Pandemic as a New Factor in Sustainable Economic Development in 2020: Scientific Analytics and Management Prospects

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Abstract. Purpose: The purpose of the research is to test the hypothesis and scientific analytics of the pandemic COVID-19 as a new factor in the sustainable development of the economy in 2020, as well as to identify the prospects for managing this factor in the interests of maintaining sustainability.

Design/Methodology/Approach: Statistics on the manifestations of sustainable development, the pandemic of COVID-19 and its factors in the top 12 countries with the largest number of deaths were analyzed. The method of regression analysis, firstly, determines the dependence of the manifestations of sustainable development highlighted in chapter 2 of this book on the proportion of deaths in COVID-19 by constructing regression curves. Secondly, a multifactorial model of the regression dependence of the proportion of deaths at COVID-19 from the selected potential factors - health care costs, the number of doctors per 1 thousand people was compiled population, number of hospital beds per 1 thousand people population, and R&D expenditure.

Findings: It is justified that the pandemic is an independent (isolated from the economic crisis) as a new factor in the sustainable development of the economy in 2020, impeding economic growth. A scientific analysis conducted on the example of the top 12 countries with the largest number of deaths from COVID-19 revealed significant prospects for managing the pandemic as a factor in sustainable development.

Originality/Value: Recommendations have been proposed to achieve zero mortality from COVID-19, suggesting an increase in health care costs by 159.20%, the number of doctors by 1 thousand people of population by 59.70%, and R&D expenditures by 9.38% for sustainable economic development.

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**1 Introduction**

The beginning of the third decade of the twenty-first century was marked by new barriers to sustainable development. The global economic crisis caused by a sharp decline in business activity with a significant increase in government budget spending on social protection and business support measures is the most obvious barrier. The pandemic of a new coronavirus infection COVID-19 in most existing studies is considered inseparable from the crisis - as its source and catalyst.

This work hypothesizes that the pandemic is an independent, separate barrier to sustainable development from the economic crisis. Evidence of differences in exposure to infectious diseases in countries with different income levels provides a logical basis for the hypothesis. According to World Bank (2020), mortality from non-communicable diseases (cause of death, by non-communicable diseases, % of total) prevails in high-income countries and amounts to 88%. In middle-income countries (middle income), it is much lower (72%) and significantly lower (38%) in low-income countries (low income).

From the perspective of sustainable development, differences in mortality in pandemic conditions can have a pronounced impact on the balance of power in the world economic system, stability and balance of which is one of the characteristics of sustainability. In addition, COVID-19 mortality can be a significant factor in business activity as a manifestation of economic growth, the distribution of income in society as a manifestation of social justice, the adequacy of funds for financing environmental protection activities as a manifestation of sustainable development goals, as well as a source of additional risks that deter innovation.

The aim of the study is to test the hypothesis and scientific analytics of the pandemic COVID-19 as a new factor in the sustainable development of the economy in 2020, as well as to identify the prospects for managing this factor in the interests of maintaining sustainability.

**2 Materials and Method**

The study of the manifestations and factors of the sustainable development of modern economics is devoted to the works of scientists such as Andronova et al. (2019), Frolov et al. (2017), Goyal and Sergi (2015), Haabazoka (2019), Inshakov et al. (2019), Morozova et al. (2019), Petrenko et al. (2018), Popkova et al. (2014), Popkova et al. (2017), Popkova et al. (2016), Pozdnyakova et al. (2017), Ragulina et al. (2019a), Ragulina et al. (2019b), Sergi (2018), Sergi et al. (2019), Tripathi et al. (2020), Zavyalova et al. (2018), Zhang et al. (2018). The pandemic as a factor in the development of socio-economic systems has been addressed in publications by authors such as Leite et al. (2019), Sengupta and Wang (2014), White (2006), Woodward (2006), Orazov (2020), Perminov (2020), Cherevatenko (2020).
**Table 1.** Statistics on the manifestations of sustainable development, pandemic COVID-19 and its factors in the top 12 countries with the highest number of deaths

