

DO MACROINDICATORS CORRELATE WITH COVID-19 IN EUROPEAN COUNTRIES? A COMPARATIVE ANALYSIS

Adrian Tudor TUDORACHE

*Bucharest University of Economic Studies, Piața Romană no. 6-8, Romania
tudortudorache1993@gmail.com*

Luminița NICOLESCU

*Bucharest University of Economic Studies, Piața Romană no. 6-8, Romania
luminicolescu@yahoo.com*

Abstract. *The Covid-19 health crisis influenced economies and societies to a large extent, determining researchers and practitioners to study the economic consequences of this crisis. This paper aims to analyze if and how macroeconomic evolutions were related to the evolution of Covid-19, during the major years of the pandemic, 2020 and 2021, in selected European countries. The methodology was based on testing the correlation analysis between Covid-19 cases and macro-level indicators (such as GDP change, unemployment, and inflation). Four countries were studied, categorized according to geographical location and size (large Western European countries, small Western European countries, large Central and Eastern European countries, and small Central and Eastern European countries), and 3 countries were selected in each group for analysis. Results illustrated that Western European countries were more affected at the macroeconomic level by the health crisis than Central and Eastern European countries. Among all groups, small Western European countries were the most affected. Also, inflation was the macro-level phenomenon most correlated with the evolution of Covid-19 cases.*

Keywords: *Covid-19 crisis; European countries; macroeconomic evolutions; GDP; unemployment; inflation.*

Introduction

The health crisis determined by the Covid-19 virus had unprecedented and unexpected consequences for the entire world (Tudorache & Nicolescu, 2021). Communities of both researchers and practitioners are concerned by the economic effects of the crisis (Bremmer, 2020; Manyika, 2020) and about how the world will evolve after the Covid-19 crisis ends. This is a current topic of discussion with high expected importance for the future; therefore, it is debated in the literature to a large extent. Different articles investigate the impact of the crisis at a general economic level (Ibn-Mohammed et al., 2021), while others look at the impact of the Covid-19 epidemic on specific industries, for example, the auto industry (Belhadi et al., 2021) and the airline industry (Amankwah-Amoah et al., 2021). Other articles speculate on the future and try to imagine how the world will look after the Covid-19 crisis will end (Rebelo, 2020; Sneider & Singhal, 2021; Tudorache & Nicolescu, 2021).

The purpose of the present paper is to investigate the existence or not of a correlation between the evolution of Covid-19 and the economies of European economies during

the Covid-19 crisis, considering from an economic point of view the main macro-level aspects. The main objectives relate to identifying if there is a relationship between the evolution of Covid -19 cases and the country-level GDP, unemployment, and inflation in the respective country. The methodology used to reach these objectives includes the correlation analysis between the number of Covid -19 cases and each macro-level indicator considered, respectively the GDP, unemployment, and inflation. Four European countries were included in the analysis: small Western European countries, large Western European countries, small Central and Eastern European countries, and large Central and Eastern European countries. Also, as part of the methodological endeavor is a comparative analysis between the four groups of countries, as far as the relationships between macroeconomic indicators and the evolution of the Covid-19 cases, is concerned. The paper has the following organization: the next section refers to what the literature presents about the Covid-19 crisis and its effects; after that, the methodology section presents the main methodological aspects considered; the following section tests the correlation between the Covid-19 cases and the macro-level economic indicators in the selected European countries during the years of the core COVID-19 outbreak, respectively 2020 and 2021; the conclusion section ends the paper.

Literature review

According to specialists the Covid-19 health crisis had effects that manifest at multiple levels (Bremmer, 2020; Manyika, 2020) in societies and economies. Numerous authors identified the main levels at which the impact of the Covid-19 health crisis is felt: world level, national level, industry level, company level, and individual level (Belhadi et al., 2021, Ibn-Mohammed et al., 2021). Consequently, the effects of Covid-19 need to be analyzed at each level.

