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Restrictive COVID-19 policies in the EU countries and Russia: An Institutional Approach[1]

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Abstract

Based on empirical quantitative data, the article provides a comparative analysis of the course of the first COVID-19 pandemic wave in the countries of the European Union and Russia in 2020, with a particular interest in the differences in policies implemented to counter infection as well as the specifics and stringency of government response measures. Special attention is paid to the countries' institutional characteristics (including the quality of healthcare, management, public trust in the government, and value orientations), which, according to the authors' hypothesis, determine the specifics of the measures taken and their effectiveness. Using the developed index of severity of the epidemiological situation and regression analysis, institutional characteristics that most influence the effectiveness of restrictive measures and the easiest passage of the pandemic wave were identified. It is also shown that, despite significant differences between Russia and the EU, restrictive policies in Russia during the first wave of COVID-19 were largely in line with those of EU countries and that patterns and models identified on the basis of EU data accounting for institutional characteristics can predict the severity of the epidemiological situation in Russia with sufficient quality.

[1] This research was performed by a team of researchers from the "Preservation of the World Cultural and Historical Heritage" – a program of the Interdisciplinary Scientific and Educational School of Moscow State University.
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Introduction

The COVID-19 pandemic that has engulfed the whole world has become a serious challenge – a stress test of the systemic functioning of the state. The pandemic has tested the state's ability to effectively mobilize resources for an adequate response to emergencies, to make optimal decisions in the context of limited time and a high degree of uncertainty, and to ensure the proper functioning of healthcare, economic, and social protection systems.

It is still impossible to give the exact date for the end of the pandemic, but the global community has already gained enough experience (both successful and unsuccessful) in combating the spread of COVID-19, its treatment, and managing the negative economic and social consequences of the pandemic. Looking to the future, it is now important to determine the mitigating factors and measures in order to be better prepared for potential future pandemics. It is particularly important to examine the initial phase of the pandemic – when the nature of the virus was not yet known, and there were no means of control other than restrictive measures. In this regard, comparative cross-country studies are an important tool to reach such conclusions.

In this study, for the purposes of statistical analysis, the authors analyze the experience of all 27 Member States of the European Union, the United Kingdom, and the Russian Federation. This choice was due to the fact that Russia has experienced rather severe consequences of the pandemic compared to other countries, although it implemented strict measures to combat its effects. Understanding the reasons for this discrepancy is essential to clarify the predictors of the effectiveness of COVID-19 measures. To do so, it is important to analyze the experiences of other countries.

The comparison with the EU countries and the UK results from: 1) the geographical proximity; 2) the similar timing of the outbreak of the pandemic (March-August 2020); 3) the fact that Russia introduced measures to combat the pandemic and protect businesses and the population, which are largely based on similar measures in the EU; 4) the assumption that the COVID-19 statistical data from the EU are more reliable than the data from other regions with which Russia could be compared; 5) the similarities between Russia and the EU including common social, economic, and political features that allow for the comparison of institutional characteristics.

The authors' hypothesis is that the stringency of COVID-19 measures and the severity of the pandemic are remarkably related to institutional characteristics. To predict severity, it is important to consider not only the restrictive measures but also the institutional conditions under which these measures are used and which largely determine their effectiveness. The authors expect that the inclusion of institutional characteristics in the severity model will significantly improve its predictive power. The authors also assume that despite the significant differences between Russia and the EU, patterns and models based on EU data that take institutional characteristics into account will have good predictive quality in Russia as well.

Thus, the aim of this study is to compare the passage of the first wave of the pandemic in Russia and EU countries in order to

– describe the relationships between the stringency of restrictive measures (1), the severity of the pandemic (2), and institutional characteristics (3).

– to develop a model describing the severity of the pandemic based on the stringency of restrictive measures and institutional characteristics;

– to determine how Russia fits into European trends.

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Literature Review

The severe consequences of the pandemic were not only due to the fact that the virus was new, and physicians lacked the resources to deal with it but also the fact that governments were not prepared for a pandemic. In this regard, global research on COVID-19 responses and their effectiveness since the spring of 2020 fills an important knowledge gap and reduces future risks when similar situations arise.

Initially, such studies lacked verified information, contributing to their delayed appearance. A more complete picture of the political reflection of the "first wave" of the COVID-19 pandemic did not emerge in Russia until late 2020 (Belik and Kolosov 2020; Abisheva et al. 2021; Timofeev 2020).

The titles of the published works show that relatively little attention has been paid to the problem of the interdependence between the severity of the epidemiological situation and the stringency of governmental measures.[5] A team of researchers from the universities in the United Kingdom (UK) and the United States (US), with the participation of scientists from the Higher School of Economics (HSE) in Russia, used data from the COVID-19 Public Health Protective Policy Index Project to study variables that correlate with the overall stringency of public health measures in federal policies and the contribution of federal and subnational institutions to COVID-19 policies (Shvetsova et al. 2021). The issue of stringency of anti-COVID-19 measures was also discussed in political science journals in Canada (Paquet and Schertzer 2020). In the special issue of the Canadian Journal of Political Science, articles examined the stringency of anti-COVID-19 measures provided by policy-making institutions, including "protective public health response," "patterns of policy aggressiveness," and "statutory-regulatory regimes" (Rayment and Vanden Beukel 2020). In particular, the indicator of municipal policy "aggressiveness" in countering COVID-19, the relationship between municipal policy measures and potentially relevant features of the local context in Canada—type of province, population size, cases of COVID-19, and local ideology—was analyzed (Armstrong and Lucas 2020).

Geographically, there is a mismatch: first-wave pandemic policies in Russia and Eastern Europe (including only the countries that are Member States of the EU) have been "overshadowed" by the study of the EU (Balog-Way et al. 2021), the UK, and the US (Balog-Way and McComas 2020). For example, Eastern European countries were rarely included in the global samples based on the study of perceptions of pandemic risks (Dryhurst et al. 2020). The risks of a pandemic in the first half of 2020 and the readiness of the healthcare system in the US and the UK (where the level of risk perception of COVID-19 was particularly high) were studied most intensively. The lack of attention to Eastern Europe is especially noticeable compared to many articles studying the onset of the pandemic in China (Xuefei Ren 2020); in Russia, researchers also conducted a lot of analysis on China and India during the first wave of the COVID-19 pandemic (Emelyanova, Kapitsyn, and Karateev 2022).

