THE INFLUENCE OF THE COVID-19 PANDEMIC CRISIS ON THE REAL CONVERGENCE OF THE MEMBER STATES OF THE EUROPEAN MONETARY UNION

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Abstract

In this scientific paper, we will start from the COVID-19 pandemic crisis and try to highlight how the real convergence of the euro area member states was influenced during this period as a result of the implementation of various measures to limit economic activities. We propose to create an aggregate index of real convergence, starting from the theory of optimal monetary zones. After the construction of this index, we propose to calculate an index value for all 20 member states of the European Monetary Union (including Croatia), in the period 2011-2022. Our aim is to observe how real convergence in the euro area has been influenced during the COVID-19 pandemic crisis. Something that can be easily concluded from the results obtained. At the end of the article, we manage to classify the member states of the European Monetary Union into 3 large clusters, depending on how their convergence index is compared to that of the euro zone average.

Keywords*: convergence index; COVID-19; economic crisis; Eurozone; pandemic crisis; real convergence.*
JEL Classification*: E320; E520; F450; F150*

Introduction

The European Monetary Union is a structure created primarily by political decisions. In theory, to join this union, states must meet nominal convergence criteria, established through the Maastricht Treaty. The nominal convergence criteria refer to the following milestones: public debt, budget deficit, inflation rate, nominal long-term interest rate and stability of the exchange rate between the national currency of the state that wants to join and the euro. From previous scientific research, but also from the specialized literature, we could observe that the criteria of real convergence are equally important.

In order to have economic stability within the union, we must also take into account indicators such as: the unemployment rate, the GDP per capita, trade openness, the price index. The desynchronization of the economies of the member states of the euro zone by abandoning the convergence criteria or by establishing numerous derogations to not comply with the nominal convergence criteria at the time of accession, led to a series of crises that affected the European Monetary Union to a greater or lesser extent.

One of the most recent crises is the COVID-19. The pandemic crisis felt in the European Monetary Union during 2020-2022 also led to effects in the economic area.

The COVID-19 crisis, triggered by the emergence and global spread of the SARS-CoV-2 virus, had a significant impact on the world economy. This unprecedented pandemic has brought with it a series of devastating economic consequences, transforming the global economic landscape and causing significant changes in the way economic systems operate.

Since the outbreak of the pandemic, governments around the world have been forced to take severe measures to restrict mobility and social distancing to slow the spread of the virus. However, these measures, necessary to protect public health, had an immediate impact on economic activities. Temporary business closures, event cancellations and travel restrictions have disrupted supply chains, reduced demand and significantly reduced global economic activity.

One of the first sectors affected was the tourism and hospitality industry. With travel restrictions and border closures, international travel has fallen sharply, and hotels, restaurants and other tourism-related businesses have been hit hard. Many jobs were lost in this sector and the negative economic impact was felt around the world.

At the same time, the closing of factories and non-essential businesses led to a significant increase in unemployment. Many people lost their sources of income and household incomes dropped drastically. This had a direct impact on domestic demand as consumers reduced their spending and focused their resources on basic necessities only.

The financial sector was also heavily affected by the crisis. The stock market experienced spectacular falls, and investors reassessed their strategies in the context of economic uncertainty. Companies suffered significant losses, and many were forced to cut staff or even close permanently.

In order to mitigate the economic impact of the pandemic, governments around the world have adopted fiscal and monetary stimulus measures to be able to lessen the negative effects on the economy. From the study of the current specialized literature, we have noticed that there are few scientific works that address the effects of the pandemic on the real convergence of the euro zone states. Moreover, we have not identified an index of real convergence to be used in the study of the effects of the pandemic crisis on the economy. Our aim is to observe how real convergence in the euro area has been influenced during the COVID-19 pandemic crisis. The results of this article can be used by researchers in the field of economic crises to be able to continue with a deepening of this research. At the same time, the results can be used by political decision-makers to be able to avoid taking social protection measures in the future that can negatively influence the economy in the long term.

Background

In the study of the specialized literature, we identified an important component dedicated to the theory of optimal monetary zones. National economies must be protected in the perspective of the emergence of asymmetric shocks as a result of the abandonment of national monetary policy. These protection methods are actually the real convergence criteria. Unlike the nominal convergence criteria, established through the Maastricht Treaty (1992), the real convergence criteria are not imposed standards, but they result from the ability of states to synchronize their economies with those of other member states. We have identified in the specialized literature several examples of real

convergence criteria: the mobility of production factors (Mundell, 1961), the level of economic openness of states (McKinnon, 1963), the degree of diversification of national production (Kenen, 1969), the degree of financial integration (Ingram, 1973), the comparative level of inflation compared to the other member states (Fleming, 1971), the political will, the price index, etc.

