Economic impacts of covid-19 pandemic in V4 cmpared with other selected EU countries

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Abstract: The COVID-19 pandemic has vast economic impacts. The aim of the contribution is to evaluate the economic condition based on selected indicators in a set time, in selected EU countries in the context of the COVID-19 pandemic. As part of the research, we focused on the evaluation of economic indicators before and during the pandemic using statistical methods. The article discusses the development and changes in individual indicators due to the impact of the pandemic, while we specified the negative economic impacts of the pandemic in order to find a way to mitigate the economic impacts. The results of the contribution can thus help the recovery of the economies of individual countries.

1. Introduction

COVID-19 pandemic has vast economic impacts, reaching over single spreading of the COVID-19 virus. As the SARS-CoV-2 acute respiratory syndrome spread around the world, related constraints shifted from parts supply problems to declining business in the service sector. The pandemic caused the second largest global recession in history when more than a third of the world's population was in lockdown [1].

The revival of the economy, which was negatively affected by the coronavirus pandemic and the current war conflict in Ukraine, may take more than five years. The World Bank warned that this could cause a deepening of economic inequality in the world. Due to the mentioned, the main goal of the contribution is to evaluate the economic condition of Slovakia, Poland, the Czech Republic, Austria, Switzerland, Germany and Hungary during the pandemic period, based on selected economic indicators for the time period before the pandemic 2018, 2019 and the period during the pandemic 2020 and 2021.

2. Literature review

The emergence of coronavirus disease (COVID-19) on the global public health scene has led to growing concerns and uncertainties. Because of the aforementioned, the main goal of the contribution is to evaluate the economic condition of Slovakia, Poland, the Czech Republic, Austria, Switzerland, Germany and Hungary during the pandemic period, based on selected economic indicators for the time period before the pandemic 2018, 2019 and the period during the pandemic 2020 and 2021. Zhang et al. [2] made a vast analysis of COVID-19 pandemic impact on economy, studying 36 countries during 2019-2020, found the impacts have a fluctuant trend, turned to be pessimistic. Sarkodie and Owusu [3] pointed the economic impacts of COVID-19 are caused also due to the social distancing and found the global pandemic has led to the enhancement of the health system and decline of emissions, but economic development appears deteriorated, air pollution is reported to have declined,

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municipal and medical waste is increasing. The COVID-19 pandemic has created widespread harm and disruption [4]. It is necessary, according to Grabara et al. [5], continue to invest in the environment, which requires a comprehensive approach to overcoming existing obstacles. It is important to take measures at the regulatory, economic, financial and socio-political levels. They ensure the successful creation and subsequent improvement of conditions for the activities of national and international investors to improve the efficiency of energy in the given country. Countries have implemented unprecedented measures to protect the lives and livelihoods of their inhabitants. The scope and composition of these responses are shaped, in part, by research and analysis about the estimated economic impacts of the COVID-19 Pandemic and proposed responses to it [6].

As for the geographical aspect of the coronavirus impact, Ataguba [7] studied area of African economies found that many developed countries are financing COVID-19-related activities in their own countries, which may leave little room for providing relief funds to developing countries. Asian countries are studied as well, see for example Tanaka [8], with evaluation of effectiveness of economic policies of the Asian countries governments. Baycan and Tuysuz [9] determined the factors, differentiating COVID-19 impacts in area of economy and foreign trade in Turkey, different from the other countries, found that individual regions are influenced differently. Aguilar et al. [10] monitored the economic activity in Spain in real time, proving to be helpful to predict COVID-19 recession. As for the comparing between UK and USA, the COVID-19 global pandemic uncertainty ranks the UK as the country with the highest uncertainty level among 143 countries. The USA has introduced 100% of pre-COVID-19 crisis level GDP, the highest policy cut-rate among 162 countries [3]. Salustri [11] made a research, orientated to the Italian production system, found a negative impact of Covid-19 on annual GDP between 5 and 10%. The average impact on annual GDP, however, is the result of heterogeneous shocks affecting most sectors of economic activity. In case of US situation, Famiglietti and Lebovici [12] found that health containment and economic support policies are highly effective at curbing the spread of COVID-19 without leading to a long-term contraction of economic activity. Asante and Mills [13] studied COVID-19 socio-economic impact in Ghana, mainly in area of market places found the necessity to study micro-geographical studies. The situation in Ghana resulted in the increased food prices, the economic hardships associated with the lockdown directive, and the forceful relocation and decongestion exercises to enforce social distancing among traders. COVID-19 pandemic influenced also foreign trade and foreign direct investment found the impacts vary among individual economic sectors, especially in Indonesia [14].

