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The changing pattern of European country groups: Economic, financial, and health indicators, 2000–2015

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ABSTRACT

This study compares the European country groups using economic, financial and health indicators in 2000 and 2015. The "Core" European Union (EU) countries, which are the main progenitors of the deterioration processes within the EU, have changed their cluster memberships from higher-order clusters to lower-order ones. Deposits in banks (assets) to GDP (%) and inflation at consumer prices (annual %) have played a leading role in the formation of EU country groups for 2000 and 2015. The study emphasized the importance of political cohesion and financial stance to mitigate European countries' financial risks and welfare states.

KEYWORDS

economic growth, financial development, health, European countries, k-means, clustering

JEL CLASSIFICATION INDICES

O1, O16, H51, N1, C38

1. INTRODUCTION

The interplay and linkages between economic growth, financial development, inequalities in health, gaps in income distribution, and poverty reduction have caught the attention of welfare researchers (Jalilian – Kirkpatrick 2005).

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Life expectancy at birth is one of the traditional socioeconomic measures, along with income and welfare, used to measure improvements in *health*. The quality of life is one of the several socioeconomic determinants of development, and are just as important as GDP per capita or the illiteracy rate (Mattila et al. 2013). Additionally, immunization rate is an indicator of child-wellbeing. A recent consensus in academic and policy circles holds that the differences in people's health in different countries lie at the root of large income differences across countries. Hence, a consensus voice now asserts that improving health will not only improve our lives but will also spur rapid economic growth. Some scholars have found evidence supporting this statement, identifying a strong correlation between life expectancy at birth and level of economic development plus recent economic growth (Acemoglu – Johnson 2007). Moreover, longevity has a positive effect on per capita growth (Prettner 2013). The aging of the population and remaining health inequalities among the EU countries and their regions, as well as various social clusters within the EU population, are current problems in Europe (Spinakis et al. 2011). Europe is becoming older and needs to prepare for both the aging trend and increasing demographic transitions (Reher et al. 2017). In these circumstances, low birth rate and increased life expectancy are the main characteristics affecting the level of health status in the developed European nations (Debon et al. 2017). International poverty issues show that short life expectancy at birth and ill health cause poor health (Strauss –Thomas 1998). Furthermore, life expectancy at birth changes over time and the effect of the epidemiological transition on a country's life expectancy has an effect on health status of the population. The effect of the international epidemiological transition on a country's life expectancy was related to the extent to which its population was initially (circa 1940) affected by various specific diseases, for example, tuberculosis, malaria and pneumonia, as well as the timing of various health interventions. Thus, the positive effect of life expectancy at birth on GDP per capita will be monitored over a 40–60-year period (Acemoglu – Johnson 2007).

Financial development is one of the channels of economic growth via improvements in investment and productivity (Shan et al. 2001). It is defined as a process that marks improvements in the quantity, quality and efficiency of financial intermediary services. Monetization ratio, domestic credit and stock market capitalization are indicators of financial development (Chaiechi 2012). Additionally, capital markets stimulate economic growth (Brasoveanu et al. 2008) and are one of the main determinants of financial development. The literature suggests that macroeconomic models concentrate on the real side of the economy and pay little attention to the financial sector. The level of economic development and financial markets differs among the European countries. Europe can be divided into two regions: Western Europe and Eastern Europe. These two areas differ considerably from one another. Several factors contribute to these differences, such as geographic location, culture and economics. Eastern Europe includes countries that were once part of the Soviet Union, but Western economies are far more advanced than the Eastern economies (Claeys – Vander Vennet 2008). However, from the mid-1990s to the start of the financial crisis, Western Europe's growth performance slowed. There have been significant changes in the global economic environment since the postwar era. Among the most prominent are rapid globalization combined with a new world division of labor associated with the rise of Asia, development of new technologies based on information, and communication technologies. The evolving European growth process has been taken in the context of European integration starting with the European Payment Union, which resulted from the Marshall Plan (Crafts 2011). European growth prospects have since been negatively