A large-scale study by Capano et al. (2020) did not mention Russia and Eastern European countries. Nevertheless, the subject matter and methods of the study are noteworthy for the purposes of this article. Capano et al. compare the effects of different country conditions on responses to the COVID-19 pandemic. The pandemic is considered as a "natural experiment" in which governments, faced with roughly the same challenges, take a variety of protective and restrictive measures, which is interesting for comparing policy instruments and the factors that led to their choice. In their study, Capano et al. have created models to help develop responses to the pandemic (2020).

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[5] One of the few studies was conducted at Lomonosov Moscow State University in 2021-2022. Another notable exception is the work of political scientist Norbert Kersting (Kersting 2021; Kersting and Graubner 2020).

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In Russia, the first wave of the pandemic was studied extensively (Chubarova and Sharova 2020). Although the correlation between the severity of the situation, the stringency of measures, and the effectiveness of institutions was not specifically considered, nevertheless, it was still possible to identify the influence of spatial parameters. Russian regional experts used models to describe the spatial diffusion of COVID-19 in regions across Russia and explained the relationship between the spread of the virus and the economic specialization of the regions, their population density, urbanization, per capita income, demographic features, and the level of excess mortality. The "network – places – scaling of infection" model is justified, which explains the mechanisms of COVID-19 spread and the development of counteraction measures. A pandemic is considered a multidimensional interaction in space and time of complex biological, social, and organizational systems that includes the spread of the disease, restructuring of institutions, restrictive measures, and the dissemination of information. The Russian experience was compared with regional data from Poland, Italy, Iceland, Britain, Germany, Sweden, and Denmark.

Polish authors Krzysztofik, Kantor-Pietraga, and Spórna (2020) considered spatial and functional features of the fight against the virus in different regions of the country, as well as multidimensional conditions for the spread of the virus in its trans-industrial regions (2021). Other authors apply a spatial approach to solving the problem of optimal distribution of human resources in the first wave of the pandemic (Jarynowski, Wójta-Kempa, and Krzowski 2021).

Severity of the situation in the first COVID-19 pandemic wave

Italy was the first country in Europe to suffer from COVID-19. The delay in implementing strict measures, in no small part, explains the exponential growth in the number of infected in Italy, where there was a serious overload of emergency rooms. In just three weeks (February 21–March 11, 2020), the virus infected 12,462 people, of which 827 died.

After Italy, the virus quickly spread to Germany and the UK, then to Scandinavia and Eastern Europe. In Germany, the first case of infection was registered in Bavaria on January 27, 2020 (Schilling et al. 2021). As soon as someone tested positive for COVID-19, they were instructed to enter mandatory isolation, which prevented the further spread of the virus. Delayed reporting and an increase in the number of asymptomatically infected people distorted statistics on COVID-19.

The main indicators that most accurately expressed the severity of the situation were mortality rates, the number of hospitalizations and severe cases of the disease, and the number of occupied intensive care beds. Based on the analysis of a set of these variables, in April 2020, experts from the Deep Knowledge Group in London identified Germany as the country most successfully countering the spread of COVID-19 in Europe. Germany was second after Israel in the world ranking of the security of states in the face of the pandemic. Russia, the UK, Italy, and Spain were not included in the top 40 places on this list. On the contrary, these nations were in the top 20 countries most exposed to "coronavirus risks."[6]

Moscow, being a densely populated metropolis and the largest transportation, financial, and industrial hub of Russia, initially became a hotbed for the spread of COVID-19 and occupied a leading position in terms of the total number of cases and deaths. In Russia, the first cases were identified at the end of January 2020,

[6] EU Reporter. "#Deep Knowledge Group Ranks #Israel 1st in the #COVID-19 Health Safety Countries Ranking." 2020. *EU Reporter*. April 3, 2020. Accessed January 22, 2023. https://www.eureporter.co/frontpage/2020/04/03/deepknowledgegroup-ranks-israel-1st-in-the-covid-19-health-safety-countries-ranking/.

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and the peak number of active patients during the first period of the pandemic occurred in May 2020. At the same time, it is necessary to point out the distinctions in the spread of COVID-19 in different regions. This is especially true for some geographically remote regions of Russia and regions with a significant shift in labour migration, for example, the regions of Murmansk and Magadan, the Komi Republic, and the Yamalo-Nenets Autonomous Okrug (Chubarova and Sharova 2020).

Using spatial analysis of the situation in Russian regions, Zemtsov and Baburin explained the relatively high morbidity rate in Moscow, the Moscow Region, St. Petersburg, and the Nizhny Novgorod Region by the high mobility of people and commerce in these regions. The spatial models used by these authors made it possible to consider the Russian dynamics of morbidity and mortality in 2020 in the context of the global dynamics of morbidity and mortality. The study demonstrated the importance of restrictive measures. However, the effectiveness of the anti-COVID-19 policies varied by region and depended on many local economic, geographical, social, and legal factors such as population density (especially in agglomerations), mobility of the population (tourists, entrepreneurs, migrants), law enforcement practices, the level of poverty, the socio-demographic structure of the population (including the proportion of elderly people and their short-term movements, location of bus stations, organization of testing and hospitalization, and the dissemination of information – advertising, propaganda) (Zemtsov and Baburin 2020).

A comparison of mortality rates in Russia and the EU countries demonstrates that during the first COVID-19 wave, indicators of total mortality in Russia (13 deaths per 100 000 population) were at the level of Germany (12) and Denmark (11.5), were significantly lower than in Belgium (86), Spain (63), Italy (59), Sweden (58), and France (48) but higher than in Austria (8), Hungary, Slovenia (7), and Poland (6) (Chubarova and Sharova 2020).

At the beginning of the COVID-19 pandemic, the danger of the virus was underestimated. Due to the underestimation of the situation, the protective and restrictive measures taken did not play a very important role, and the role of institutional characteristics (general quality of health care, sanitation level, urbanization, etc.) increased, which emphasizes the importance of studying these characteristics.

