in two aspects – first, its size; secondly, the intensity of changes. There is a known law of physics that mass is a measure of inertia. Therefore, it is logical to assume that a country that has accumulated a powerful economic potential on the eve of the pandemic and has used it for constant economic development acquires greater inertia in the economic sense. This was confirmed by the calculations made in the paper. Based on the correlation-regression analysis, it has been proven that the EU countries with the largest GDP and positive changes on the eve of the pandemic experienced the least economic consequences due to the COVID-19 pandemic. This discovery is significant for economically developing EU countries.

From the analysis of literature sources, it can be seen that the country's competitiveness has the greatest influence on GDP. Therefore, it is essential to develop scientific research related to its increase in the future. In addition, the Global Competitiveness Index of countries, which consists of 12 dimensions, is published annually by the World Economic Forum. Its analysis reveals the strengths and weaknesses of countries' competitiveness and, therefore, can help to form effective strategies to increase it.

CONCLUSIONS

The aim of this paper was to determine individual EU countries' losses caused by the COVID-19 pandemic and the circumstances they depended on. To achieve this, firstly, the economic development indicator of the countries was chosen and justified – the Gross Domestic Product per capita. Then, the answer to the set goal was sought by comparing the economic consequences of the pandemic with the state of economic development of the countries on its eve. It is reflected by two parameters – the size of the GDP and the intensity of its positive changes. According to the results of the correlation-regression

analysis, it was established that the EU countries with the largest GDP and positive changes in GDP experienced the smallest consequences of economic development.

The size of a country's GDP depends to a large extent on its competitiveness. Hence, in the future, to avoid declines in economic development due to shocks of a similar nature, it is first necessary to increase the country's competitiveness. This is the most direct way to increase GDP. Practical strategies for this purpose can be formulated on the basis of the country's Global Competitiveness Index published annually by the World Economic Forum. Its dimensions reveal the strengths and weaknesses of countries' economic development.

AUTHOR CONTRIBUTIONS

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