affected by the financial crisis. It is widely considered that a major crisis makes it more difficult to achieve the desirable reforms (Karanikolos et al. 2013). Prochniak (2011) provided a closer look at the determinants of economic growth in the Central and Eastern European (CEE) countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Croatia, Montenegro and Slovenia. The investment rate, human capital (as measured by the education level of the labor force), financial sector development, and economic structure (high services share in GDP) are indicators of economic growth for the CEE countries. On the other hand, in the aftermath of the global financial crisis, there has been considerable debate about the economic and financial stability of the euro area. Preliminary evidence permits us to estimate that the euro area inflation expectations were anchored until the fall of 2001 and that there has been a decrease in long-term inflation expectations over the long run (Lyziak – Paloviita 2017). In other words, a positive trend in price and wage formation has been expected for more than a decade in the euro area.

Current *political agendas* of leading global actors will transform EU's balance of power. In order to support this notion, European banks are undergoing a real-life stress test in the wake of Britain's vote to leave the EU. Some banking systems that have already shown some weaknesses became more unstable after this historic change in the EU. The best examples are Italy and Portugal. Italian banks, as a whole, have a high level of non-performing loans, whose total amount has been rising since the financial crisis. Greek banks have also had significant problems in maintaining liquidity, profitability and appropriate capitalization levels (Radulescu et al. 2017). Despite some studies reporting that membership in the EU significantly lowered the discount rate and expected earnings growth differentials across countries between 1990 and 2007 (Bekaert et al. 2017), many problems have remained. Political instability, uncertainty regarding power balances, inflation expectations, and an aging population are socioeconomic problems that have plagued Europe for more than a decade. There is a lack of current prior evidence about the grouping of the European countries with regard to economic, financial and health indicators. These indicators deserve special attention, since their role in determining welfare dynamics is such a crucial one. Post Keynesian theory, in general, focuses on the real side of the economy, while the role of the financial sector such as financial intermediaries, the banking system, and credit and stock market capitalization are rarely discussed (Chaiechi 2012). However, it is emphasized that the evolution of the financial system is positively related to the development of the real economy. This is known as the McKinnon-Shaw approach (McKinnon 1973). Demetriades – Hussein (1996), Ghirmay (2004) and Kar et al. (2011) supported this statement with the cross-country studies. Generally, the countries with better developed financial systems grow faster, economic growth and financial development are driving forces of the nations' prosperity, and the interdependence of economic growth and financial development is like a chicken-and-egg problem (Shan et al. 2001). In other words, financial development may affect investments and productivity, but it is undoubtedly not the only factor, and it might even not be the most important one (Tamazian et al. 2009; Chow – Fung 2013). In contrast, the evolution of economic growth and financial development without considering health outcomes is counterproductive, since health indicators provide more insight into global development trends.

A considerable amount of research established how economic crisis could affect health outcomes (e.g., Cylus et al. 2012). According to Wei-Wu (2002), an increase in trade openness is associated with a rapid increase in life expectancy and reduction in infant mortality, even after accounting for income, institutions and other factors. Public health programs, such as immunization, contribute to a better quality of life and reduce healthcare costs, as well as positively

affect child education possibilities, household behavior and macroeconomic indicators over time. A substantial amount of existing literature supports the interrelationships between health outcomes and economic performance (Acemoglu – Johnson 2007; Jit et al. 2015; Spiteri – von Brockdorff 2019; Dincă et al. 2020).

In light of the literature discussed previously, three groups of indicators were selected to form EU country clusters. 1) GDP per capita, annual inflation at consumer prices (%), the percentage of export of goods and services in GDP, and the percentage of high-technology exports of all manufactured exports are considered economic growth indicators. 2) Financial system deposits as a percent of GDP, as well as bank deposit assets as a per cent of GDP are selected as indicators of financial development. 3) Children's measles immunization rate and life expectancy at birth are considered health indicators that indicate the health status of the European population and children's health status, respectively.

The objective of this study was to assess the consistency of the European country groups in terms of economic, financial and health indicators in 2000 and 2015. This helped to understand the differences between the country groups and how these clusters changed over time.