Stringency of restrictive measures

As is often the case with an unknown phenomenon, the first cases of COVID-19 in Western and Eastern Europe did not cause an adequate political reaction, although they did not go unnoticed. Countries lacked the proper experience in dealing with this virus to take sufficient precautions. All countries needed some period of time to understand the nature of the virus, the symptoms that it produced, and its level of contagiousness. Without this data, any epidemiological response and preventative measures were rather "blind." However, most EU Member States and Russia had some kind of a "grace period" compared to the previously affected East Asian countries.

European countries could use data from China, where the first confirmed COVID-19 cases were recorded in December 2019. In February 2020, the World Health Organization (WHO) – China Joint Mission on Coronavirus Disease 2019 (COVID-19) working there on behalf of the WHO received valuable information from Chinese doctors.[7] On January 27, 2020, before the pandemic was declared, the WHO had already

[7] WHO. *Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19)*. 16-24 February 2020. Accessed February 28, 2022. https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf .

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warned that even though researchers had not fully decoded the coronavirus genome, it was nevertheless necessary to adjust the global risk level to "high," noting that some infected people become contagious before they feel unwell (Berres 2020). On January 30th, 2020, the WHO declared a global health emergency.

Italy was the first country in Europe to introduce restrictions on leaving home, and closing schools and offices. On February 22, 2020, the Italian government issued the first decree introducing lockdowns in 11 cities in Northern Italy. On March 2, 2020, the third decree on restrictions was issued, which identified three zones: "red" (closed), "yellow" (medium-risk), and "green" (low-risk). On March 10, 2020, the decree on the nationwide lockdown came into force.

However, there was contradictory information, and the response measures were not always justified. The Italian Minister of Health stated that the virus can be transmitted only by direct contact with a sick person. The Minister of Economy and the Minister of Infrastructure and Transport announced efforts to contain the economic damage, but with only 0.01% of the area locked down, it was not advisable to suspend flights to other regions (Ruiu 2020). Although the virus spread in several regions, some schools reopened, and some bars and shops organized public events, including advertising events to attract visitors.

Germany and most European countries initially took a cautious approach to the adoption of restrictions but moved to tougher measures shortly after; the Swedish government chose a more restrained approach, relying on recommendations and voluntariness as opposed to restrictions. In May 2020, there was a noticeable easing of restrictions in Germany, with almost all European countries starting to lift some restrictions in June 2020.

During and after the lockdown, the number of COVID-19 cases decreased; several comparative studies in European countries have shown the significant impact of strict mobility and contact restrictions on reducing COVID-19 incidence (Bobyleva, Anshin, and Ptitsyn 2020; Osipov, Safonov, and Kuzmina 2020; Blümel and Busse 2020; Eckner 2020). In Germany, strong contact restrictions imposed on March 9, 16, and 23, 2020 led to an overall decrease in the number of infections. This, of course, does not mean that non-pharmaceutical measures solve everything. However, while there were ongoing difficulties with testing and the procurement of personal protective equipment (PPE) and medical supplies, as well as no vaccines available, non-pharmaceutical measures were crucial.

The significance of restrictive measures became evident in the example of the Eastern European countries during the second half of 2020. Compared to the EU's "core" countries (Germany, France, Belgium, Netherlands), countries in Eastern Europe had a relatively low incidence rate during the winter and spring of 2020 but then experienced a sharp breakdown (from August through to the end of 2020). There was a sharp short-term increase in the mortality rate in the Czech Republic. The main reason was the abrupt transition from severe restrictions (when there were few cases of COVID-19 and very low mortality) to the liberalization of control over the mobility of the population (Greer et al. 2021, 413).

There were numerous discussions about the adequacy of restrictive measures. Scientists from the University of Oxford have developed indicators that are convenient for comparing the policies of different countries – the Government Response Index, the Stringency Index and other indices, which included the type and volume of school closures, travel restrictions, corporate financial assistance, and investment in vaccine development.[8]

[8] Mathieu et al. "COVID-19: Stringency Index." *Our World in Data*. Accessed February 28, 2022. https://ourworldindata.org/covid-stringency-index.

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There were difficulties with assessing the activities of the EU governing bodies to combat the pandemic because during the first stage of the pandemic, there were disputes about the contribution of the European Commission to the distribution of materials (medicines, masks, etc.), and the fight against the spread of COVID-19 (especially restrictive measures) focused mainly on the level of national states. Therefore, the authors did not make a comparison with the level of the EU's general anti-COVID-19 policies.

As for Russia, by the end of January 2020, it promptly closed its borders with China and Chinese citizens were banned from entering the country. In March 2020, in a short period of time, the following measures were introduced: quarantine for people who tested positive for COVID-19 and mandatory isolation for individuals who had contact with those who were exposed to the virus. In order to enforce these measures, a home quarantine monitoring system named "Social Monitoring" (a smart phone application that sends requests for location confirmation and monitoring using GPS/GLONAS) was introduced.

In Russian regions, governors and mayors took restrictive measures at the local level. In February-March 2020, people with symptoms of upper respiratory tract infection who travelled to China (Italy was later added to the list) were quarantined in hospitals, remaining there until they received two negative test results. As COVID-19 spread across Europe, the Russian Government closed all international borders on April 4, 2020, and only began allowing some international flights from the beginning of August 2020 (Greer et al. 2021, 414).

Institutional characteristics

One of the approaches to understanding why countries applied certain restrictive policies and why the measures taken gave certain results is to consider the institutional characteristics of countries. This approach assumes that governments apply measures taking into account the available "institutional capacity." On the other hand, "institutional capacity" determines (to some extent) how effective the measures are. According to this conceptual model, it would be logical to assume that even the most successful management decisions made in conditions of unsatisfactory institutional performance are doomed to low efficiency. Of particular importance here is the identification of characteristics that are most associated with the success of the measures. This approach can also help to assess the readiness of countries for possible future epidemiological challenges. The difficulty in this area of research is the selection process of institutional characteristics to consider, taking into account their great diversity and quantity.