| Country     | Manifestations of sustainable development | Manifestations and factors of the pandemic COVID-19 |
|-------------|------------------------------------------|---------------------------------------------------|
|             | Global Competitiveness Index 4.0, points 1–100 | Economic growth rate, % | GDP per capita, US $ | Sustainable Development Index, points 1–100 | Number of confirmed cases of COVID-19 incidence, cases | Mortality rate for COVID-19 incidence, % | Health expenditure, % of GDP | The number of doctors per 1 thousand people population, people | Number of hospital beds per 1 thousand people population, pcs | R&D expenditure, % of GDP |
|             | y1                             | y2                        | y3 | y4 | x1 | x2 | x3 | z1 | z2 | z3 | z4 |
| USA        | 83.7                          | 2.121                     | 64212.535  | 74.5 | 100304 | 1694864  | 5.92 | 17.07342 | 2.6 | 2.9 | 2.79 |
| UK         | 81.2                          | 1.606                     | 38965.146  | 79.4 | 38161  | 271226  | 14.07 | 9.76235 | 2.8 | 2.8 | 1.66 |
| Italy      | 71.5                          | 0.800                     | 30941.744  | 75.8 | 33229  | 232248  | 14.31 | 8.93549 | 4.1 | 3.4 | 1.35 |
| Spain      | 75.3                          | 2.045                     | 28619.088  | 77.8 | 29039  | 238936  | 12.15 | 8.97039 | 4.1 | 3.0 | 1.20 |
| France     | 78.8                          | 1.749                     | 39121.158  | 81.5 | 28660  | 146657  | 19.54 | 11.53930 | n/a | 6.5 | 2.19 |
| Brazil     | 60.9                          | 1.954                     | 11110.946  | 70.6 | 26754  | 438238  | 6.10 | 11.77150 | 2.1 | 2.2 | 1.26 |
| Belgium    | 76.4                          | 1.477                     | 42798.478  | 78.9 | 9443   | 57800   | 16.34 | 10.03842 | 3.3 | 6.2 | 2.59 |
| Mexico     | 64.9                          | 2.710                     | 8692.176   | 68.5 | 9044  | 81400   | 11.11 | 5.46900  | 2.2 | 1.5 | 0.49 |
| Germany    | 81.8                          | 1.415                     | 43372.885  | 81.1 | 8489  | 181196  | 4.68 | 11.13917 | 4.2 | 8.3 | 3.02 |
| Iran       | 53.0                          | 4.454                     | 49272.273  | 70.5 | 7677  | 146668  | 5.23 | 8.10277  | 1.1 | 1.5 | 0.83 |
| Canada     | 79.6                          | 1.843                     | 45845.251  | 77.9 | 6918  | 88856   | 7.79 | 10.53465 | 2.6 | 2.7 | 1.55 |
| Netherlands| 82.4                          | 1.732                     | 47012.124  | 80.4 | 5931  | 46126   | 12.86 | 10.35932 | 3.5 | 4.7 | 1.99 |
| Average    | 74.13                         | 1.99                      | 33801.57   | 76.4 | 25304.08 | 302017.92 | 10.84 | 10.31    | 2.96 | 3.81 | 1.74 |

* n.a. – data is missing from the source.

Source: compiled and calculated by authors based on materials Institute of Scientific Communications (2020a), Institute of Scientific Communications (2020b), World Health Organization (2020).
Nevertheless, existing literary sources do not allow to form a systemic vision of the sustainable development of the economy in a pandemic, which requires further research into the problem posed. The incidence of infectious diseases is not manageable, at least in the medium term, because even vaccination does not prevent the incidence, but only smoothes its consequences. Therefore, this work focuses on COVID-19 mortality as a manifestation of their danger and the cause of pandemic declaration. The objects for study are the top 12 countries in the number of deaths from COVID-12 according to the World Health Organization as of May 30, 2020 (Data last updated: 2020/5/30, 6:30 pm CEST).