In area of COVID-19 influences to the individual sectors, we can mention for example study by Mofijur et al. [15], made in area of energy sector and waste management. The socio-economic crisis has reshaped investment in energy and affected the energy sector significantly with most investment activity facing disruption due to mobility restrictions. Delays in energy projects are expected to create uncertainty in the years ahead. The most useful results are provided by Goodell [16], which presents most cited work in the literature, comparing the COVID-19 impacts with other epidemics and pandemics. The work emphasized the impacts to the financial markets and financial institutions. Hu and Zhang [17] evaluated COVID-19 impact on single corporate performance, found the performance deteriorated during the pandemic.

Padhan and Prabheesh [18] explore the effects of the pandemic and proposes potential policy directions to mitigate its effects from the view of published literature. Their study indicates the need for greater coordination at national and international levels. Due to the mentioned, the main goal of the contribution is to evaluate the economic condition of Slovakia, Poland, the Czech Republic, Austria, Switzerland, Germany and Hungary during the pandemic period, based on selected economic indicators for the time period before the pandemic 2018, 2019 and the period during the pandemic 2020 and 2021.

3. Methodology

The main goal is to evaluate the economic condition of Poland, the Czech Republic, Austria, Switzerland, Germany, Slovakia and Hungary in the pandemic period, based on selected economic indicators for the period from 2018 to 2021. Economic indicators help assess the overall state of the economy. These indicators include, for example: GDP, inflation, unemployment, public debt, direct wages, and balance of payments [19, 20]. The following contributed to the achievement of the goal:

- Evaluation of the economic condition of selected countries based on economic indicators,
- Statistical evaluation of the connection of economic indicators using correlation and cluster analysis.

To assess the impact, we selected Slovakia, Poland, the Czech Republic, Austria, Switzerland, Germany and Hungary in a narrow circle of countries. Based on the collected data, with the help of statistics, we interpret the results and compare their development before and during the pandemic. The graphs used will show us the development of indicators within Slovakia, then based on the graphs we will show the development of indicators for selected countries. We will use correlation and cluster analysis to display the data. In the last part, we will summarize the results we arrived at based on the statistical methods used.

During the research, we gradually described and analysed economic indicators in selected countries. The following tables show the collected data, which we used to create graphs, hypotheses, correlations and cluster analyses. The data in the tables are collected for the quarters for the years

2018, 2019, which are from the period before the pandemic, and the quarters for the years 2020, 2021, which are during the pandemic [21, 22].

Process of the research is as follows:
1) Detail analysing of the economic indicators for Slovakia,
2) Comparing of the indicators development in chosen countries,
3) Determination of 4 hypothesis, in which to find differences before and during the pandemic,
4) Correlation models for Slovakia before and during the pandemic,
5) Cluster analysis.

In the research, we first collected data in tables, based on which we later devoted ourselves to detailed statistics, hypotheses, correlations, and cluster analyses. In the first part, we analyzed the indicators for Slovakia in detail, later we compared the development of indicators for selected countries, we determined four hypotheses in which we looked for differences before and during the pandemic, we proposed correlation models for Slovakia, and finally we created and described cluster analyses.

2.1. Hypothesis

H1 We assume a difference in the development of GDP in Slovakia in the period before the pandemic 2018-2019 and in the period during the pandemic 2020-2021.

H0: There is no significant difference in the development of GDP in Slovakia in the period before and during the pandemic.

H1: There is a significant difference in the development of GDP in Slovakia in the period before and during the pandemic.

Table 1. Verification of H1 hypothesis – GDP

	p-value	α	comparing	We accept
GDP	0,0316	0,05	p < α	H1

We found that the inequality $p=0.0316 < \alpha$ holds. It follows that we reject the null hypothesis (H0) and accept the alternative hypothesis (H1), which states that there is a significant difference in the development of GDP in Slovakia in the period before and during the pandemic. In the period before the 2018-2019 pandemic, the average GDP is 22,809,712,500 euros, and in the period during the 2020-2021 pandemic, the average GDP is 23,658,025,000 euros. Our assumption is that there is a difference in GDP development in Slovakia in the period before the 2018-2019 pandemic and in the period during the 2020-2021 pandemic.

H2 We assume a difference in the development of unemployment in Slovakia in the period before the pandemic 2018-2019 and in the period during the pandemic 2020-2021.