Interest in studying the relationship of institutional characteristics to COVID-19 policies has already been outlined in a number of publications. The authors of a study conducted at the University of Michigan analyzed the issues arising from the pandemic, focusing on the countries of Eastern Europe that have common institutional features (Hungary, Czech Republic, Bulgaria) (Greer et al. 2021, 413-4). This study demonstrated the breadth of institutional characteristics that influence the severity of the pandemic. Hungary, Czech Republic, and Bulgaria have lower indicators of public administration efficiency and regulatory quality, including a lower level of investment in this area compared to developed EU countries (for example, Germany and France). According to the Global Health Index, Hungary, the Czech Republic, and Bulgaria ranked 35th, 42nd and 61st, respectively,[9] which determined their lower level of preparedness in dealing with the pandemic (Greer et al. 2021). However, the high level of investment and modernization of technological equipment in the UK and Sweden did not help with their preparedness for the pandemic.

[9] World Bank. "Worldwide Governance Indicators." Accessed February 28, 2022. https://info.worldbank.org/governance/wgi/Home/Reports.

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With comparable populations, there are institutional differences between Hungary, Bulgaria, and the Czech Republic. While Hungary and Bulgaria are more comparable, the Czech Republic's institutions are functioning more efficiently, even though the level of democratic consolidation has declined in all three countries since 2010 (Engler et al. 2021). In terms of social policy, the Czech Republic and Hungary combine elements of the Bismarckian welfare state with neoliberal policies. The responsible attitude and competence of the three governments may be called into question when they (especially the Czech Republic and Bulgaria) quickly eased restrictive measures in April–May 2020, which contributed to a rapid increase in the incidence of COVID–19 in July–August 2020; in September–October 2020, the peak incidence was reached. In less neoliberal and more authoritarian Hungary, authorities kept some restrictive measures throughout the summer so that only at the end of August 2020 there was an increase in the incidence of diseases. The testing and tracking systems in all three countries were overloaded, which means that the time provided by the successful actions in March 2020 was not used productively and this likely correlated with the low efficiency of administration in these countries. A critical role was played by the preservation of basic sanitary and epidemiological services as well as the work of infectious disease specialists in primary healthcare (Sheiman, Shishkin, and Shevksy 2018), which helped to contain the spread of COVID-19.

Sample Description

Since the aim of this study was to assess the extent to which the first wave of the pandemic in Russia resembled that of the one in EU countries and what explains the differences between the cases, data from 27 EU countries, the UK, and Russia were used for the study. Data for the UK were included in the study even though the country was no longer formally a member of the EU at the time of the first wave of coronavirus (UK membership was terminated on January 31, 2020).

Methodology

To describe the severity of the epidemiological situation in a particular country, a previously developed Severity Index[10] was used and calculated according to the following formula:

$$X_i = \frac{X1_i^{(ls)} + X2_i^{(ls)} + X3_i^{(ls)} + X4_i^{(ls)}}{4},$$

where $X1_i^{(ls)}$ is the linearly scaled peak number of cases detected per 100 000 population, based on the 7-day moving average, for the i-th country; $X2_i^{(ls)}$ – linearly scaled number of days from the onset of the pandemic in the country to the peak for the i-th country; $X3_i^{(ls)}$ – linearly scaled number of days from the peak to the time when the peak value decreases by 40% for the i-th country; $X4_i^{(ls)}$ – linearly scaled peak number of deaths caused by COVID-19, based on the 7-day moving average for the i-th country, calculated per 100 000 population.

Qualitative interpretation of all components of the index: the higher they are, the more severe the epidemiological situation was.

[10] A detailed description of the process for calculating the index and the results obtained by country are provided in another article by the authors (Demchuk et al. 2021).

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The Severity Index allows for a comparison of the course of a pandemic wave in various countries with diverse populations and at different time intervals. Moreover, its application to the situation in Europe (where all countries experienced the first wave at about the same time) seems justified. The Severity Index is a convenient generalizing characteristic of the situation in the country.

To describe the severity of protective and restrictive measures imposed by the government, the Stringency Index was selected,[11] which was developed by researchers from Oxford University as part of the "COVID-19 Government Response Tracker" project.[12] This index considers nine indicators or events (see Appendix A for details).

The Stringency Index has been calculated by the authors of the project since January 2020 and covers more than 180 countries, considering the stringency of the measures for all nine indicators. In this study, the authors used the averaged data from the Stringency Index for the period starting from the onset of the pandemic in a country to its peak (i.e., the period described by the parameter $X2$ of the Severity Index). The authors of this article refer to this averaged characteristic as SI. Thus, SI describes the average severity of the measures that allowed to curb the upward trend in the daily number of cases in a given country.

Seven groups of indicators were used to describe the institutional characteristics of the countries, including demographic, economic, health, cultural, and other parameters (see Appendix B for more details). Data relevant to the study at the time of the onset of the first wave of the pandemic in Europe were used.

Further data analysis was performed by pair correlation analysis of stringency, severity, and institutional characteristics to estimate the relationship between them. In some cases, the study of the correlation between individual components of the Severity Index on the one hand and institutional characteristics on the other was used to determine the features of the influence of institutional characteristics.

To estimate the effects of institutional characteristics on the severity of the first COVID-19 wave, the Principal Component Regression (PCR) technique was used. For this purpose, the data were centred and scaled so that the obtained parameters of the multivariate linear regression equation could be compared with each other.

To assess the extent to which Russia fits in or diverges from the EU trends, the authors included a dummy variable in the PCR model and also compared the correlation coefficients between severity and institutional characteristics and between stringency and institutional characteristics for two samples: with and without Russia.

Data Analysis

Relationship between the severity of the epidemiological situation and the stringency of the measures

In the first phase, the relationship between the severity of the situation (X variable) and the stringency of the measures (SI variable) was analyzed. The correlation analysis showed a negative Pearson linear

[11] OxCGRT. "Methodology for Calculating Indices." Accessed March 1, 2022. https://github.com/OxCGRT/covid-policy-tracker/blob/master/documentation/index_methodology.md.

[12] University of Oxford. COVID-19 Government Response Tracker. Accessed April 12, 2022. https://www.bsg.ox.ac.uk/research/research-projects/covid-19-government-response-tracker.