According to the research carried out by Alesina et al. (2002), countries that show a close correlation between their incomes and prices and between theirs and those of other states in the union, react favorably to abandoning their own monetary policy in favor of a common one.

In the study of real convergence, we focused on 4 economic indicators, the most common in the specialized literature when it comes to real convergence: GDP per capita (Davies, 2011; Kaitila, 2013); unemployment rate (Mundell, 1961; Davies, 2011; Sensier et al., 2016; Ferreiro et al., 2017); price index (Mundell, 1961; Fleming, 1971; Williamson, 1974); trade openness (Mundell, 1961; McKinnon, 1963; Kindleberger, 1971; Corsetti et al., 2020).

According to Mundell's (1961) theory, the optimal level of a currency area refers to an efficient combination of price stability, employment and trade. He believes that the optimal level of a currency area is determined by the ability of a member of the monetary union to maintain price stability and achieve maximum labor utilization, provided there is a balance in foreign trade. Mundell argues that labor mobility plays a crucial role in defining optimal currency areas, as it can stabilize the economy by partially taking over the role of the exchange rate.

However, there are many objections to this theory because labor mobility is not the only determining factor in the formation of a monetary union. Kindleberger (1971), for example, argues that a strong integration of commodity markets is a prerequisite for any economy wishing to be part of an optimal currency area. According to his opinion, the more commodity markets are integrated between national economies, the more similar production structures become and the conditions for intra-industry trade are created. Thus, Kindleberger highlights the importance of the integration of goods markets in determining the viability of a monetary union, thereby arguing in his support against the exclusivist view of labor mobility as the only relevant factor.

The year 2020 brought a new challenge for the entire world economy. This year marks the beginning of one of the most significant crises of the last century. We are referring here to the pandemic crisis, which also had harmful effects on the world economy. In order to reduce the effects of the COVID-19 pandemic, states resorted to radical measures. Thus, some economic sectors suffered greatly, activities being extremely restricted. Moreover, some states also resorted to lock-down periods, which meant a total freeze of the economy, with the exception of essential sectors. All these measures had different effects on each state, but overall they influenced economic development and interfered with the goal of common economic convergence. During the pandemic period, states abandoned the convergence criteria, in an attempt to protect their population and national economy as best as possible.

Methods

The purpose of this scientific article is to analyze what happened to the target of the euro area member states to tend towards a real convergence, in the context of the emergence of the pandemic crisis COVID-19.

In order to achieve the proposed goal, we have established a series of objectives that we want to follow throughout the realization of this research:

1. Creating an aggregate index of real convergence.
2. Calculation of the aggregate index of real convergence for each member state of the European Monetary Union
3. Analysis of the evolution of the aggregate index of real convergence in the selected period and identification of the effects of the pandemic crisis on this evolution.

In the following, we will give a brief description of the methodology used in the design of this scientific article. First of all, we selected the 20 member states of the European Monetary Union (including Croatia that only joined on January 1, 2023), for which we collected statistical data from Eurostat, for the period 2011-2022. We chose 2011 as the starting year, because we wanted the data not to be influenced by the economic crisis of 2008.

After identifying the time period under investigation, we decided to construct an index of real convergence. In its construction, we limited ourselves to the four indicators identified in the specialized literature: GDP per capita, unemployment rate, economic openness and price index.

To create this aggregate index of real convergence, we used the methodology proposed by Nardo et al. (2008). In other words, this index is calculated as weighted averages using the loading scores of the extracted principal components using Panel Principal Components analysis. So, for each indicator we calculated weights using the squared loadings in the variance explained by each component:

$$I_i = \frac{1}{v}\sum_{j=1}^{v} x_{ij} w_j$$

$$w_j = \sum_{m=1}^{M}\left[\frac{Explained\ \text{var}\,iance_m \left(loading_{j.m}\right)^2}{\sum_{l=1}^{M} Explained\ \text{var}\,iance_l \sum_{n=1}^{v}\left(loading_{n,m}\right)^2}\right]$$

Where:

M - is the number of components selected and loaded

j,m - is the loading score of variable j for component m and is zero when the variable does not contribute to the formation of the component. The criterion considered for selecting the number of components, M, is that its eigenvalues are greater than 1.