H0: There is no significant difference in the development of unemployment in Slovakia in the period before and during the pandemic.

H1: There is a significant difference in the development of unemployment in Slovakia in the period before and during the pandemic.

Table 2. Verification of H2 hypothesis – unemployment

	p-value	α	comparing	We accept
Unemployment	0,0031	0,05	p < α	H1

We found that the inequality $p=0.0031 < \alpha$ holds. It follows that we reject the null hypothesis (H0) and accept the alternative hypothesis (H1), which states that there is a significant difference in the development of unemployment in Slovakia in the period before and during the pandemic. In the period before the 2018-2019 pandemic, the average unemployment is 6.35%, and in the period during the 2020-2021 pandemic, the average unemployment is 7.86%. Our assumption is that there is a difference in the development of unemployment in Slovakia in the period before the 2018-2019 pandemic and in the period during the 2020-2021 pandemic.

H3 We assume a difference in the development of inflation in Slovakia in the period before the pandemic 2018-2019 and in the period during the pandemic 2020-2021.

H0: There is no significant difference in the development of inflation in Slovakia in the period before and during the pandemic.

H1: There is a significant difference in the development of inflation in Slovakia in the period before and during the pandemic.

Table 3. Verification of H3 hypothesis – inflation

	p-value	α	comparing	We accept
Inflation	0,9875	0,05	p > α	H0

We found that the inequality $p=0.9875 > \alpha$ holds. It follows that we accept the null hypothesis (H0), which says that there is no significant difference in the development of inflation in Slovakia in the period before and during the pandemic. In the period before the 2018-2019 pandemic, the average inflation is 2.59%, and in the period during the 2020-2021 pandemic, the average inflation is 2.58%. Our assumption that there is a difference in the development of inflation in Slovakia in the period before the 2018-2019 pandemic and in the period during the 2020-2021 pandemic is not valid.

H4 We assume a difference in the development of public debt in Slovakia in the period before the pandemic 2018-2019 and in the period during the pandemic 2020-2021.

H0: There is no significant difference in the development

of public debt in Slovakia in the period before and during the pandemic.

H1: There is a significant difference in the development of public debt in Slovakia in the period before and during the pandemic.

Table 4. Verification of H4 hypothesis – public debt

	p-value	α	comparing	We accept
Public debt	0,0001	0,05	p < α	H1

We found that the inequality p=0.0001 < α holds. It follows that we reject the null hypothesis (H0) and accept the alternative hypothesis (H1), which states that there is a significant difference in the development of public debt in Slovakia in the period before and during the pandemic. In the period before the 2018-2019 pandemic, the average public debt is 45,073,407 euros, and in the period during the 2020-2021 pandemic, the average public debt is 55,268,236 euros. Our assumption is that there is a difference in the development of public debt in Slovakia in the period before the 2018-2019 pandemic and in the period during the 2020-2021 pandemic.

2.2. Correlation analysis

We investigated whether there is a correlation between the monitored indicators in Slovakia before the 2018-2019 pandemic and during the 2020-2021 pandemic. We assess the quality (strength, tightness) of the selected regression function between the variables using correlation analysis. Its task is therefore to assess the tightness of the statistical dependence between the investigated variables. The pairwise correlation coefficient (correlation coefficient) ρ_{xy} or also known as Pearson's correlation coefficient measures the tightness of the two-way linear relationship between two random variables X and Y, when applying:

$\rho_{xy}=0$ - variables X and Y are not linearly dependent;

$\rho_{xy}>0$ - there is a direct linear relationship between variables X and Y;

$\rho_{xy}<0$ - there is an indirect linear dependence between variables X and Y.

The correlation coefficient takes values from the interval $\langle-1; 1\rangle$, and the closer the absolute value is to 1, the closer the linear dependence. The point estimate of the correlation coefficient ρ_{xy} is the sample pairwise correlation coefficient r_{xy}, for which the following applies: Rimarčík (2000) interprets the correlation coefficient as follows: below 0.1 - trivial correlation, 0.1-0.29- small correlation, 0.3-0, 49- medium correlation, 0.5-0.69- high correlation, 0.7- 0.89- very high correlation and 0.9 and above- almost perfect correlation.

2.3. Results

The results of correlation analysis in Slovakia compared before and during the pandemic, are given in Table 5, 6.