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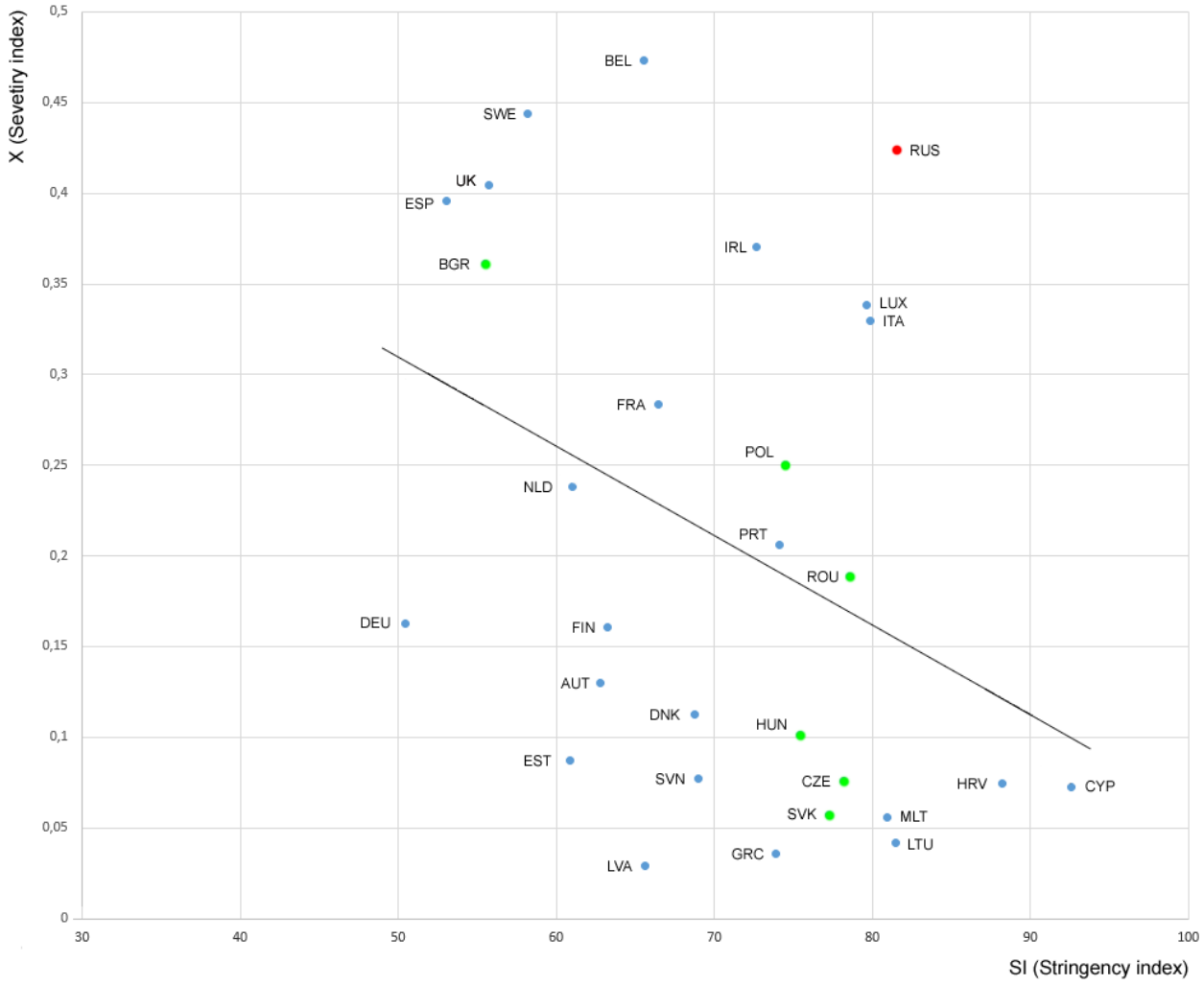
correlation coefficient of –0.37 (95% confidence level), which can be interpreted as a moderate negative relationship (Figure 1). In other words, more stringent measures correspond to a lower severity of the situation. This result is logical and consistent with the goals of the measures introduced – to protect the population from COVID-19, stricter measures should be more protective.

Figure 1. Relationship between the severity of the epidemiological situation and the stringency of the measures.



Source: Authors' calculations

High variability of severity and stringency indicators

At the same time, a wide range can be seen with respect to the regression line. This means that two countries with the same stringency of measures can have very different severity, and conversely, countries with similar severity can have very different stringency. In Belgium and Latvia, the stringency of the measures was approximately the same (they are roughly on the same vertical line) but the severity of the situation was significantly different. Cyprus and Slovenia had similar severity levels but very different stringency levels.

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The reasons for this range may be:

– the influence of additional factors (especially those related to the institutional characteristics of the countries)

– inaccuracies in national statistics

– in some cases, the measures were not introduced as a preventive measure but as a response to the current unfavourable epidemic situation in the country. Thus, the explanatory model becomes more complex: on the one hand, as has been shown, the measures taken reduce the severity, but on the other hand, the severity of the situation encourages more stringent measures. If in the first case there is a negative correlation, in the second case there is a positive correlation. The superposition of these two trends leads to a rather large spread of points in the scatterplot.

It should be noted that the correlation coefficient obtained is much closer to –1 than the coefficient obtained in the previous sample studies conducted by the authors for countries around the world. This may suggest that the EU's restrictive policies were, on the whole, more well-thought-out and timely than the global average.

The position of the Eastern European countries is quite compact: with very similar stringency scores (between 70 and 80), they have a relatively low dispersion in severity. The exception is Bulgaria, where high severity was observed under weaker restrictions. Nevertheless, despite its particular position on the scatterplot, Bulgaria fits the "stronger restrictions – lower severity" trend. Overall, the Eastern European countries of the EU show a very strong correlation between stringency and severity, which is -0.82. This indicates the closeness of institutional characteristics, approximately similar conditions, and a similar impact of restrictive measures on severity.

Russia is not in the best position in the European comparison. It is far from the trend line: relatively strict measures are associated with rather high severity. However, this is not to say that the situation in Russia is very different from that of the EU countries; it is similar to that of Italy, Luxembourg, and Ireland.

Best policies

Analyzing the position of countries in the two-dimensional space of the stringency of measures and epidemic severity (Figure 1), the authors can identify the zone at the bottom left, which corresponds to the easy passage of the pandemic wave and, at the same time, relatively lax measures. The countries with the best policies—combining the possibility of the low severity of the epidemiological situation and low stringency of measures—are Germany, Estonia, and Latvia. Adjacent to these countries are Austria, Denmark, Finland, Slovenia, and Greece. The COVID-19 policies of these countries can be seen as an example of how to best learn from this experience.