2. METHOD

2.1. Variables

Data were obtained from the World Bank (WB). In total, 49 European countries were examined. Table 1 shows the mean values of the key variables for 2000 and 2015. The *k*-means clustering

Table 1. Mean values of variables for all countries, 2000 and 2015

Variable group	Variable	Label	2000	2015	Change
Health	Life expectancy at birth (years)	LE	74.48	78.42	3.94
	Immunization, measles (% of children under 12 months)	IMM	89.51	91.76	2.25
Economic growth	GDP per capita (US$)	GDP_pc	16,331	28,850	12,519
	Inflation rate of consumer prices annual (%)	Inf_con	12.40	2.55	−9.85
	Export of goods and services (% of GDP)	Exp_g_s	46.41	57.80	11.39
	High-technology exports (% of manufactured exports)	Tech_exp	13.99	11.38	−2.61
Financial development	Financial system deposits to GDP (%)	Finan_GDP	47.95	73.96	26.01
	Deposit money bank assets to GDP (%)	Deposit_GDP	69.98	89.91	19.93

Source: World Bank (WB), Open Data, author's calculations.

algorithm was used to determine the European country clusters. Life expectancy at birth indicates the number of years a newborn child can expect to live. The immunization rate indicates measles immunization given to what percentage of children under 12 months of age (WB 2018). Economic growth indicators consist of GDP per capita, annual inflation at consumer prices (%), export of goods and services, and the percentage of high-technology exports of all manufactured exports. Financial development indicators include financial system deposits as a per cent of GDP and bank deposit assets as a percent of GDP.

According to Table 1, all variables increased significantly between 2000 and 2015, only the inflation rate decreased, reflecting the improvements of economic growth, financial development and state of health in Europe.

2.2. Data analysis

We used *k*-means clustering to classify the European country groups in terms of the study variables. The *k*-means clustering method is a well-known clustering algorithm that minimizes clustering errors (Likas et al. 2003). It calculates its centers iteratively (Gersho – Gray 1992). This method finds locally optimal solutions with respect to the clustering error. It is a fast, iterative algorithm that has been used in many clustering analyses. This is a point-based clustering method that starts with the cluster centers initially placed at arbitrary positions and proceeds by moving at each step the cluster centers to minimize clustering error (Likas et al. 2003; Witten – Frank 2005). Finding the optimal number of clusters is important in a *k*-means clustering exercise; it is far from easy because the "right" number is often uncertain (Han et al. 2012; Gajawada et al. 2011).

There are many ways to calculate the cluster number (Han et al. 2012). One simple method is to set the number of clusters to about $\sqrt{n/2}$ for a data set of "*n*" points. In expectation, each cluster has $\sqrt{2n}$ points. Our case contains 49 observations; therefore, the optimal number of clusters is 5. The main disadvantage of *k*-means is its sensitivity to the initial positions of cluster centers. In order to obtain the ideal number of clusters, it is necessary to implement several runs based on differing initial positions. The *k*-means algorithm produces useful statistics to identify clusters and determine the role of each variable in discriminating between clusters. In this procedure, the analysis of variance *F* statistics provides information about the contribution of each variable to group discrimination, and we used these results to discriminate between numbers of *k*-means. Furthermore, the distance between cluster centers allows us to relate clusters according to their proximity to others. This was used for ordering the clusters.

3. RESULTS

3.1. Preliminary analysis procedure: variable transformations and labeling of clusters

The dataset includes skewed distributed variables. During the preliminary analysis process, logarithmic and square root transformations were applied to normalize variable distributions and improve the performance of the analysis. The Spearman correlations (r_s) between the study variables were examined ($r_s < 0.45$) that suggested minimal risk of multicollinearity. After normalization procedure, *k*-means clustering was performed by determining number of clusters

as 5. Then, cluster labels were determined by using distances between final cluster centers. Table 3 shows Euclidean distances between the final cluster centers. Euclidean distance is a common distance measure for cluster analysis. Let x_i and v_j each be a P-dimensional vector. Equation (1) shows the computation of Euclidean distance as (Liao 2005):

$$d_E = \sqrt{\sum_{k=1}^{P} (x_{ik} - v_{jk})^2} \quad (1)$$

High distances between clusters indicate greater differences between clusters in this procedure (Liao 2005). In our case, we labelled the final cluster centers by considering the distance between them. To do this, for each of two years, the cluster with the highest score for the most distinguishable variable was labeled "A", whereas the cluster that was the most distant from "A" was identified as "E". Note that cluster "A" may be different in both years; in other words, the weight of the variables shaping them are not necessarily the same. Additionally, label "C" indicates only that the cluster center is third closest to the center of the "A" in each year (see Table 2).