Table 5. Correlation analysis – Slovakia before pandemic

			Before pandemic 2018 – 2019					
			GDP	Unemploy-ment	Inflation	Average wages	Public debt	Payment balance
Before pandemic 2018- 2019	GDP	Pearson Correlation	0,587	0,520	0,491	,726	,909	-0,243
		Sig. (2-tailed)	0,126	0,187	0,217	0,041	0,002	0,561
		N	8	8	8	8	8	8
	Unemploy-ment	Pearson Correlation	-0,685	-0,669	-0,281	-,772	-,890	0,191
		Sig. (2-tailed)	0,061	0,070	0,501	0,025	0,003	0,650
		N	8	8	8	8	8	8
	Inflation	Pearson Correlation	0,187	0,009	0,610	0,236	0,570	-0,313
		Sig. (2-tailed)	0,658	0,983	0,109	0,573	0,140	0,450
		N	8	8	8	8	8	8
	Average wages	Pearson Correlation	0,702	0,375	0,586	,970	,762	-0,348
		Sig. (2-tailed)	0,052	0,360	0,127	0,000	0,028	0,398
		N	8	8	8	8	8	8
	Public debt	Pearson Correlation	-0,109	0,427	-0,021	-0,083	0,508	0,411
		Sig. (2-tailed)	0,797	0,292	0,961	0,845	0,199	0,311
		N	8	8	8	8	8	8

	Pearson Correlation	-,710	-0,342	-0,288	-0,605	-0,525	0,246
Payment balance	Sig. (2-tailed)	0,048	0,407	0,489	0,112	0,181	0,557
	N	8	8	8	8	8	8

We have confirmed a significant correlation between GDP before the 2018-2019 pandemic and average wages during the 2020-2021 pandemic (r=0.726; p=0.041; very high correlation) and between GDP before the 2018-2019 pandemic and public debt during the 2020-2021 pandemic (r=0.909; p=0.002; almost perfect correlation). Furthermore, a significant correlation was confirmed between the balance of payments before the 2018-2019 pandemic and the GDP during the 2020-2021 pandemic (r=-0.710; p=0.048; very high correlation). A significant correlation was also confirmed between average wages before the 2018-2019 pandemic and average wages during the 2020-2021 pandemic (r=0.970; p<0.001; almost perfect correlation) and between average wages before the 2018-2019 pandemic and public debt during the 2020-2021 pandemic. (r=0.762; p=0.028; very high correlation).

Table 6 Correlation analysis – Slovakia during pandemic

			During pandemic 2020 – 2021					
			GDP	Unemploy-ment	Inflation	Average wages	Public debt	Payment balance
During pandemic 2020 – 2021	GDP	Pearson Correlation	1	0,159	0,585	0,809	0,521	-0,300
		Sig. (2-tailed)		0,706	0,128	0,015	0,185	0,471
		N	8	8	8	8	8	8
	Unemploy-ment	Pearson Correlation	0,159	1	-0,383	0,298	0,711	0,540
		Sig. (2-tailed)	0,706		0,349	0,473	0,048	0,167
		N	8	8	8	8	8	8
	Inflation	Pearson Correlation	0,585	-0,383	1	0,637	0,346	-0,771
		Sig. (2-tailed)	0,128	0,349		0,090	0,401	0,025
		N	8	8	8	8	8	8
	Average wages	Pearson Correlation	,809*	0,298	0,637	1	,718*	-0,429
		Sig. (2-tailed)	0,015	0,473	0,090		0,045	0,289
		N	8	8	8	8	8	8
	Public debt	Pearson Correlation	0,521	0,711	0,346	0,718	1	-0,067
		Sig. (2-tailed)	0,185	0,048	0,401	0,045		0,874
		N	8	8	8	8	8	8
	Payment balance	Pearson Correlation	-0,300	0,540	-0,771	-0,429	-0,067	1
		Sig. (2-tailed)	0,471	0,167	0,025	0,289	0,874	
		N	8	8	8	8	8	8