The role of institutional characteristics

To examine how the severity of the epidemiological situation in a country and the stringency of the measures taken are related to its institutional characteristics (as well as to understand which characteristics are responsible for a country falling the lower left part of the scatterplot), a pair linear correlation analysis was performed. The Pearson coefficients are shown in Table 1.

In order to assess the combined impact and individual effect sizes of the institutional characteristics, the authors conducted a multivariate regression analysis. The objective was to obtain a linear regression model

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for pandemic severity (dependent variable *X*) using institutional characteristics (C_1, C_2, …) and the stringency of restrictive measures (*SI*) as independent variables. In addition, a dummy variable *D* (*D*=0 for EU countries and *D*=1 for Russia) was included in the model to estimate the difference between Russia and the EU:

$$X = a_1 C_1 + a_2 C_2 + \ldots + b\,SI + f\,D + a\,,$$

where a, a_1, a_2, …, b, f are model parameters estimated from the data. The linear form of the model can be debated, but the authors chose it for its simplicity and its ability to provide an easy comparison of the contribution of institutional characteristics to epidemic severity reduction. In future research, it is reasonable to use other types of models, including nonlinear models.

Since some of the institutional characteristics (e.g. Population Density, Safe Sanitation, Employment rate, Government Trust Index, Media Trust Index, and Broadband Subscriptions) have a weak correlation with the Severity Index (see Table 1), they are excluded from the set of independent variables. Survival/Self-Expression Values and Traditional/Secular Values were not used as predictors in the regression model due to incomplete data.

As some independent variables demonstrated a strong correlation among themselves, the Principal Component Regression (PCR) technique was used to avoid multicollinearity and, thus, wide confidence intervals for the model parameters. The data were centred and scaled to allow comparison of the regression model parameters. The first two PCs have a cumulative proportion of explained variance equal to 73.4 % and therefore used to build a regression model:

$$X = d_1 PC_1 + d_2 PC_2 + d$$

The calculated parameters (d_1, d_2) both have p-values of less than 0.05. The resulting coefficients for institutional characteristics (a_1, a_2,…,a_n) are shown in Table 1. The coefficient b for *SI* is –0.180, the coefficient f of the dummy variable D is 0.017, and the constant d is equal to –0.009. The amount of variance explained by the model (R-squared) is 0.33. Thus, the authors see that the inclusion of institutional characteristics in the severity prediction model increases the amount of variance explained from 0.13 (Figure 1) to 0.33.

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Table 1. Relationship between severity and institutional characteristics and between the Stringency Index and institutional characteristics

	Indicator	Correlation coefficient between indicator and Severity index (*X* variable)	Regression parameter for Severity model (slope)	Correlation coefficient between indicator and Stringency of protective and restrictive measures (*SI* variable)
1	Area	0.45	0.207	–0.45
2	Population	0.40	0.228	–0.42
3	Population density	–0.05	–	0.13
4	Urban population	0.42	0.093	–0.34
5	Health Expenditures	0.50	0.091	–0.41
6	Life expectancy at birth	0.40	0.009	–0.17
7	Safe Sanitation	0.13	–	–0.27
8	GDP per capita, PPP	0.40	0.001	–0.05
9	Employment rate	0.00	–	–0.14
10	Government Trust Index	0.03	–	–0.15
11	Media trust index	0.03	–	–0.12
12	Survival / Self-Expression Values	0.37	–	–0.56
13	Traditional / Secular Values	–0.15	–	–0.40
14	Fragile States Index	–0.28	–0.003	0.36
15	Democracy Index	0.35	–0.024	–0.46
16	Government Effectiveness	0.21	0.038	–0.42
17	Regulatory Quality	0.26	0.005	–0.45
18	ICT Development Index (IDI)	0.31	0.093	–0.45
19	Broadband subscriptions	0.12	–	–0.31

Source: Authors' calculations

Discussion

The importance of the "scale" factor and health expenditures

When analyzing the scatterplot (Figure 1), it is noticeable that, in addition to Russia, such large and populous EU countries as Spain, Sweden, France, Italy, the UK, and Poland are above the trend line. The position above the trend line means that with such stringent restrictions, one could expect a much better situation in severity and that the actual observed severity is higher than expected. The only large EU country that falls

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below the trend line is Germany. It is also noteworthy that only a few countries with a small territory and population are above the trend line.

The relationship between severity and land area and the relationship between severity and population size is confirmed by the data in Table 1. The correlation coefficient between severity and area is 0.45 (the second highest coefficient in the column), and the regression parameter is 0.207 (one of the highest). The coefficient between severity and population size is 0.40, and the regression parameter is 0.228. In other words, the larger the area and the larger the population, the more severe the pandemic wave. Thus, the "scale" of the country turns out to be one of the main factors leading to severe consequences of the pandemic. Smaller countries seem to be more manageable, and therefore, the restrictions introduced are more appropriate and achieve a greater impact. In particular, the inconvenience of managing large and/or populous areas led to a system in which restrictions were regulated at the regional level rather than the national level (this practice was also adopted by Russia).

It is important to note that there is a positive correlation between health expenditures and severity. This means that countries with higher expenditures experienced a more severe pandemic. While logically it was expected that high expenditures would mean a good healthcare system in which the pandemic wave should pass more easily, it is also worth noting that there is a positive relationship between pandemic severity and other institutional characteristics of the same group: life expectancy and sanitary conditions of the population. These results can be explained by several reasons:

First, high healthcare expenditures are not the same as high healthcare efficiency (as seen, for example, in the US during the summer of 2020).

Second, good healthcare financing usually means relatively affordable healthcare, better diagnostics, sufficient medicine and test materials, and adequate procedures for collecting and processing health statistics. As a result, countries with higher health expenditures are likely to have higher detection rates of individuals infected with COVID-19. This suggests that morbidity and mortality statistics from COVID-19 are likely to be underestimated in countries with low health expenditures.

Third, higher life expectancy indicates not only good quality healthcare but also people's attitudes towards their health. People who are concerned about their health often seek the help of doctors and have more frequent checkups. This also leads to more frequent detection of the virus.