At the world level, the economic impact of the Covid-19 health crisis is profound (Tudorache & Nicolescu, 2022). The pandemic determined a global recession (Aramayo & Vokoun, 2020; Gruszczynski, 2020), that manifested at the level of the global economy and at the level of national economies. At the beginning of the pandemic, at the global level, the global supply chains have been disrupted (Garofali, 2020), due to the high degree of worldwide integration of production processes, as well as the high level of integration of distribution systems, globally (Gruszczynski, 2020). Consequently, companies dependent on foreign supplies encountered an increased risk of disruption during the pandemic, illustrating that outsourcing became a much riskier strategy than before the Coronavirus -19 outbreak (Zahra, 2021). Also at the global level, at the outset of the health crisis, international trade was negatively affected, with large declines being registered, mainly due to a) governmental measures such as lockdowns; b) transportation disruptions; c) protective measures with the limitation of exports for certain product categories (medical products, food, and hygiene products) that were scarce at the time (Aramayo & Vokoun, 2020).

At the country level, the demand for many products declined with negative consequences on production. The decrease in product demand was associated with some people losing their jobs (Aramayo & Vokoun, 2020) and consequently have lower purchasing power. Other people displayed higher cautiousness when spending due to a perceived high level of future uncertainty. All these determined a decline in many countries' economies.

At the the industry level, the situation differed depending on the industry, with some industries being highly positively influenced, while others being highly negatively influenced. Among the industries on which Covid-19 had negative influences were certain service industries such as tourism, catering, restaurants, and bars, but also air transport, entertainment, and personal care services (Ibn-Mohammed et al., 2021; Zahra, 2021), but also manufacturing industries such as the auto industry and the garment industry. Among the industries on which Covid-19 had positive influences were industries related to the internet (e-commerce, internet communication) (Sneider & Singhal, 2021) and to the medical industry (sanitary products and medical equipment) (Zahra, 2021). The information technology sector also developed highly during this period, due to the shift of many activities online: teleworking, telehealth, and e-learning. At the same time, cybersecurity was in high demand due to the development of many online activities.

At the company level, the Covid-19 crisis had huge impacts. Small and medium-sized companies were at risk and many went bankrupt (Amankwan-Amoah et al., 2021), while other small and large companies had to adapt their way of operating to survive. The needed company-level changes were determined by legislation: health and safety measures (distancing, sanitizing), but also by the need to adapt to new conditions: remote working for staff, higher levels of digitalization, and the incorporation of newer digital technologies (Zahra, 2021).

In this context, it is interesting to investigate the relationship between Covid-19 and macro-level evolutions, as the activity of all other economic actors (companies and individuals) highly depends on what happens at the macro level in the economy (Tudorache & Nicolescu, 2022).

Methodology

The general purpose of the present paper is to investigate if the economic evolutions of European countries were related to the evolution of the Covid-19 cases. In order to pursue this purpose, the paper has as major objectives: a) to investigate the existence or not of correlations between the number of Covid-19 cases and a series of macro-level aspects in European countries and b) to compare the relationships existent between Covid-19 cases and the considered macroeconomic aspects in different groups of European countries.

The macro-level indicators that portray an economy are GDP change (quarterly) and unemployment and inflation (monthly). Data for these indicators was collected for the main two years of the Covid-19 pandemic, 2020 and 2021. The data about the COVID-19 number of cases was collected weakly and computed at a monthly level also for the period January 2020 – December 2021.

European countries have been categorized according to two criteria: a) the traditional geo-political geography: Central and Eastern European (CEE) countries and Western European (WE) countries and b) the dimension of the country measured by population size in: large countries (over 10 mills. inhabitants) and small countries (less than 10 mills. inhabitants). By combining the two criteria, four groups of countries resulted: large CEE countries (with over 10 mills. inhabitants), small CEE (with less than 10 mills. inhabitants), and large Western European countries (with more than 10 mills.

inhabitants) and small Western European countries (with less than 10 mill. inhabitants). In each group the first three countries (as size) were considered, for analysis. Table 1 shows the European countries included in the study with their populations.