2.4. Cluster analysis

The cluster analysis of unemployment in selected countries in the years 2018-2022 shows two clusters in hierarchical clustering (see Figure 1). Ward′s method proved to be the best clustering method. Characteristic of this analysis is the decomposition of the file into several homogeneous subsets. Statistical units in one cluster are as similar as possible and statistical units of different clusters are as different as possible.
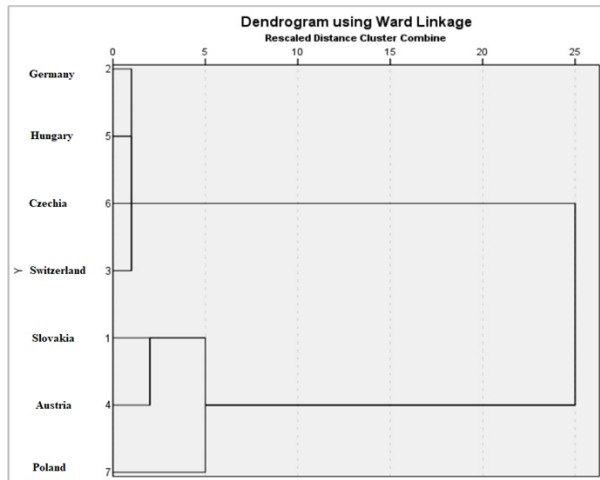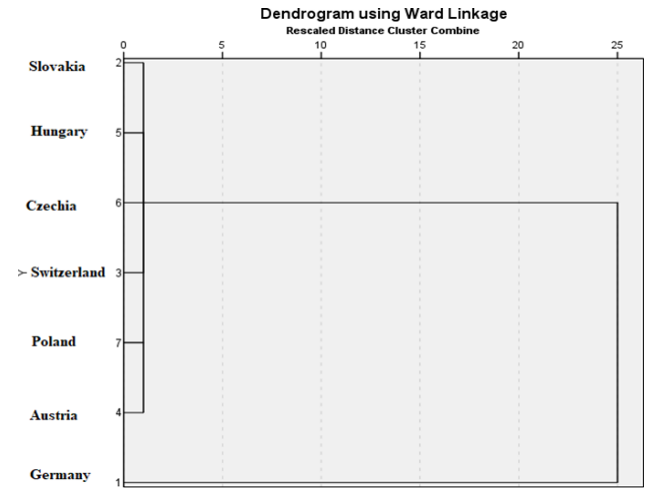
Figure 1. Dendogram – unemployment

Figure 2. Dendogram – GDP

In the first cluster, we see the most similar countries with regard to the development of unemployment between 2018 and 2021. The most similar countries are Germany and Hungary. Subsequently, the closest to them is the Czech Republic, and in the third step of clustering, the closest to them is Switzerland. The second cluster is made up of Slovakia, Austria and Poland. In the fourth step of clustering, Slovakia is clustered with Austria. In the fifth step of clustering, Poland is clustered with them. In the sixth and last step of clustering, these two clusters are clustered (cluster 1 consists of the countries Germany, Hungary, the Czech Republic and Switzerland, cluster 2 consists of Slovakia, Austria and Poland). We can see the described hierarchical clustering on the above-mentioned dendogram (Table 7).

In the first step of clustering, Slovakia and Hungary are closest to each other. In the second step of clustering, the closest to these countries is the Czech Republic. In the third step of clustering, Switzerland and Poland are closest to each other. In the fourth clustering step, Austria is closest to Switzerland and Poland. In the fifth step of clustering, they create countries Slovakia, Hungary, the Czech Republic, Poland, Austria and Switzerland form one cluster, to which Germany will be added in the sixth clustering step. From the dendogram we can see that the development of Germany's GDP in 2018-2021 is the furthest from the GDP development of the other monitored countries. The agglomeration schedule for GDP cluster analysis is given in Table 8.

Table 8. Cluster analysis – GDP

Agglomeration Schedule						
	Cluster Combined			Stage Cluster First Appears		Next Stage
Stage	Cluster 1	Cluster 2	Coefficients	Cluster 1	Cluster 2	
1	2	5	1276837663318761500000	0	0	2
2	2	6	8666738074010968000000	1	0	5
3	3	7	16486026004510970000000	0	0	4
4	3	4	44108987188677645000000	3	0	5
5	2	3	253359724024701400000000	2	4	6
6	1	2	847222485347974000000000000	0	5	0

The cluster analysis of average wages in selected countries in the years 2018-2022 shows two clusters in hierarchical clustering. Ward′s method proved to be the best clustering method.
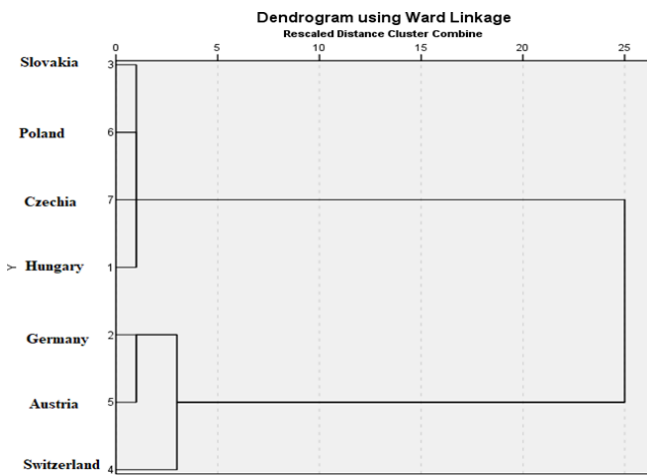
Table 7. Cluster analysis – unemployment