3.2. Contribution of each variable to the discrimination of country groups

In Table 3, F values represent the role of each variable in discriminating between the clusters from an ANOVA performed on each dimension. On the one hand, it is seen that the percent of bank deposit assets as a percent of GDP ($F = 51.72$, $P < 0.001$) played the most significant role in discriminating country groups in 2000. On the other hand, inflation in consumer prices

Table 2. Distances between final cluster centers for 2000 and 2015

Clusters	2000				
	1 (C)	2 (E)	3 (D)	4 (B)	5 (A)
1 (C)		4.813	5.733	4.174	6.231
2 (E)	4.813		4.768	4.542	8.255
3 (D)	5.733	4.768		4.916	7.373
4 (B)	4.174	4.542	4.916		3.759
5 (A)	6.231	8.255	7.373	3.759	
Clusters	**2015**				
	1 (D)	2 (E)	3 (A)	4 (B)	5 (C)
1 (D)		22.364	19.631	3.982	3.471
2 (E)	22.364		41.922	25.659	23.746
3 (A)	19.631	41.922		16.716	18.415
4 (B)	3.982	25.659	16.716		5.387
5 (C)	3.471	23.746	18.415	5.387	

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Table 3. Each variable's contribution to the discrimination of groups: ANOVA results[a]

Variables	2000						2015					
	Cluster		Error		F	Sig.	Cluster		Error		F	Sig.
	Mean square	d.f.	Mean square	d.f.			Mean square	d.f.	Mean square	d.f.		
Life expectancy at birth (years)	0.02	4	0.00	44	15.29	0.000	0.01	4	0.00	44	11.56	0.000
Immunization, measles (% of children under 12 months)	0.59	4	0.15	44	3.76	0.010	0.12	4	0.32	44	0.40	0.003
GDP per capita (US$)	18.50	4	0.82	44	22.42	0.000	7.42	4	0.58	44	12.64	0.000
Inflation, consumer prices annual (%)	11.70	4	0.81	44	14.28	0.000	607.54	4	5.17	44	117.42	0.000
Export of goods and services (% of GDP)	0.36	4	0.22	44	1.62	0.003	0.53	4	0.19	44	2.81	0.036
High-technology exports (% of manufactured exports)	4.25	4	0.80	44	5.25	0.002	1.63	4	0.32	44	5	0.002
Financial system deposits to GDP (%)	16.62	4	0.64	44	25.70	0.000	1.24	4	0.15	44	7.9	0.000
Deposit money bank asset to GDP (%)	74.65	4	1.44	44	51.72	0.000	41.27	4	1.88	44	21.9	0.000

Note: [a]Log and square root transformations were applied for study variables to normalize distributions.
Source: World Bank (2018).

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annual (%) ($F = 117.42$, $P < 0.001$) plays a leading role to determine the European country clusters for the year 2015. Furthermore, the P values indicate that there are statistically significant differences between five clusters for the year 2000 ($P < 0.05$) and 2015 ($P < 0.05$). It is clear that economic growth and financial development indicators play a leading role in determining the European country groups compared with health indicators (Table 3).

3.3. Labeled clusters and their descriptive statistics for 2000 and 2015

Table 4 shows the labeled clusters generated for 2000 and 2015 using the study variables and k-means clustering with $k = 5$. In 2000, there were five cluster groups, with 15 members in the first, 17 in the second, 8 in the third, 2 in the fourth, and 7 in the fifth cluster. In 2015, there were five cluster groups, the first one having 2 members, the second 24, the third 9, the fourth 11, and the fifth having 3 members (Table 4).

3.4. European country clusters and cluster statistics

The ensuing section summarizes the mean values of five clusters in terms of study variables for 2000 and 2015. We demonstrated that these clusters represent the common identifiable characteristics of different clusters. Cluster statistics are interpreted by using the labeled clusters in Table 4.