Table 1. Population of European countries included in the study
(Source: Worldometer)

Countries			
Large Western European countries > 10 mill. inh.	France	Germany	Italy
Population 2020 (thousands)	65,273,5	83,783,9	60,461,8
Small Western European countries < 10 mill. inh.	Austria	Ireland	Switzerland
Population 2020 (thousands)	9,006,3	4,937,7	8,654,6
Large Central and Eastern European countries < 10 mill. inh.	Czech Republic	Poland	Romania
Population 2020 (thousands)	10,708,9	37,846,6	19,237,6
Small Central and Eastern European countries < 10 mill. inh.	Bulgaria	Hungary	Slovakia
Population 2020 (thousands)	6,948,4	9,660,3	5,459,6

Data for all countries was collected from the Eurostat interactive database, the European Statistical Recovery Dashboard for the economic data (GDP change, unemployment rate and inflation rate) and the data about the Covid-19 cases was collected from European Centre for Disease Prevention and Control of EU.

Appendices 1-4 present the data for the two years of analysis (2020-2021) for all considered indicators and all countries included in the study.

The research method is based on the correlation analysis by computing the Pearson coefficient. Correlation is seen as a measurement of the monotonic association between two variables and depicts the linear relationship between two continuous variables, usually known as the Pearson product-moment correlation (Schober et al., 2018). The correlation shows the degree to which the change in one variable determines changes in the second variable. Pearson coefficient (r) is used to measure the correlation between two continuous variables and depicts direction and strength of the association of the two considered variables. The direction of the linear relationship can be positive (the two variables move in the same direction: when variable 1 increases also variable 2 increases) or negative (the two variables move in opposite directions: when variable 1 increases, variable 2 decreases). The strength of the correlation can be interpreted as weak (r between 0.1 and 0.3), medium (r between 0.3 and 0.5) and strong (r above 0.5) (Laerd Statistics, 2020).

In the present study, in order to conduct the correlation analysis and identify the existence or not and the direction and the strength of a linear relationship between variables, the number of Covid-19 cases at 1000 inhabitants was calculated and included in the analysis, along with the existing macroeconomic indicators.

Results and discussions

For each group of countries were analyzed the correlations between the three main types of macro indicators considered (GDP change, unemployment, and inflation and the Covid-19 number of cases (measured at 1000 inhabitants). The purpose was to investigate if there was a relationship between the evolution of Covid-19 cases and the evolutions at the macro level of the European economies. The results presented in Tables 2 and 3 indicate both similarities and differences in the way Covid-19 correlated with the economies of countries. The analysis will be done first on variables correlated and then on groups of countries.

Table 2. Level of correlation between cases of Covid-19 and main indicators at a macro level (Source: authors' calculations)

Countries	Pearson coefficient		
	Covid-19 cases/1000 inh. with GDP change	Covid-19 cases/1000 inh. with unemployment	Covid-19 cases/1000 inh. with inflation
Large Western European countries			
France	-0.0391	-0.0524	0.3744
Germany	0.0261	-0.3041	0.5855
Italy	0.0754	0.1681	0.3255
Small Western European countries			
Austria	0.1965	-0.1140	0.4679
Ireland	0.3175	-0.6630	0.8463
Switzerland	0.2643	0.3160	0.8173
Large Central and Eastern European countries			
Czech Republic	0.2184	0.4147	-0.0549
Poland	0.1644	0.4405	0.3656

Romania	0.0722	-0.2014	0.2520
Small Central and Eastern European countries			
Bulgaria	0.3407	0.1904	0.3054
Hungary	0.1790	-0.0318	0.4199
Slovakia	0.0333	0.1842	0.1521

The correlation between Covid-19 and the change in GDP. The relationship between the number of cases of Covid-19 and the change in the GDP proved to be rather weak in all countries. Most of the larger countries, from both geographical regions, registered very low, almost insignificant values of the correlation coefficient (under 0,1), whereas the largest values of the coefficient were encountered in smaller countries, with the highest in Bulgaria (0,34), Ireland (0, 31) and Switzerland (0,26). This suggests that in general, in Europe, the evolution of the GDP was weakly correlated with the evolution of the number of Covid-19 cases in 2020-2021.