Agglomeration Schedule						
	Cluster Combined			Stage Cluster First Appears		Next Stage
Stage	Cluster 1	Cluster 2	Coefficients	Cluster 1	Cluster 2	
1	2	5	,847	0	0	2
2	2	6	2,453	1	0	3
3	2	3	10,290	2	0	6
4	1	4	28,660	0	0	5
5	1	7	90,138	4	0	6
6	1	2	454,915	5	3	0

The cluster analysis of GDP in selected countries in the years 2018-2022 in hierarchical clustering shows two clusters. Ward′s method proved to be the best clustering method (see Figure 2).

Figure 3. Dendogram- Average wages

Figure 4. Dendogram- Payment balance

The hierarchy of clustering of the development of average wages in the years 2018-2021 (Figure 3; Table 9) has six steps. In the first step, the closest countries, namely Slovakia and Poland, were grouped together. In the second step, Germany and Austria are closest to each other. In the third step of clustering, the Czech Republic is closest to Slovakia and Poland. In the fourth step, Hungary joins these countries. In the fifth clustering step, Switzerland is clustered with the countries of Germany and Austria. In the last step, these two clusters are clustered (cluster 1 represents the countries of Slovakia, the Czech Republic, Poland and Hungary, cluster 2 represents the countries of Germany, Austria and Switzerland).

In the case of the development of the balance of payments in the years 2018-2021 (see Figure 4; Table 10), clustering occurred as follows: in the first step, Slovakia and Hungary were closest to each other. In the second step of clustering, Austria and the Czech Republic are closest to each other. In the third step of clustering, a cluster of Slovakia and Hungary with Austria and the Czech Republic will be created. In the fourth step, Austria is assigned to this cluster, and in the fifth clustering step, Switzerland. Germany is the last to join these countries.

Table 9. Cluster analysis – average wages

Agglomeration Schedule						
	Cluster Combined			Stage Cluster First Appears		
Stage	Cluster 1	Cluster 2	Coefficients	Cluster 1	Cluster 2	Next Stage
1	3	6	28590,000	0	0	3
2	2	5	100761,571	0	0	5
3	3	7	737697,571	1	0	4
4	1	3	2438977,205	0	3	6
5	2	4	37160387,696	2	0	6
6	1	2	330865422,299	4	5	0

Table 10. Cluster analysis – payment balance

Agglomeration Schedule						
	Cluster Combined			Stage Cluster First Appears		
Stage	Cluster 1	Cluster 2	Coefficients	Cluster 1	Cluster 2	Next Stage
1	2	4	5289925589804,532	0	0	3
2	6	7	32849690310706,645	0	0	3
3	2	6	100571244695260,720	1	2	4
4	2	5	178339433010938,780	3	0	5
5	2	3	2537460420886214,500	4	0	6
6	1	2	52162528715054232,000	0	5	0