3.4.1. Country clusters for 2000. According to the grouping of countries and descriptive statistics for the year 2000, cluster "A" consists of advanced economies and the founding fathers of the EU. Based on the mean values, the countries in cluster "A" exhibited relatively high levels of life expectancy at birth, GDP per capita (US$), export of goods and services as a per cent of GDP, high technology exports as a per cent of manufactured exports, financial system deposits and bank deposit assets both as a per cent of GDP. Accordingly, cluster "A" includes the "core" European countries, i.e., Belgium, France, Italy, Luxembourg, the Netherlands, Germany, Austria, Denmark, Portugal and Switzerland. These countries formed extensive economic cooperation and engaged in supranational economic integration (Fatas – Summers 2018). It is not surprising that these developed countries found good compromise levels in terms of performance in economic growth, financial development and health-improvement indicators in 2000. Cluster "B" comprises mainly CEE countries such as Croatia, Hungary, Poland, Slovakia, Slovenia and also the developed European countries, such as Sweden and Norway. There are several members of this group who were not EU members: Czech Republic, Andorra, San Marino, Lichtenstein and Iceland. This cluster includes a high number of members where health, economic growth and financial development indicators show mediate results. Group "C" includes countries that joined after some expansion of the EU: Montenegro, Serbia, Bosnia and Herzegovina. It also includes some eastern neighboring countries: Armenia, Azerbaijan, Belarus, Georgia and Moldova. Cluster "C" is characterized by poor performance in terms of the study variables, particularly economic growth and financial development. The clusters "D" and "E" represent low order countries in terms of the study variables. Cluster "D" comprises two countries in the CEE, cluster "E" consists of developing countries that are "near board" on the Black Sea. They have moderate performance in terms of the study variables (Table 5).

Table 4. European country groups/clusters, 2000 and 2015

2000	2015
Group A	Group A
Austria	Hungary
Belgium	Sweden
Cyprus	**Group B**
Italy	Bulgaria
Luxembourg	Croatia
Malta	Lithuania
The Netherlands	Estonia
Denmark	Finland
France	Ireland
Germany	Poland
Ireland	Romania
Portugal	Slovakia
Spain	Slovenia
United Kingdom	Albania
Switzerland	Montenegro
Group B	Serbia
Croatia	Former Yugoslav Republic of Macedonia
Czech Republic	Turkey
Estonia	Bosnia and Herzegovina
Finland	Kosovo
Greece	Armenia
Hungary	Azerbaijan
Poland	Belarus
Slovakia	Georgia
Slovenia	Moldova
Sweden	Russia
Former Yugoslav Republic of Macedonia	Ukraine
Kosovo	**Group C**
Andorra	Cyprus
Iceland	Malta

(continued)

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Table 4. Continued

2000	2015
Liechtenstein	The Netherlands
Norway	Denmark
San Marino	Greece
Group C	Portugal
Montenegro	Spain
Serbia	Norway
Bosnia and Herzegovina	Switzerland
Armenia	**Group D**
Azerbaijan	Austria
Belarus	Belgium
Georgia	Czech Republic
Moldova	Latvia
Group D	Luxembourg
Lithuania	Germany
Albania	Andorra
Group E	Iceland
Bulgaria	Liechtenstein
Latvia	Monaco
Turkey	San Marino
Monaco	**Group E**
Russia	Italy
Ukraine	France
Romania	United Kingdom

Table 5 shows cluster patterns in 2015 using the same clustering technique as was used in 2000.

3.4.2. Country clusters for 2015. For 2015, cluster "A" outperforms other clusters, despite only having two members. These countries are successful to achieve the inflation targets, which is particularly evident in Sweden's improved fiscal stance (Borio et al. 2010). Most of the countries are grouped in cluster "B" for the year 2015. It consists mainly of Eastern European and former Soviet Union states, along with the Baltic states of Estonia and Lithuania. Armenia, Azerbaijan and Georgia are Caucasian nations, while Belarus, Moldova, Russia and Ukraine are

Table 5. Health, economic growth, and financial development indicators mean values by clusters for the year 2000