Table 3. Interpretation of correlation between cases of Covid-19 and main indicators at a macro level (Source: authors)

Countries	Pearson coefficient interpretation		
	Covid-19 cases/1000 inh. with GDP change	Covid-19 cases/1000 inh. with unemployment	Covid-19 cases/1000 inh. with inflation
Large Western European countries			
France	Negative, Very weak	Negative, Very weak	Positive, Medium
Germany	Positive, Very weak	Negative, Medium	Positive, Large
Italy	Positive, Very weak	Positive, Weak	Positive, Medium
Small Western European countries			
Austria	Positive, Weak	Negative, Weak	Positive, Medium
Ireland	Positive, Medium	Negative, Large	Positive, Very large
Switzerland	Positive, Weak	Positive, Medium	Positive, Very large

Large Central and Eastern European countries			
Czech Republic	Positive, Weak	Positive, Medium	Negative, Very weak
Poland	Positive, Weak	Positive, Medium	Positive, Medium
Romania	Positive, Very weak	Negative, Weak	Positive, Weak
Small Central and Eastern European countries			
Bulgaria	Positive, Medium	Positive, Weak	Positive, Medium
Hungary	Positive, Weak	Negative, Very weak	Positive, Medium
Slovakia	Positive, Very weak	Positive, Weak	Positive, Weak

The correlation between Covid-19 and unemployment. There are countries where the relationship between the cases of Covid-19 and unemployment was direct and positive (Italy, Switzerland, Czech Republic, Poland, Bulgaria, and Slovakia), suggesting that when the number of Covid-19 cases increased, unemployment also increased. However, the strength of this linear relationship highly differed from one country to another. Moderate positive correlations were encountered in Poland (0,44), the Czech Republic (0,41), and Switzerland (0,31), where the increase in Covid-19 cases was associated with an increase in unemployment, as many people lost their jobs due to the lack of activity of the companies they work for. Still positive, but with a lower strength were also the correlations from Italy (0,16), Slovakia (0,18), and Bulgaria (0,19). In half of the studied countries, unemployment increased with Covid-19 cases.

In the other half of the studied countries, the relationship between Covid-19 cases and unemployment was indirect, suggesting that unemployment decreased when the number of Covid-19 cases increased. Except for Ireland where this correlation was very strong (-0.66) and in Germany where the correlation was moderate (-0.30), in all other countries the correlation was rather weak (France: -0.05; Austria: - 0.11; Hungary: - 0.03).

The differences in the correlations between the number of Covid-19 cases and unemployment are explained by the different governmental policies of countries, with countries with higher social protection having decreasing unemployment during the Covid-19 period, this being rather Western European countries (France, Germany, Austria).

The correlation between Covid-19 and inflation. Inflation was the macro level indicator that correlated with the number of Covid-19 cases the most in all countries. The correlation was positive in all countries (except the Czech Republic) illustrating that at an increase of the number of Covid-19 cases, an increase in inflation took place. In most countries the correlation was medium to strong, indicating a tight common evolution of these phenomena. The countries with a strong positive correlation between the number of Covid-19 cases and inflation were Ireland (0.84) and Switzerland (0.81), while the countries with moderate positive correlations were Germany (0.58), Austria (0.46),

France (0.37), Italy (0.32), Poland (0.36) and Hungary (0.41) and the countries with small positive correlations were Romania (0.25), Bulgaria (0.30) and Slovakia (0.15).

The correlation between Covid-19 cases and macroeconomic indicators in large Western European countries. In this group of countries, Covid-19 was correlated with macrolevel evolutions to a small up to medium level: with the highest correlation in the case of inflation; with two countries with negative correlations between the number of Covid-19 cases and unemployment and with very weak correlations of the GDP change with Covid-19.

The correlation between Covid-19 cases and macroeconomic indicators in small Western European countries. For this group of countries, the number of Covid-19 cases was correlated to a higher extent with macro-level phenomena: inflation was highly and positively correlated with Covid-19, and unemployment's correlation with Covid-19 differed from one country to another, but there were again two countries with negative correlation and GDP's change weakly correlated with Covid-19 (but to a higher level than in the case of large Western European countries).