The cluster analysis of the balance of payments in selected countries in the years 2018-2022 shows two clusters in hierarchical clustering. Ward′s method proved to be the best clustering method.
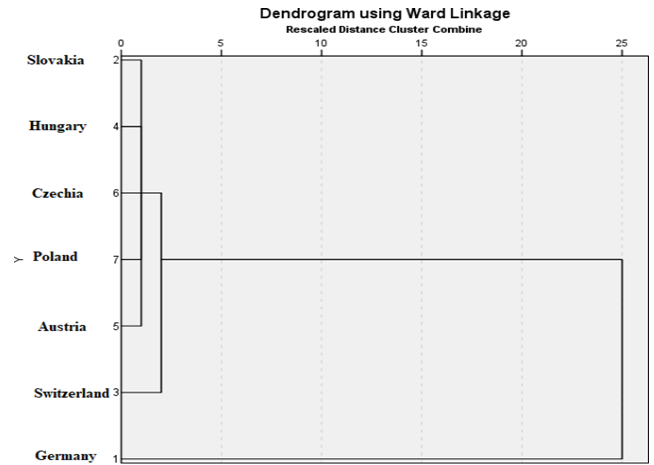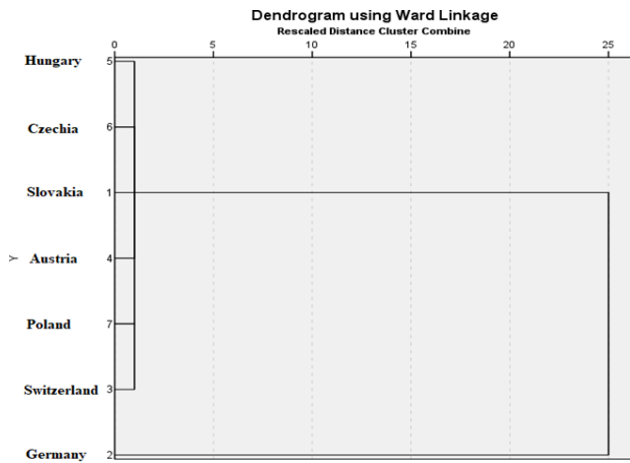
The cluster analysis of the development of public debttz in selected countries in the years 2018-2022 shows two clusters in hierarchical clustering. Ward′s method proved to be the best clustering method.

Figure 5. Dendogram – Public debt

Figure 6. Dendrogram- Inflation

When it comes to public debt (Figure 5; Table 11), according to the cluster analysis, Hungary and the Czech Republic are next to each other. In the second step of clustering, Slovakia is closest to Hungary and the Czech Republic. In the third step of clustering, Austria and Poland are closest to each other. In the fourth step of clustering, Switzerland will join Austria and Poland. In the fifth step of clustering countries such as Hungary, the Czech Republic, Poland, Slovakia, Austria and Switzerland. Germany will be the last to join them in the sixth clustering step.

In the cluster analysis of the Inflation indicator (Figure 6; Table 12), three clusters were formed. The first cluster is represented by countries such as Austria, Germany, Slovakia and the Czech Republic, the second cluster is represented by Hungary and Poland, and the third cluster is the size of one country, namely Switzerland. The gradual clustering of individual countries is shown below in Table 6. Germany and Austria are closest to each other. The development of inflation in Switzerland is the most distant compared to other countries.

Table 11. Cluster analysis – public debt

Agglomeration Schedule						
	Cluster Combined			Stage Cluster First Appears		
Stage	Cluster 1	Cluster 2	Coefficients	Cluster 1	Cluster 2	Next Stage
1	5	6	3496720945430000	0	0	2
2	1	5	19820674789098464	0	1	5
3	4	7	36809298211745664	0	0	4
4	3	4	124899493515254736	0	3	5
5	1	3	870361298126453760	2	4	6
6	1	2	57836963829543940000	5	0	0

The cluster analysis of inflation in selected countries in the years 2018-2022 shows two clusters in hierarchical clustering. Ward′s method proved to be the best clustering method.
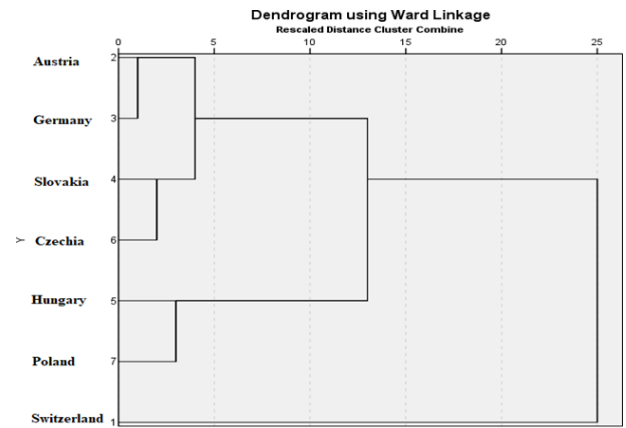
Table 12. Cluster analysis – inflation

Agglomeration Schedule						
	Cluster Combined			Stage Cluster First Appears		
Stage	Cluster 1	Cluster 2	Coefficients	Cluster 1	Cluster 2	Next Stage
1	2	3	4,028	0	0	4
2	4	6	11,871	0	0	4
3	5	7	23,232	0	0	5
4	2	4	41,136	1	2	5
5	2	5	89,098	4	3	6
6	1	2	180,549	0	5	0

2.5. Discussion

In the case of unemployment in Slovakia in the first quarter of 2018, unemployment was 6.90% and decreased to 6.20% in the 4th quarter of 2019. Subsequently, unemployment during the pandemic increased to 8.50% in the 1st quarter of 2021. Then it started to decline and in the 4th quarter of 2021, it reached 7.60%, which is 0.7% more than before the start of the pandemic. Similarly, in Slovakia, we see the impact of the pandemic on the development in indicators such as GDP, inflation, public debt and balance of payments [23].