After calculating the new weights, we normalized the variables using the min-max method, as follows:

$$x_{norm_i} = \frac{x_i - x_{\min}}{x_{\max} - x_{\min}}$$

Following the normalization of the variables, we reached the following results, which we will use in the calculation of the aggregate index of real convergence, for each member state of the European Monetary Union.

Results and discussion

This article adds value to the specialized literature by creating the aggregate index of real convergence and by analyzing its fluctuation during the COVID-19 crisis. After calculating the composition of the aggregate nominal convergence index using the methodology, we reached the following values:

Table 1. Variables' weights for the real convergence index

Variable	Weights
GDP per capita	0.4349
Unemployment rate	0.1170
Price index	0.0163
Trade openness	0.4316

Source: Developed by authors based on the research in May 2023

We can see from the previous table that GDP per capita and economic openness have the greatest weight in the composition of the real convergence index. Both indicators are located at a percentage of 43% of the composition of the index. In the order of weight in the index, the unemployment rate follows, and the least significant indicator of the real convergence included in the composition is the price index, which represents only 1.63%.

In the following, we calculated for each member state of the European Monetary Union a value of the aggregate index of real convergence, using the weights of the indicators calculated in table number 1. We applied the calculation both for the 20 member states and for the euro zone average per assembly. We follow two directions in the interpretation of the data. First of all, the higher the aggregate index of real convergence, the more the respective state tends to improve convergence by increasing economic development. On the other hand, we also have to look at the eurozone average, the bigger the differences between the eurozone index and that of a state, the more efforts must be made by that state to tend to the average.

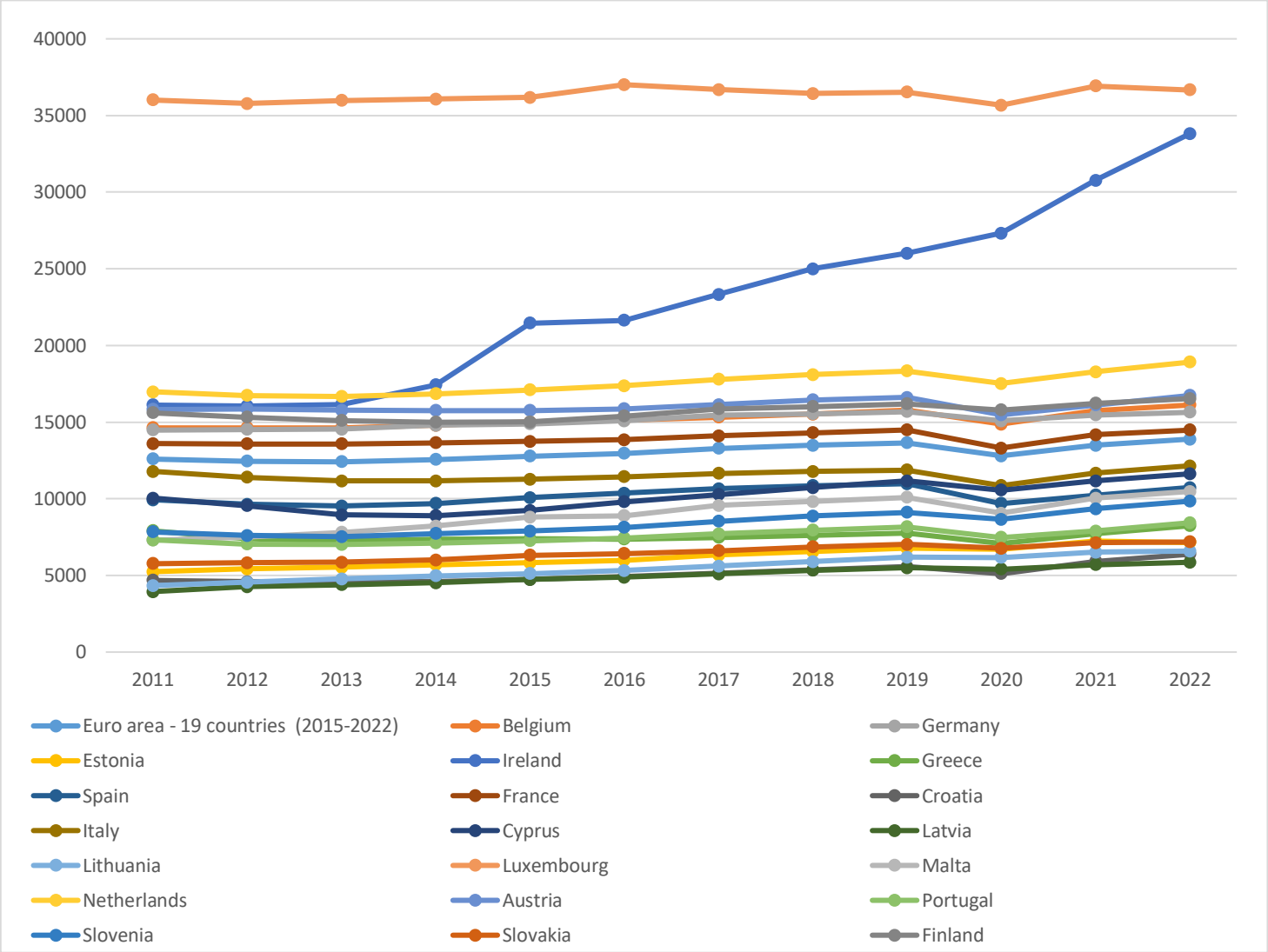
Table 2: Aggregate index of real convergence within the member states of the European Monetary Union