The correlation between Covid-19 cases and macroeconomic indicators in large Central and Eastern European countries. In this group of countries the relationship between Covid-19 and GDPs' change was rather weak; moderate and positive correlations were registered with unemployment and the correlation of Covid-19 with inflation was also weak to moderate.

The correlation between Covid-19 cases and macroeconomic indicators in small Central and Eastern European countries. For this group of countries correlations of macroindicators with the cases of Covid-19 were weak to moderate, with the highest correlations in case of inflation; with weak correlations for unemployment and variate correlations in case of GDP change.

Table 4 presents a synthesis of the types of correlations encountered between the number of Covid-19 cases and different macro-level indicators in the four groups of European countries,

Table 4. Synthesis of correlations between cases of Covid-19 and macrolevel phenomena (Source: authors)

Groups of countries	Synthesis
Large Western European countries	1 Large, 3 Medium, 1 Weak
Small Western European countries	2 Very large, 1 Large, 2 Medium, 3 Weak
Large Central and Eastern European countries	3 Medium, 4 Weak
Small Central and Eastern European countries	3 Medium, 4 Weak

It can be concluded that small countries from Western Europe were the most affected at macrolevel by Covid-19 crisis, as there were encountered more and stronger correlations between Covid-19 and macrolevel phenomena. They were followed by large countries in Western Europe, where Covid-19 was also moderately and strongly correlated with a number of macro-level indicators. So, countries in Western Europe were more affected by Covid-19 at macrolevel.

Conclusions

The social and economic life at global level was affected by the Covid-19 health crisis. Specialists consider that the effects of the Covid-19 outbreak are visible at multiple levels: starting with the global level and continuing at country, industry, company and individual levels.

The present paper presents the results of a study that looked at how macrolevel evolutions were related to the evolution of the Covid-19 cases. The main findings of the research include:

- at a general level, the GDP change is weakly correlated with the evolution of Covid-19 in the selected European countries.
- inflation was the phenomenon that was the most correlated with the evolution of Covid-19 in most countries, with some countries having very strong positive correlations.
- unemployment was also correlated with the evolution of Covid-19, but rather with weak and moderate correlations. However, the direction of the correlation was different, with some countries registering negative correlations and illustrating that unemployment decreased when Covid-19 cases increased. This was due mainly to protective and social measures taken for the population, which was encountered in more Western European countries.
- countries in Western Europe were more affected by Covid-19 at a macroeconomic level, as stronger correlations were found between the evolution of Covid-19 and macroeconomic indicators in these countries.
- smaller countries were more affected than larger countries by the evolution of Covid-19.

The results of the present study were similar to the findings of Olkiewicz (2022) who also identified correlations between the increasing infection rate and macrolevel indicators in the G7 countries. He considers that the identified dependencies, even though small, had economic significance and that the pandemic of Covid-19 determined the economic indicators that further affected in a direct manner the business confidence in the analyzed countries.

The paper contributed with an analysis of the relationship between the evolution of economies in European countries and the evolution of Covid-19 during the main years of the Coronavirus pandemic, respectively 2020 and 2021, and with a comparison between groups of European countries. Differences were encountered between CEE countries and Western European countries on the one hand and between small and large countries, on the other hand. The paper has also a practical impact on governments that need to be aware of the influence of sanitary crises on economic evolutions and consider macro-level policies to diminish the negative influence of health crises and support economic development in their countries.

The study has also a number of limitations. First, the research was limited only to a number of European countries, but further studies can look at other regions and other countries of the world. Second, the study only tests the correlation between macro-level phenomena and Covid-19 cases, but further study can continue the analysis with further inferential statistics, such as regression analysis. Third, only a limited number of macrolevel indicators were included in the study. Further research can also extend the number and types of economic indicators to be tested to exports and imports, for example.