This assumption would correspond to the first three quarters of 2020. Subsequently, there was an increase in the

average wage, and in the 4th quarter of 2021 - during the pandemic, the average wage was 226 EUR higher than in the 4th quarter of 2019 - before the pandemic. We verified the impact of the pandemic on GDP, unemployment, inflation and public debt through statistical analysis. We have confirmed the significant impact of the pandemic on the development of GDP, unemployment and public debt. In the case of inflation, we did not confirm the significant impact of the pandemic on its development. In the season before the 2018-2019 pandemic, the average inflation is 2.59%, and during the 2020-2021 pandemic, the average inflation is 2.58%. Correlation analysis confirmed a significant dependence in Slovakia between GDP before the 2018-2019 pandemic and average wages during the 2020-2021 pandemic, between GDP before the 2018-2019 pandemic and public debt during the 2020-2021 pandemic, between the balance of payments before the 2018-2019 pandemic and GDP during the 2020-2021 pandemic. A significant correlation was also confirmed between average wages before the 2018-2019 pandemic and average wages during the 2020-2021 pandemic and between average wages before the 2018-2019 pandemic and public debt during the 2020-2021 pandemic. Using cluster analysis, we determined the similarity of the development of selected indicators in the monitored countries.

The second cluster was formed by Slovakia, Austria and Poland. In the case of GDP, we found that Germany had the most distant GDP development from other countries and formed a separate cluster. The second cluster with similar wage trends is represented by countries such as Germany, Austria and Switzerland. In the case of the balance of payments, Germany was once again the most distant from the other monitored countries. Likewise, Switzerland was further away from countries such as Slovakia, Poland, Hungary, the Czech Republic and Austria, but its balance of payments development in the monitored period was closer to these countries than to Germany. Also in the case of public debt, the cluster analysis points to a different development of public debt in Germany compared to the other monitored countries. In the case of inflation, the cluster analysis created several clusters for us. In terms of inflation, Austria and Germany are the closest. Subsequently, based on the similarity of the development of inflation, Slovakia and the Czech Republic, Hungary and Poland were grouped together. Switzerland was the most distant among the monitored countries in the development of inflation. Subsequently, Austria, Germany and Slovakia, the Czech Republic were close to each other in terms of inflation development. Hungary and Poland were subsequently added to these four countries.

4. Conclusion

An economic indicator is a piece of economic data, usually macroeconomic in scope that analysts use to interpret current or future investment opportunities.

Significant changes in economic indicators can be observed if a political or economic crisis occurs, which can significantly affect the functioning of economies. Such changes were brought about by the Covid-19 pandemic. In the contribution, we focused on the comparison of economic indicators in the period before and during the pandemic. The main goal was to evaluate the economic condition of Slovakia, Poland, the Czech Republic, Austria, Switzerland, Germany and Hungary during the pandemic period, based on selected economic indicators for the period from 2018 to 2021. We set partial goals, which were to evaluate the economic condition of selected countries based on economic indicators, to evaluate the connection of economic indicators using correlation and cluster analysis.

The analysis of the development of selected indicators in Slovakia registers changes in the period before the 2018-2019 pandemic and during the 2020-2021 pandemic. The surprise is the development of the average wage in Slovakia, where we expected stagnation at the time of the pandemic. Similarly, the analysis of the development in the other monitored countries (Poland, Czech Republic, Hungary, Austria, Germany, and Switzerland) demonstrated the impact of the pandemic on selected indicators.

In the case of unemployment, we found a similarity in the development of unemployment between Germany, Hungary, the Czech Republic and Switzerland. In the case of GDP, we found that Germany had the most distant GDP development from other countries. Average wages had a similar development in Slovakia, Poland, the Czech Republic and Hungary. In the case of the balance of payments, Germany was once again the most distant from the other monitored countries. Also in the case of public debt, the analysis points to a different development of public debt in Germany compared to the other monitored countries [24].

The results of the contribution can be used to define possible solutions for reducing the impacts of the Covid-19 pandemic and post-pandemic challenges in the future. This report will benefit governments, leaders, firms and customers in addressing a pandemic-like situation in the future.

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