At the same time, it can be noted that there is a negative relationship between the stringency of the measures and indicators 5, 6, and 7 (Health Expenditures, Life Expectancy at Birth, and Safe Sanitation). This is apparently due to the fact that governments are largely guided by the state of the healthcare system, sanitary conditions, and public health when making decisions about the introduction of certain COVID-19 measures. The higher these indicators are, the more the authorities assume that the healthcare system, sanitary conditions, and public health offer reliable protection for the population from the pandemic and, as a result, introduce weaker measures. In other words, effective healthcare, good sanitary conditions, and the health of the nation should compensate for lax protection and restriction measures.

For a deeper understanding of the relationship between "scale" and severity, as well as the relationship between health expenditures and severity, one can turn to an analysis of how these institutional characteristics relate to the components of the Severity Index. The results of this analysis, presented in Table 2, lead to the following conclusions:

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– The components $X1$ (peak number of detected cases) and $X4$ (peak number of deaths) have a stronger correlation with the health expenditures than with the "scale" indicators. It can be concluded that the proportion of registered infected and deceased people depends on the quality of healthcare.

– The "scale" indicators, in turn, are more strongly related to the components $X2$ (days from the beginning to peak of the pandemic) and $X3$ (days from peak to 40% decrease) than health expenditures. $X2$ and $X3$ describe time parameters and the duration of the wave. Therefore, it looks quite logical: it is the size of the population and territory that determines how long the pandemic lasts and how long the wave recedes.

Based on these results, the authors can show that the positive relationships between severity and indicators 1, 2, and 5 (Area, Population, and Health Expenditures) are not random and confirm the assumption that the positive relationship between health expenditures and severity is due to higher quality of diagnosis and better medical statistics.

Table 2. Correlation coefficients between selected institutional characteristics and Severity Index components

Indicator	Severity index (*X)*	Peak number of detected cases ($X1$)	Number of days from the beginning of the pandemic in the country to the peak ($X2$)	Number of days from the peak until the peak value decreases by 40 % ($X3$)	Peak number of deaths ($X4$)
1. Area	0.45	0.12	0.35	0.41	0.36
2. Population	0.40	0.12	0.17	0.33	0.44
5. Health Expenditures	0.50	0.66	0.02	–0.14	0.52

Source: Authors' calculations

The situation in Russia is almost completely consistent with these conclusions: health expenditures in Russia are relatively low compared to EU countries. They correlate with a low $X4$ value (0.12), while the EU average is 0.58. High values of Area and Population indicators for Russia are accompanied by high values of $X2$ (56 days) and $X3$ (58 days) instead of 34 and 14 days, respectively, in Europe.

Interestingly, Area, and Population have a striking negative correlation with stringency. It can be seen that the larger the area and population, the weaker the restrictions. This can likely be explained by the fact that the more stringent the measures are, the more difficult it is to control their implementation in a large area and/or with a large population. Small states with a small population are considered better suited to introduce stringent measures and effectively monitor their implementation. Thus, the "scale" of the country proves to be a crucial factor in protecting the population and reducing the severity of the pandemic. At the same time, it is important to emphasize that the "scale" factor affects the components ($X2$ and $X3$), which are almost unaffected by health expenditures. This means that an increase in health expenditures is unlikely to

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compensate for the "scale effect." This may explain, in particular, the difficult course of the pandemic in the US in spite of the very high health expenditures.

The role of urbanization

Another factor that has a noticeable impact on both severity and stringency is urbanization. At the same time, a weak correlation between severity, stringency, and population density should be noted. It could be supposed that the urbanization indicator reflects close physical contact of the population rather than population density. Additionally, the urban population feels the consequences of the introduction of restrictive measures and the breakdown of the usual way of life to a greater extent than the rural population,[13] which, among other things, affects the psychological state of the population and is expressed through the opposition to restrictions.

At the same time, the difference in the signs of the correlation coefficients between urbanization and severity and between urbanization and stringency is remarkable. A positive relationship between urbanization and severity seems logical, while a negative relationship between urbanization and stringency could indicate that governments underestimate the urbanization factor when introducing protection and restriction measures. Two factors could account for this underestimation. First, during the initial wave of the pandemic, epidemiologists did not yet fully identify the modes of transmission of COVID-19. Second, when the measures were introduced, it was assumed that the urban population could count on better healthcare and better sanitation and was thus better protected from the pandemic.

Wealth vs. system effectiveness

Gross domestic product (GDP) based on purchasing power parity (PPP) per capita shows a surprisingly small effect on severity, according to the obtained regression model. Most likely, a similar result is a consequence of the imposition of three effects:

– EU countries, like Russia, have a fairly good level of GDP PPP per capita (although with Russia, a high level of income inequality should be mentioned). This parameter is more than two times higher than the world average in all countries in the sample. Thus, GDP PPP per capita can be considered consistently high in all the countries studied, which has no critical impact on the situation of the population or the state of infrastructure or on other factors that, in turn, may influence the severity of the pandemic.

– Well-being can positively influence the severity (this relationship can be interpreted similarly to the interpretation of the positive relationship between severity and health expenditures).

– At the same time, a high GDP PPP per capita should reduce severity because the population presumably has better healthcare and more opportunities to receive proper medical help.

In general, it must be noted that at the time of the pandemic outbreak, it was not the available resources (which can be indirectly assessed by GDP PPP per capita) that were critical for reducing its consequences but the ability to use these resources effectively. It is, therefore, no coincidence that Government Effectiveness and the Democracy Index (often interpreted as an indicator of institutional quality) carry more weight in the authors' model.

The relationship between system effectiveness indicators and severity should take into account the noticeable negative relationship between system effectiveness and the Stringency Index. The data obtained

[13] GfK. "Issledovanie GfK: Effekt COVID-19 [GfK Study: The Effect of COVID-19]." Accessed March 21, 2022. https://www.gfk.com/ru/press/issledovanie-gfk-ehffekt-covid-19

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can be interpreted as indicating that authorities have implemented less stringent restrictive measures with confidence in the effectiveness of the system. Better policies and institutions should compensate for weaker restrictions. In general, it appears that the more effective governments are, the more they rely on their ability to control the situation. At the same time, the positive correlation between the indicators of Government Effectiveness, Regulatory Quality, and Severity may indicate that these capabilities are overestimated. Another reason for this positive correlation is that the high level of Government Effectiveness and Regulatory Quality means both the efficiency of healthcare and the effectiveness of identifying COVID-19 cases.