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Appendix 1 Quarterly GDP, 2020-2021 (Source: Eurostat)

Quarterly GDP change	Large CEE countries > 10 mill. inh.			Small CEE countries < 10 mill. inh.			Large Western European countries > 10 mill. inh.			Small Western European countries < 10 mill. inh.		
	CZ	PL	RO	BG	HU	SK	FR	DE	IT	AU	IE	CH
2020-Q1	-3.4	0.1	0.4	-0.1	-0.5	-3.9	-5.7	-1.8	-5.7	-2.5	3.7	-1.5
2020-Q2	-8.9	-9.2	-11.2	-7.2	-14.4	-7.2	-13.5	-10.0	-12.9	-11.4	-3.3	-6.2
2020-Q3	6.7	7.5	5.6	2.9	11.4	9.1	18.6	9.0	15.6	10.9	9.5	6.3
2020-Q4	0.8	-0.2	3.8	1.8	1.8	0.4	-1.1	0.7	-1.6	-2.0	-4.7	-0.1
2021-Q1	-0.4	1.6	2.2	1.4	1.5	-1.4	0.1	-1.7	0.3	-0.4	10.0	-0.1
2021-Q2	1.3	1.8	1.5	0.8	2.0	1.9	1.3	2.2	2.7	4.2	5.2	1.8
2021-Q3	1.6	2.3	0.4	0.6	0.7	0.4	3.1	1.7	2.6	3.8	0.9	1.7
2021-Q4	1.9	2.0	0.3	0.7	0.6	0.4	0.7	-0.7	2.9	3.5	1.2	2.1

Note: CZ - Czech Republic; PL - Poland; RO - Romania; BG - Bulgaria; HU - Hungary; SK - Slovakia; FR - France; DE - Germany; IT - Italy; AU - Austria; IE - Ireland; CH - Switzerland; CEE - Central and Eastern European

Appendix 2 Monthly unemployment, 2020-2021 (%) (Source: Eurostat)

Country/ Months	Large CEE countries			Small CEE countries			Large WE countries			Small WE countries		
	CZ	PL	RO	BG	HU	SK	FR	DE	IT	AU	IR	CH
2020M1	1.9	3.0	5.0	4.4	3.6	6.0	8.1	3.4	9.7	4.4	3.4	4.1
2020M2	1.8	3.0	5.1	4.2	3.5	6.0	7.7	3.5	9.7	4.5	3.5	4.1
2020M3	1.9	2.9	5.6	4.5	3.4	6.0	7.5	3.6	7.3	4.9	3.6	4.3
2020M4	2.2	3.0	6.2	5.8	3.6	6.6	7.5	3.7	7.4	6.0	3.7	4.6
2020M5	2.4	3.2	6.4	5.9	4.9	6.7	7.1	3.8	8.5	7.1	3.8	4.9
2020M6	2.7	3.3	6.7	5.6	4.9	6.7	7.5	3.9	9.5	7.7	3.9	5.0
2020M7	2.9	3.4	6.3	5.3	4.3	7.0	8.7	4.0	10.1	6.8	4.0	5.1
2020M8	2.7	3.3	6.2	5.3	4.2	7.1	9.0	4.1	10.0	6.4	4.1	5.1
2020M9	2.8	3.3	6.1	5.3	4.3	7.0	9.0	4.1	10.1	6.4	4.1	5.1
2020M10	3.1	3.2	6.2	5.4	4.0	7.0	8.3	4.1	10.0	6.1	4.1	5.1
2020M11	3.0	3.2	6.3	5.4	4.3	7.1	8.0	4.1	9.6	6.1	4.1	5.1
2020M12	3.2	3.4	6.4	5.6	4.2	7.1	7.8	4.0	9.8	6.8	4.0	5.2
2021M1	3.2	3.7	6.0	5.9	4.5	7.1	7.9	3.9	10.2	7.3	3.9	5.4
2021M2	3.2	3.9	6.0	6.0	4.5	7.1	8.1	3.9	10.1	7.0	3.9	5.5
2021M3	3.4	3.9	5.9	5.9	4.0	7.2	8.1	3.8	10.0	6.7	3.8	5.4
2021M4	3.3	3.8	5.5	5.6	4.1	7.1	8.3	3.7	10.1	7.1	3.7	5.4
2021M5	3.1	3.6	5.3	5.5	4.2	7.0	8.3	3.6	9.9	6.7	3.6	5.3
2021M6	2.8	3.4	5.2	5.2	4.1	6.9	8.1	3.5	9.4	6.2	3.5	5.2
2021M7	2.6	3.2	5.2	5.0	4.1	6.7	8.0	3.4	9.2	6.0	3.4	5.1
2021M8	2.8	3.1	5.4	5.0	4.1	6.6	7.9	3.4	9.3	5.9	3.4	4.9
2021M9	2.6	3.0	5.2	4.9	3.6	6.5	7.7	3.3	9.2	5.2	3.3	4.9