The regression analysis method determines, firstly, the dependence of the manifestations of sustainable development highlighted in chapter 2 of this book on the proportion of deaths in COVID-19 by constructing regression curves. Secondly, a multifactorial model of the regression dependence of the proportion of deaths at COVID-19 from the selected potential factors - health care costs, the number of doctors per 1 thousand people is compiled population, number of hospital beds per 1 thousand people population, and R&D expenditure (Table 1).

3 Results

To reflect the dependence of the manifestations of sustainable development on the proportion of fatalities in COVID-19, regression curves are constructed on the basis of the data from Table 1 (Fig. 1).
According to Fig. 1, the proportion of deaths in COVID-19 has a weak neutral effect on most manifestations of sustainable development. Its only negative manifestation is that with an increase in the proportion of deaths at COVID-19 by 1%, the economic growth rate decreases by 0.08%. This underscores the existence, albeit moderate, but sufficiently pronounced, negative impact of the pandemic on sustainable development and the need to manage it.

As a result of the analysis of data from Table 1, the following multifactorial model of the regression dependence of the proportion of deaths at COVID-19 from the selected potential factors was also obtained: \( x_3 = 15.66 - 0.58 * z_1 - 0.82 * z_2 + 0.98 * z_3 - 0.20 * z_4 \). The multiple correlation was 47.35%, indicating that the model was sufficiently important and could be used for further calculations in the ongoing study. Based on the obtained regression model, the simplex method determined the target values of factor variables to achieve zero COVID-19 mortality (Table 2).

### Table 2. Prospects for achieving zero COVID-19 mortality

| Indicator | Variable | Target value | Average in 2020 | Target increase over average, % |
|-----------|----------|--------------|-----------------|---------------------------------|
| Health expenditure, % of GDP | z1 | 26.72 | 10.31 | 159.20 |
| The number of doctors per 1 thousand people population, people | z2 | 4.34 | 2.72 | 59.70 |
| The number of hospital beds per 1 thousand people population, pcs | z3 | 3.81 | 3.81 | 0.00 |
| R&D expenditure, % of GDP | z4 | 1.91 | 1.74 | 9.38 |
| Morbidity mortality rate | x3 | 0.00 | 10.84 | -100.00 |

Source: calculated and compiled by authors.

Based on the data obtained in Table 2, COVID-19 mortality factors are arranged by significance in Fig. 2, which also reflects their averages in 2019, target values in 2020, and target increases to achieve zero mortality.

**Fig. 2.** Ranking of COVID-19 mortality factors by importance and their target increase to achieve zero mortality, % (Source: calculated and built by the authors.)
As it has been seen in Fig. 2, the key driver of COVID-19 mortality is health spending, which must be increased from 10.31% of GDP to 26.72% of GDP, that is, by 159.20%, to achieve zero mortality. The second most important factor is the number of doctors per 1 thousand people population, which in order to achieve zero mortality should be increased from 2.72 people up to 4.34 people, that is, 59.70%. The least significant factor was R&D expenditures, which in order to achieve zero COVID-19 mortality should be increased from 1.74% of GDP to 1.91% of GDP, that is, by 9.38%. The number of hospital beds does not affect COVID-19 mortality.

4 Conclusion

Therefore, the hypothesis put forward has been proved and it is justified that the pandemic is an independent (isolated from the economic crisis), and a new factor in the sustainable development of the economy in 2020, impeding economic growth. A scientific analysis conducted on the example of the top 12 countries with the largest number of deaths from COVID-19 revealed significant prospects for managing the pandemic as a factor in sustainable development. Recommendations have been proposed to achieve zero mortality from COVID-19, suggesting an increase in health care costs by 159.20%, the number of doctors by 1 thousand people population by 59.70% and R&D expenditures by 9.38% for sustainable economic development.

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