TIME	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Euro area -	12593,45698	12459,67721	12407,47	12560	12774,08	12969,36	13279,6	13484,83	13654,8	12799,84	13481,64	13891,82
Belgium	14623,52188	14636,29973	14635,13	14800,84	15011,97	15126,48	15316,8	15517,33	15781,61	14865,28	15737,52	16116,13
Germany	14477,43188	14512,79434	14533,95	14790,32	14882,32	15090,45	15439,44	15544,34	15674,48	15079,92	15470,62	15644,8
Estonia	5245,698622	5434,061372	5527,829	5707,714	5821,022	5990,478	6332,818	6553,907	6766,06	6707,435	7241,659	7143,915
Ireland	16114,30342	16050,60854	16149,57	17424,94	21453,32	21645,51	23320,78	24998,18	26013,59	27320,7	30774,71	33804,73
Greece	7912,183554	7397,370948	7263,137	7351,565	7381,367	7376,387	7475,18	7617,963	7770,803	7083,505	7725,987	8238,007
Spain	9931,303716	9632,437274	9533,004	9694,581	10072,89	10372,59	10660,68	10856,65	10982,43	9687,932	10230,76	10727,99
France	13600,86394	13579,58915	13584,04	13649,58	13745,82	13845,53	14102,87	14294,88	14490,43	13313,07	14175,88	14485,25
Croatia	4680,904616	4585,991914	4582,712	4588,912	4734,685	4943,84	5163,309	5359,759	5573,564	5120,67	5922,605	6380,574
Italy	11781,2729	11403,34048	11168,22	11168,48	11273,28	11438,05	11652,58	11783,77	11870,54	10859,48	11676,2	12151,44
Cyprus	10039,66551	9549,32842	8948,809	8892,269	9247,158	9808,728	10273,48	10721,5	11157,78	10562,9	11157,03	11628,12
Latvia	3944,990182	4267,959196	4396,889	4522,982	4734,733	4885,471	5096,315	5335,373	5507,863	5416,126	5703,848	5858,847
Lithuania	4337,536516	4562,395532	4771,093	4974,136	5115,712	5309,565	5614,137	5894,055	6181,442	6172,034	6515,247	6589,637
Luxembour	36010,04276	35772,25408	35976,19	36064,36	36172,1	37010,25	36695,04	36424,85	36518,52	35673,81	36914,41	36673,76
Malta	7294,04061	7521,533102	7809,394	8219,636	8794,487	8887,306	9567,441	9811,185	10093,26	9052,655	10039,76	10479,78
Netherlands	16972,47709	16740,68002	16671,38	16845,58	17105,49	17379,83	17782,96	18097,25	18326,21	17517,94	18274,37	18913,71
Austria	15834,14853	15873,39547	15781,62	15759,7	15763,6	15871,77	16130,08	16440,14	16614,05	15475,76	16119,87	16736,97
Portugal	7305,668276	7041,940518	7016,752	7108,841	7265,394	7434,38	7714,779	7950,367	8159,176	7471,904	7893,685	8435,825
Slovenia	7833,910214	7613,595	7527,289	7728,146	7889,258	8132,934	8524,458	8873,988	9103,474	8650,12	9339,281	9843,07
Slovakia	5763,584622	5832,40926	5865,144	6011,502	6316,759	6427,03	6606,971	6859,86	7018,042	6772,479	7131,845	7179,404
Finland	15609,84082	15318,76532	15109,17	14990,5	15019,82	15397,94	15856,36	16014,23	16193,12	15785,24	16236,51	16533,73