2021M10	2.6	3.0	5.2	4.9	3.9	6.4	7.6	3.3	9.4	5.7	3.3	4.9
2021M11	2.2	3.0	5.2	5.0	3.8	6.3	7.5	3.2	9.2	5.3	3.2	4.9
2021M12	2.2	3.0	5.2	5.0	3.8	6.3	8	3.2	9	5.3	3.2	4.9

Note: CZ - Czech Republic; PL - Poland; RO - Romania; BG - Bulgaria; HU - Hungary; SK - Slovakia; FR - France; DE - Germany; IT - Italy; AU - Austria; IE - Ireland; CH - Switzerland; CEE - Central and Eastern European; WE - Western European

Appendix 3 Monthly inflation, 2020-2021 (%) (Source: Eurostat)

Country / Months	Large CEE countries			Small CEE countries			Large WE countries			Small WE countries		
	CZ	PL	RO	BG	HU	SK	FR	DE	IT	AU	IE	CH
2020M1	3.8	3.8	3.9	3.4	4.7	3.2	1.7	1.6	0.4	2.2	1.1	0.2
2020M2	3.7	4.1	2.9	3.1	4.4	3.1	1.6	1.7	0.2	2.2	0.9	-0.2
2020M3	3.6	3.9	2.7	2.4	3.9	2.4	0.8	1.3	0.1	1.6	0.5	-0.4
2020M4	3.3	2.9	2.3	1.3	2.5	2.1	0.4	0.8	0.1	1.5	-0.3	-1.0
2020M5	3.1	3.4	1.8	1.0	2.2	2.1	0.4	0.5	-0.3	0.6	-0.8	-1.0
2020M6	3.4	3.8	2.2	0.9	2.9	1.8	0.2	0.8	-0.4	1.1	-0.6	-1.3
2020M7	3.6	3.7	2.5	0.4	3.9	1.8	0.9	0.0	0.8	1.8	-0.6	-1.2
2020M8	3.5	3.7	2.5	0.6	4.0	1.4	0.2	-0.1	-0.5	1.4	-1.1	-1.4
2020M9	3.3	3.8	2.1	0.6	3.4	1.4	0.0	-0.4	-1.0	1.2	-1.2	-1.1
2020M10	2.9	3.8	1.8	0.6	3.0	1.6	0.1	-0.5	-0.6	1.1	-1.5	-0.9
2020M11	2.8	3.7	1.7	0.3	2.8	1.6	0.2	-0.7	-0.3	1.1	-1.0	-0.8
2020M12	2.4	3.4	1.8	0.0	2.8	1.6	0.0	-0.7	-0.3	1.0	-1.0	-1.0
2021M1	2.2	3.6	2.0	-0.3	2.9	0.7	0.8	1.6	0.7	1.1	-0.1	-0.6
2021M2	2.1	3.6	2.5	0.2	3.3	0.9	0.8	1.6	1.0	1.4	-0.4	-0.4