Cluster identifier	A	B	C	D	E
No. of countries in clusters	15	17	8	2	7
LE	78.03	75.18	70.55	73.01	70.13
IMM	85.67	92.09	84.69	96.00	95.14
GDP_pc	24,219.32	19,421.47	800.78	2,236.57	13,698.50
Inf_con	2.64	7.36	37.49	0.52	20.23
Exp_g_s	58.51	44.17	37.11	28.20	41.73
Tech_exp	22.78	13.71	5.60	2.57	8.70
Finan_GDP	91.46	42.59	7.9938	28.07	19.06
Deposit_GDP	121.24	56.85	61.35	25.26	14.65

Note: See Table 1 for variable labels.

former Soviet states. Croatia, Poland, Slovakia and Slovenia are Central European members of this group. The Southeastern members of this group include Albania, Bosnia and Herzegovina, Bulgaria, Macedonia, Montenegro, Romania, Serbia, Slovenia and Turkey. For the most part, these countries are still developing and depend on larger neighbors as their largest partners. Despite the high number of members in cluster "B", these countries exhibit poor performance in 2015, the average GDP per capita was low. Perhaps many of them did not manage inflation well, since they had the highest mean inflation rate compared with the countries in other clusters.

It is clear that most countries in groups of "C," "D," and "F" were the EU-15 countries in 2015. Over time, the developed European countries have spread to other clusters. Among these countries, the Netherlands, Denmark, Portugal, Spain are the members of cluster "C," Austria, Belgium, Luxembourg, Germany are members of "D" and Italy, France and the United Kingdom (UK) are the members of cluster "E." It is seen that the countries in cluster "C" stand in the forefront in terms of good management of inflation. Additionally, they perform well in terms of economic growth and financial development indicators compared with countries in the other two lower-order country groups (Table 6).

3.4.3. Consistency of cluster memberships 2000–2015. Table 7 shows groups of the countries according to their membership in 2000 and 2015. There are some differences in the cluster arrays between the two years. Additionally, a considerable amount of transition has been observed over the fifteen years between these clusters. In 2000, there were more countries grouped in "A," including more developed nations. Over time, these developed nations were distributed to clusters "C," "D," and "E." Cluster "B" includes the countries of CEE such as Croatia, Poland, Slovakia, Slovenia and the developed European countries such as Hungary, Sweden and Norway for the year 2000. Cluster "B" performed moderately well in terms of economic growth, financial development and health-improvement indicators for 2000. The

Table 6. Health, economic growth, and financial development indicators mean values by clusters for the year 2015

Cluster identifier	A	B	C	D	E
No. of countries in clusters	2	24	9	11	3
LE	79.25	75.80	81.87	80.02	82.58
IMM	98	90.36	93.89	92.34	90.33
GDP_pc	31,648.02	11,872.10	40,477.71	53,650.52	37,001.35
Inf_con	−0.05	4.64	−0.07	1.32	0.04
Exp_g_s	67.88	51.17	61.36	75.36	28.99
Tech_exp	12.82	8.11	15.62	12.55	19.68
Finan_GDP	54.46	49.49	108.20	102.12	76.75
Deposit_GDP	96	60.66	157.33	87.60	126

Note: See Table 1 for variable labels.

Table 7. Comparison of cluster membership, 2000 and 2015

Years 2000	2015				
	A 2015	B 2015	C 2015	D 2015	E 2015
A		Ireland	Cyprus, Malta, The Netherlands, Denmark, Portugal, Spain, Switzerland	Austria, Belgium, Luxembourg, Germany	Italy, France, United Kingdom
B	Hungary, Sweden	Croatia, Estonia, Finland, Poland, Slovakia, Slovenia, Former Yugoslav Republic of Macedonia, Kosovo	Greece, Norway	Czech Republic, Andorra, Iceland, Liechtenstein, San Marino	
C		Montenegro, Serbia, Bosnia and Herzegovina, Armenia, Azerbaijan, Belarus, Georgia, Moldova			
D		Lithuania, Albania			
E		Bulgaria, Turkey, Russia, Ukraine, Romania		Latvia, Monaco	

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cluster pattern "B" showed a distinct difference after fifteen years, which indicated a significant increase in the number of members, with most of the former Soviet Union, Central European and Southeastern countries being in this group. The majority of these countries are still developing. It is interesting that, despite the larger number of countries in this group, the mean values for the study variables show poor performance. Another remarkable point has to do with the transition of the developed European countries from residing in higher-order clusters to lower-order ones from 2000 to 2015. The UK, France and Italy have constituted a separate group in terms of the study variables over time. It is possible to claim that the effect and pressure of the global crisis, the political economy and deterioration in relations between the UK and other European countries affected the cluster patterns for these countries over the years (Table 7).