Source: Developed by authors based on the research in May 2023

In order to better observe the obtained results, we chose to transpose the data from table 2 into two distinct graphs.

Figure 1: The evolution of real convergence in the euro area, in the period 2011-2022



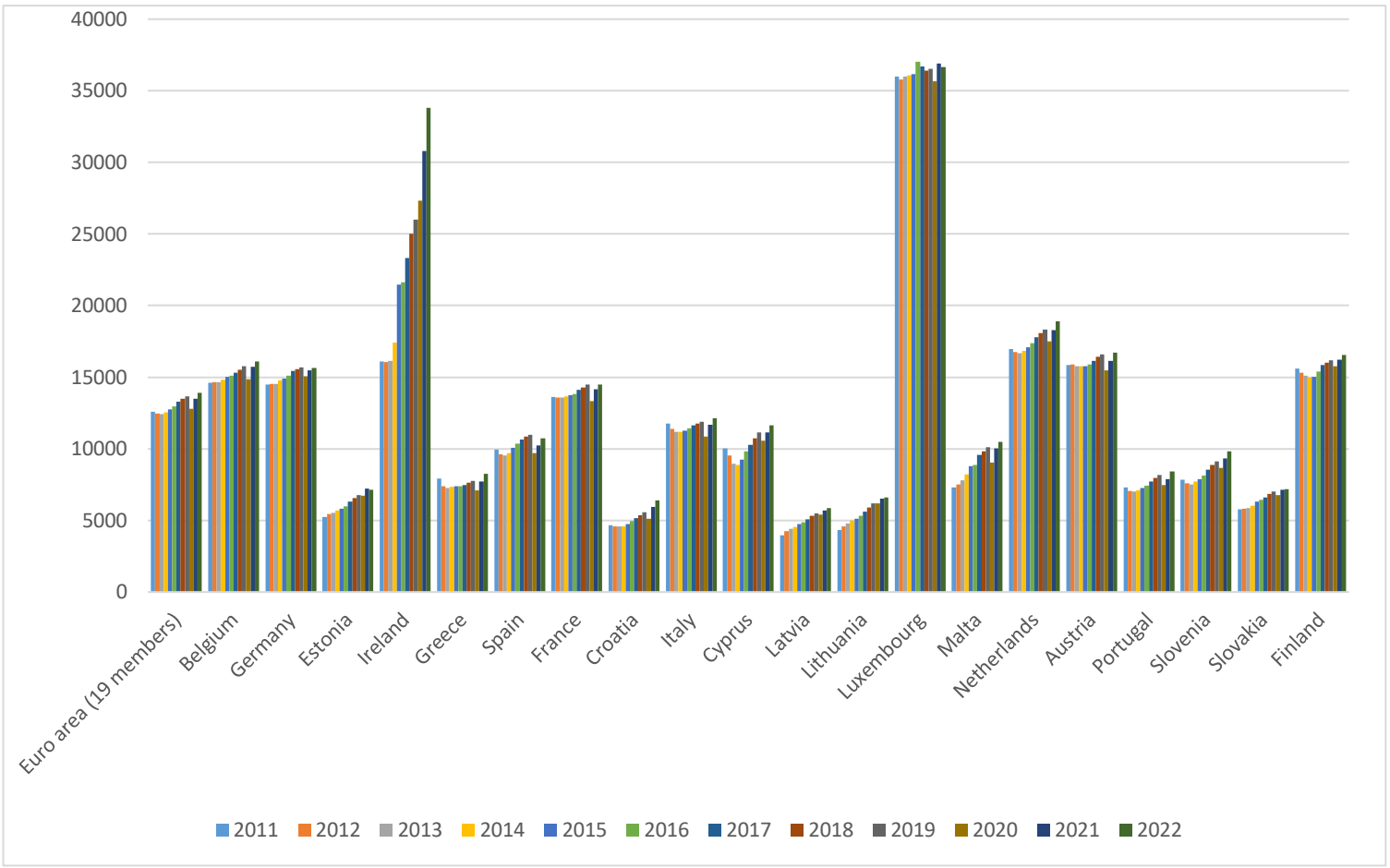
Source: Developed by authors based on the research in May 2023