The impact of ICT

The level of development and dissemination of information and communication technologies (indicators 18, 19) is likely to lead to a reduction in severity. People can be expected to leave their homes less often and have less frequent physical contact if they have electronic means of communication, opportunities to work at home, study, use services, and purchase goods online. However, it seems that this behaviour of the population is overestimated, as both indicators 18 and 19 demonstrate a positive correlation with severity. This positive correlation can also be explained by the fact that high information and communications technology (ICT) penetration is a sign of a high level of prosperity and high health expenditures in a country; the mechanism of influence of these characteristics on severity has been described above.

Russia follows European trends

The question of how Russia fits into European trends should be divided into two parts: 1) did the restrictive policy in Russia during the first wave of COVID-19 largely correspond to EU trends? and 2) how do the results of this policy compare to the results in the European Union?

The answer to the first question is positive. This can be seen both from the sequence of events (EU countries started introducing restrictive measures before Russia, so it was an obvious step for the Russian leadership to take into account the experience of the EU) and from the particular measures taken in Russia (Russia largely replicated similar measures taken by EU countries, with some differences related to the stringency of the restrictions adopted but not their nomenclature).

It can be noted that restrictive policies in Russia during the first wave of COVID-19 were largely in line with EU trends. Russia took into account institutional capacity to the same extent as the policies of European countries did. This conclusion is supported by the quantitative results of this study: for almost all institutional characteristics, the inclusion or exclusion of Russia in the sample does not lead to noticeable changes in correlation coefficients between these characteristics and the stringency of measures.

The answer to the second question is more complex. On the one hand, as is seen in Figure 1, Russia is quite far from the trend line. On the other hand, this figure is only a projection of a more complex multidimensional space in which the severity of a pandemic is influenced not only by the stringency of the measures but also by other factors. In the obtained model, the authors have tried to account for this multidimensionality, considering not only stringency but also institutional characteristics. Russia's alignment with European trends can be assessed by the constant f for the dummy variable D included in the model. Its value close to 0 shows that Russia fits well with the European trends and that the severity of the COVID-19 wave in Russia can be successfully predicted using the patterns observed in the EU. The model shows that at a given level of stringency and under the given institutional conditions, the registered severity of the epidemic situation in the Russian Federation is quite expected. The error given by the model in estimating the severity for Russia is only 0.06 on a scale of 0 to 1.

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These results may indicate that:

– the impact of some institutional characteristics on severity in Russia differs from the impact of these characteristics in EU countries

– some of the protective and restrictive measures have somewhat different effects in Russia than in EU countries

– at the same time, these differences can be explained to some extent by the trends observed in the EU

Thus, despite the existing economic, political, social, and cultural differences, Russia's restrictive policies during the first wave of the pandemic were generally consistent with those of EU countries. However, the results for Russia were more severe than could be expected based on the trends in EU countries. One of the reasons for this result seems to be that the introduction of protective and restrictive measures has simply followed the example of EU countries, not taking sufficient account of Russian specificities, in particular, the "scale effect." Of course, the Russian authorities had little time to adapt these measures to Russian conditions when "borrowing" them. It is also worth noting that at the beginning of the pandemic, it was quite difficult to assess the effectiveness or ineffectiveness of foreign experiences since, at that time, scientists did not even have a clear understanding of the mechanism and transmission of the virus.

Further research

Further research on this topic could address the following issues: 1) search for other institutional characteristics that may affect the stringency of restrictive measures as well as the severity of the epidemic; 2) clarify the shape of the relationship between institutional characteristics, stringency, and severity – in particular, it is important to test the hypothesis of an increase or decrease in the effect of institutional characteristics, since the relationship may not be linear; 3) clarify the regional specificities of the relationships between the studied characteristics.

Regarding the first point, it seems particularly important to include characteristics indicating population values in the explanatory model of severity. Based on the correlation analysis, it can be assumed that severity is significantly influenced by values. The prevalence of self-expression and secular-rational values correlates with weaker restrictive measures. Indeed, in the spread of secular-rational values, governments can rely on the population's conscious and voluntary refusal to travel, make physical contact, etc. Conversely, a higher degree of survival values leads to poorer compliance with restrictive measures, which on the one hand, increases their stringency, and on the other hand, intensifies the severity of the pandemic. Thus, Russian and international studies (Gubernatorov 2020) demonstrate that people who have no income and/or savings are more likely to downplay the real risk of COVID-19 infection and violate the protective measures established by the authorities.

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Appendix A. The components of Stringency Index

1. School closing (C1)
2. Workplace closing (C2)
3. Cancel public events (C3)
4. Restrictions on gatherings (C4)
5. Close public transport (C5)
6. Stay at home requirements (C6)
7. Restrictions on internal movement (C7)
8. International travel controls (C8)
9. Public info campaigns (H1)

Appendix B. Seven groups of indicators that were used to describe the institutional characteristics of the countries

1) Geography and demographics:

– Area[14]
– Population[15]
– Population density[16]
– Urban population (% of total population)[17]

2) State of the healthcare system, sanitary conditions and public health:

– Health Expenditures (in US dollars per capita)[18]
– Life expectancy at birth[19]
– Safe Sanitation (Sustainable Society Index – Indicator 3)[20]

3) Welfare of the population:

– GDP per capita, PPP (current international $)[21]

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– Employment (Sustainable Society Index – Indicator 20)[22]

4) Public confidence in institutions, the media, and the government:

– Government Trust Index (Eurobarometer)[23]
– Media trust index (Eurobarometer)[24]

5) Values and cultural characteristics of the population:

– Survival / Self-Expression Values (World Values Survey)[25]
– Traditional / Secular Values (World Values Survey)[26]

6) Political system:

– Fragile States Index (The Fund for Peace)[27]
– Democracy Index (Democracy Index, 10-14)[28]
– Government Effectiveness (World Governance Indicators)[29]
– Regulatory Quality (World Governance Indicators)[30]

7) Level of ICT development and dissemination:

– ICT Development Index (IDI) (Measuring the Information Society Report)[31]

– Broadband subscriptions [32] based on Fixed-broadband subscriptions and Active mobile-broadband subscriptions (International Telecommunication Union) indicators[33]

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