4. CONCLUSION

The fragmentation among the European countries and the differences in economic growth, financial development and health-improvement indicators were observed in the "core" European countries between 2000 and 2015.

To the best of our knowledge, no previous study provides a current picture of the European country groups by considering economic, financial and health-improvement indicators simultaneously. This study addresses this gap in a unique way by emphasizing changes in patterns of the European country clusters and determining leading indicators of the country groups. Our results showed that inflation rate is a leading determining variable for country groups, therefore future studies should focus on the different inflation management strategies among the European countries. Despite the European countries being faced with changes in population dynamics under unprecedented migration flows, this study does not include any indicators pertaining to the socio-demographic dynamics of these countries. More focus needed to examine the interrelationship between economic growth and financial development indicators. The effect of health and disease trends on economic growth for countries at varying development levels should be further explored.

The results showed the following: (1) European countries achieved considerable increase in economic growth, financial development and health indicators over 15 years, except in terms of inflation. (2) European countries are comprised of five groups in terms of welfare state indicators for the two analyzed years. (3) The ratio of bank deposit assets to GDP and the inflation rate (consumer prices) played a leading role in determining European country grouping for 2000 and 2015, respectively. (4) Higher-order country clusters outperformed lower-order ones in terms of the variables used in this study. (5) There is a transition between the country clusters generated for 2000 and 2015.

During these 15 years, the highly developed European countries separated from higher-order clusters, and now, constitute a smaller group. Interestingly, most developing countries are represented by the former Soviet Union countries, East European ones, Baltic states, Caucasus nations, and places in Southeastern Europe, which are also neighboring countries for the same group in 2015. These countries have exhibited poor economic and financial performance and remarkably poor management of the inflation rate compared with the countries in other groups after more than a decade.

Some countries, such as the post-communist ones, joined the euro area between 2000 and 2015. While EU membership has proven beneficial economically for them, this has not been the

case for the post-communist states outside the EU. The west and east nations still face substantial wealth disparities. By strengthening EU's transformative role, more stable and democratic policies will serve as a basis for bridging economic and financial disparities (Epstein 2014). Furthermore, structural and institutional reforms and a more equitable and transparent investment climate are essential policy requirements for improving poor economic performance and ensuring financial stability (Dabrowski 2016).

It is thought-provoking, while the developed European countries were in the same group in 2000, they have fallen into smaller groups 15 years later. The European countries experienced a global financial crisis in 2008. The European response to the crisis, however, was neither quick nor well-coordinated. One of the obstacles to responding to a global financial crisis is EU's limited fiscal capacity. The crisis atmosphere made it clear that financial markets are not going to consider the EU as a homogenous zone, there are country specific prevention policies (Dabrowski – Myachenkova 2018). In addition, the number of migrants seeking refuge in Europe has increased substantially (Hampshire 2015). These economic and social circumstances threats engulfed European countries for the past decade. Some European countries adopted austerity policies to overcome the negative effects of global financial crisis, making large cuts in public expenditures. Some others gave importance to fiscal stimuli, such as Germany, and thus, recovered quickly (Karanikolos et al. 2013). A crisis environment will threaten the credibility of the EU on the global stage by lowering its standing as an integrated market. To summarize, there is a country-specific macroeconomic and financial trauma in Europe, and the financial deprivations renewed the segmentation between the Western European "core" and the Central, Eastern and Southern European "periphery".

The literature examined the common fears of the "core" European countries regarding EU accession policies. There is a fear that the accession of rapidly growing countries will result an inflationary pressure and higher interest rates in the Eurozone (Rostowski 2006). In our case, inflation plays a leading role in determining European country groups. Future studies may shed light on the effect of fiscal adjustment policies on the level of interest rates around Europe. However, in our study, the UK is the only country that has transitioned from being a higher-order country groups to a lower-order one.