In the first graph, we have chosen to put all 20 member states of the European Monetary Union and the average of the euro area in the form of a time series. As we can see, for most of the states, the period 2011-2019 means an increase in the aggregate index of real convergence. It should be noted that the year 2020, the year of the onset of the pandemic crisis, marks a decrease in the value of the aggregate index of real convergence. The only state that stands out is Ireland, which in 2020 only records a decrease in the growth of the index, not a decrease in it. After the 2020 shock, we can see that in the last two years, the value of the index has returned to its upward trend.

Therefore, we can deduce that the restrictive measures implemented by the European states in 2020, as a result of the pandemic crisis, also had an important influence on the evolution of real convergence.

In order to better follow the evolution of the aggregate index of real convergence in the period 2011-2022, we proposed for analysis a second graph model, which this time highlights the difference in the index between the member states.

Figure 2: The evolution of real convergence in each euro area state



Source: Developed by authors based on the research in May 2023

So, in the second graph we can see that there are significant differences in the value of the aggregate index of real convergence between the member states. Following the analysis, we can group the member states into 3 large clusters: states that have an index close to the euro zone average, states that have a lower index than the euro zone average and states that have a significantly higher index than the euro zone average.

From the first group of states, the one whose real convergence index is close to the euro zone average, we find: Belgium, Germany, France, Italy, the Netherlands, Austria and Finland. We can see that this group includes the states that are considered leaders of the European Monetary Union, states whose economies are the engines of the entire area.

In the second group, the one whose states have an aggregate index of real convergence significantly lower than that of the euro zone, we find: Spain, Cyprus, Estonia, Greece, Croatia, Latvia, Lithuania, Malta, Portugal, Slovenia and Slovakia. From the start, we notice that this cluster is larger than the other two, with 11 states in its composition. Croatia stands out the most, which has the lowest values of the index in the analyzed period, but this is also explained by the fact that this state became a member of the European Monetary Union only in 2023, so in the analyzed period, it was not a

member official of the union, but he was part of the accession antechamber. Also in this group are the Baltic states, which have an index as low as that of Croatia.

The third cluster, that of states with an index significantly higher than the euro area average, includes only two states: Luxembourg and Ireland. The two states are by far the most noticeable among the member states. On the one hand we have Luxembourg, which has a much higher index value than the average of the euro area or any other member state (except Ireland). On the other hand, we have Ireland, which during the analyzed period had the most interesting course. Since 2011, the value of the index has had a significant increase, reaching in 2022 close to the values recorded by Luxembourg. As we previously reported, Ireland is also the only state that during the pandemic crisis of 2020 did not register a decrease in the value of the aggregate index of real convergence.

Conclusions

Following the research carried out, we reached several conclusions that can become the subject of a future research. First of all, we managed to identify in the specialized literature a series of four indicators that are the most representative of what real convergence means: GDP per capita, unemployment rate, trade openness and price level. With the help of these indicators we managed to create an aggregate index of nominal convergence.

We could observe that in the composition of the aggregate index of nominal convergence, each indicator has a different weight. GDP per capita and trade openness have the highest weights. Applying the index obtained to the 20 member states of the European Monetary Union, we could observe that during the pandemic crisis of 2020, a shock was felt at the level of the entire monetary union, the only state that did not register a decrease was Ireland. At the same time, we could observe that the states deviate quite a lot from the average of the European Monetary Union. Thus, we were able to create the 3 clusters, in which we were able to include all the member states.

We believe that these conclusions pave the way for a future research, in which we want to correlate the aggregate index of real convergence with the economic resilience of the member states of the European Monetary Union, during the COVID-19 pandemic. The limitations of this article are given by the short time that has passed since the end of the covid-19 crisis. Unfortunately, some effects on real convergence can be long-term. Moreover, the end of the covid-19 crisis period overlaps with the beginning of an energy crisis and a war at the border of the monetary union.

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