2021M3	2.3	4.4	2.5	0.8	3.9	1.5	1.4	2.0	0.6	2.0	0.1	-0.2
2021M4	3.1	5.1	2.7	2.0	5.2	1.7	1.6	2.1	1.0	1.9	1.1	-0.1
2021M5	2.7	4.6	3.2	2.3	5.3	2.0	1.8	2.4	1.2	3.0	1.9	0.3
2021M6	2.5	4.1	3.5	2.4	5.3	2.5	1.9	2.1	1.3	2.8	1.6	0.5
2021M7	2.7	4.7	3.8	2.2	4.7	2.9	1.5	3.1	1.0	2.8	2.2	0.5
2021M8	3.1	5.0	4.0	2.5	4.9	3.3	2.4	3.4	2.5	3.2	3.0	0.8
2021M9	4.0	5.6	5.2	4.0	5.5	4.0	2.7	4.1	2.9	3.3	3.8	0.8
2021M10	4.8	6.4	6.5	5.2	6.6	4.4	3.2	4.6	3.2	3.8	5.1	1.3
2021M11	4.8	7.4	6.7	6.3	7.5	4.8	3.4	6.0	3.9	4.1	5.4	1.5
2021M12	5.4	8.0	6.7	6.6	7.4	5.1	3.4	5.7	4.2	3.8	5.7	1.3

Note: CZ - Czech Republic; PL - Poland; RO - Romania; BG - Bulgaria; HU - Hungary; SK - Slovakia; FR - France; DE - Germany; IT - Italy; AU - Austria; IE - Ireland; CH - Switzerland; CEE - Central and Eastern European; WE - Western European

Appendix 4 Monthly number of Covid-19 cases, 2020-2021 (Source: European Centre for Disease Prevention and Control of EU)

Country/ Months	Large CEE countries			Small CEE countries			Large WE countries			Small WE countries		
	CZ	PL	RO	BG	HU	SK	FR	DE	IT	AU	IE	CH
2020M1	0	0	0	0	0	0	6	14	2	0	0	0
2020M2	3	0	3	0	0	0	143	154	2153	12	0	24
2020M3	2823	1862	1903	346	444	348	40029	63681	102834	9184	2624	14250
2020M4	4970	11831	11491	1272	2586	1044	90384	100282	108249	6398	18881	15548
2020M5	1507	10091	6364	895	857	107	16106	17793	20264	1059	3484	957
2020M6	2347	10123	6809	2112	258	149	13584	12045	7034	982	449	755
2020M7	5166	12987	25781	7211	399	690	27460	16909	8162	3686	723	3927
2020M8	9797	19033	28647	3707	4222	2045	138024	34996	29456	7578	2960	7779

2020M9	27365	17478	34276	3592	13665	3371	232996	39494	39645	13417	4964	9369
2020M10	208820	174448	96862	18743	42704	38604	727054	172041	286700	45915	24195	54152
2020M11	234222	607733	208993	83135	116387	53747	933569	492910	905113	164993	13333	186160
2020M12	135332	317398	170931	70332	127151	99429	323323	582501	507319	87805	9081	122679
2021M1	313661	254894	109919	21234	52035	185732	600956	561172	501449	60152	110418	86282
2021M2	252995	195885	74629	28088	64205	143839	497295	224118	378284	44406	23405	32312
2021M3	314303	736580	174664	105553	256947	119201	928155	448658	724427	98757	18196	53223
2021M4	228910	647161	147452	92448	221155	85824	801159	390287	581704	82433	14929	45699
2021M5	135332	317398	170931	70332	127151	99429	323323	582501	507319	87805	9081	122679
2021M6	153061	688382	145082	94620	190880	63760	1064422	631430	566268	92600	16034	67308
2021M7	41188	110428	29426	21121	33153	19879	488302	379129	239139	34610	15040	42789
2021M8	5430	7266	2934	3294	3504	3357	107762	46846	40501	5790	9587	7983
2021M9	6534	3442	2875	3539	1604	1414	366350	47177	103064	9703	30814	16875
2021M10	76075	126503	455671	108670	53369	88463	171054	414608	114564	99172	60917	40486
2021M11	366691	490815	118102	87593	222089	221100	436496	1204482	248341	315266	114460	132817
2021M12	350560	612874	32997	59556	165560	177296	2663600	1402688	1505755	136835	268857	339543

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