One of the reasons for the Eurozone crisis was the UK's threat to leave the EU (Rostowski 2015). Due to the Brexit threat, the credibility of European integration has been undermined, and the destructive effects of this crisis are still felt in many areas. The Brexit process is not surprising because the UK and some of the other "core" European countries are cornerstones of the EU, and the UK is doing much better than the Eurozone, where latching on to the Euro seems to be effectively dead, politically speaking (Artis 2006). As a result of Brexit, the UK banks are under stress. Banks in Italy and Portugal are experiencing instabilities. Greek banks, too, have encountered problems with regard to firm profitability and protecting the level of capitalization (Radulescu et al. 2017). However, it has been stated that the UK will wash its hands of the rest of Europe by leaving the EU (Opperman et al. 2019). In relation to its European trading partners, the UK has several choices, including joining the European Economic Area, negotiating bilateral deals with the EU, and going it alone as a member of the World Trade Organization. Additionally, this process will enable the UK to regain control of its borders. It is expected that the post-Brexit UK would be vulnerable to market conditions imposed by the EU, as the member states, such as Germany and France, would like to increase their share of financial services (Jensen – Snaith 2016).

Germany is one of the other "core" European countries and according to our classification, its location changed from being a higher-order cluster to lower-order one from 2000 to 2015. Germany achieved outstanding economic performance over those 15 years with a 5.7% annual increase in GDP from 2005 to 2012. Despite being often called "the sick man of Europe" in the early 2000s, today, after the "Great Recession," Germany is described as an "economic superstar." Effective control of its labor cost dynamics enables Germany to achieve accelerated growth (Dustmann et al. 2014; Daniel – Steege 2020). In our study, Sweden is another country that changed its location and achieved good results in terms of welfare state indicators for 2015. Sweden has one of the best-run European economies, with successful management throughout the post-global-financial-crisis environment (Borio et al. 2010). Nevertheless, the aforementioned European countries have also been successful to combat inflation. Inflation is the most distinguishing variable for a country, in 2015, the "core" European countries were skeptical about the effect of increasing inflation and the EU's enlargement policies on interest rates. Thus, inflation control and fiscal adjustment will continue to be the agenda of the EU members. According to the prior findings, inflation exemplifies a pro-rich pattern in Europe that means the burden of inflation was placed on the shoulders of poorer populations, particularly during 2001–2015 (Gürer – Weichenrieder 2018). Thus, it is foreseeable that effective inflation management policies are essential for the stability of the European countries.

After 15 years, the neighboring countries in CEE and those near the borders along the Black Sea have become closer and even exist in the same cluster despite the fact that their economic and financial development are lower than all other countries for 2015. The literature highlights the existence of neighboring countries in the same group in terms of economic indicators with *gravity theory*. Gravity theory states that geographical proximity, economic size and similarities in consumer preferences and economic development will turn the proximity of neighboring countries into an economic indicator. Thus, two countries will trade more with each other when their combined GNPs are larger and the geographical distance between them is less (Bruno et al. 2017). This proximity issue also has an agglomeration effect of economic integration (Overman – Puga 2002). The empirical results suggest that the degree of cultural diversity in contiguous neighboring countries has a substantial, positive effect on domestic per capita income growth, even when controlling for a broad set of regional, institutional, religious and other proximate factors pertaining to economic growth (Gören 2013).

Our results shed light on poor economic and financial performance results for the CEE countries. These "periphery" countries faced difficulties in economic and financial management after muddling through the global financial crisis environment. Additionally, some of them have asked for financial help from the International Monetary Fund, while others struggle to get by on their own means (Dabrowski – Myachenkova 2018). The EU actors are motivated by a surrounding of wealth, stability and peace. Despite transitions that are observed between country groups over the years, the best strategy is to promote economic growth, financial stability and social development over time to maintain European prosperity.

Future studies could add more variables to the dataset. It is hoped that the results of this study will appeal to welfare researchers' interest in Europe and provide an up-to-date accounting of our knowledge of the European country groups that now teeter on the edge of economic turmoil and fragmentation within the EU. It will be useful to the cluster European and other continental countries by assessing health indicators and promoting policies and proposals in that direction.

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