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HOW EUROPEAN ARE YOU? CULTURAL CHANGES OF EUROPEAN COUNTRIES IN THE LAST 20 YEARS WITH SURVEY DATA*

Seca Toker ASLAN, Mehmet Hakan SATMAN*****

Abstract

This study deviates from traditional approaches by focusing on data analysis instead of historical information to comprehend the dynamics shaping societal culture. Analyzing the cultural changes in European countries over the past two decades, the study utilizes the largest dataset to date, the Integrated Values Survey. Data from four distinct time periods spanning from 2000 to 2022 have been scrutinized. Expectation Maximization method is employed to address missing data in the dataset, and factor analysis-CLARA clustering algorithm is applied for each time period. The primary objective of this academic endeavor is to understand the dynamics of cultural evolution from a data-centric perspective. This analytical approach provides a robust foundation for comprehending cultural changes and predicting potential future developments.

Keywords: *Values survey, CLARA, Europe, European cultural map, Clustering, Cultural differences.*

NE KADAR AVRUPALISINIZ? ANKET VERİLERİ İLE AVRUPA ÜLKELERİNDE SON 20 YILDAKİ KÜLTÜREL DEĞİŞİMLER

Öz

Bu akademik çalışmanın temel amacı, kültürel evrimin dinamiklerini veri odaklı bir perspektifle anlamaktır. Bu çalışma, toplumun kültürünü oluşturan dinamikleri anlamak için tarihî bilgiler yerine veri analizine odaklanarak geleneksel yaklaşımlardan sapmaktadır. Avrupa ülkelerinin son 20 yıldaki kültürel değişimleri, bu zamana kadar toplanmış en büyük veri setlerinden Integrated Values Survey kullanılarak analiz edilmiştir. 2000'den 2022'ye kadar olan dört zaman dilimindeki veriler incelenmiştir. Veri setindeki eksik veriler Expectation Maksimization yöntemi kullanılarak doldurulmuştur ve her zaman dilimi için faktör analizi-CLARA kümeleme algoritması uygulanmıştır. Bu analiz yöntemi, kültürel değişimleri anlama ve gelecekte neler olabileceğini tahmin etme konusunda güçlü bir temel sunmaktadır.

Anahtar kelimeler: *Değerler araştırması, CLARA, Avrupa, Avrupa kültür haritası, Kümeleme, Kültürel farklılıklar.*

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INTRODUCTION

Social culture lives, grows, develops, evolves and changes over centuries. This change of societies is the subject of many researches, articles and theories. There are many differences and similarities that distinguish and sometimes unite the cultures that have lived in the world so far. Especially in recent years, with the development of technology and the spread of the internet to a significant part of the world, it seems that the borders between geographies have disappeared. These are periods when cultural interaction is perhaps at its highest in world history.

In social sciences, the cultural habits and changes of societies are examined in detail under various topics. The best way to support the theories and hypotheses presented in this field is data. When it comes to people, the most reasonable data that can be collected through research methods is survey data. However, survey data presents many difficulties in terms of both collection and sustainability. Particularly when it comes to investigating social behavior and culture, analyzing research periods of a large data set is of great importance.

In this regard, various researches are carried out to examine the behavioral patterns of societies and measure their attitudes both in the world and in Europe. Although measuring social values is a challenging task, studies in this field began in the early 1970s and some attempts were made to collect data worldwide. Internationally conducted surveys such as the European Social Survey (ESS), European Values Survey (EVS), International Social Survey Program (ISSP) and World Values Survey (WVS) have made cross-country comparisons possible. The most well-known of these initiatives are the European Values Survey (EVS) and the World Values Survey (WVS). These studies have been collecting data periodically since 1981; it is used to map the stability and change in social structures and attitudes, and to interpret how the socio-political and moral texture changes both around the world and Europe.

The European Values Survey was initiated by the European Value Systems Study Group (EVSSG), a group of academics, in the late 1970s. Researchers aimed to explore Europe's social and political institutions and the moral and social values underlying these institutions (European Values Survey, 2021). WVS is the product of a series of research conducted since 1981. The aim of the project is to evaluate the effects of stability or change over time on the social, political and economic development of countries and societies. By its purpose, the WVS is the largest empirical, non-commercial time-series survey of human beliefs and values conducted worldwide (World Values Survey, 2021). Both surveys have much in common in terms of the questions they ask and the countries they choose. For this reason, most of the studies in the literature have used both data sets in line with the research questions. The creators of WVS and EVS were inspired by this common trend in the literature and worked in close collaboration to combine both surveys, thus creating the Integrated Values Survey, which includes the data of both surveys (European Values Study, 2021).

Undoubtedly, many studies have been conducted on the definition of culture, its scope, and what values it contains. However, in this study, we try to provide an understandable perspective by processing the maximum amount of data with the largest sociological data set available. The factors obtained within the scope of the study were examined, considering all methodological situations. It should not be forgotten that at each stage of this study, research periods were evaluated separately. The results of the applied factor-cluster analysis must be evaluated separately in each research period. However, it will be possible to examine the similarities and differences between these data periods explained around common factors. This will help to understand, at least in the context of the data set, which cultural indicators explain European countries in the last 20 years. It is desired to be able to examine the change between periods, thanks to indicators that are different from each other and sometimes produced jointly in each period. It is aimed to be the most comprehensive study, especially with WVS and EVS data sets.

Hofstede (1984), an important contribution in the examination of cultural dimensions, developed the theory of cultural dimensions in order to explain the differences between cultures. This theory is largely based on data from large-scale surveys IBM conducted of its own employees. These inferences, based on workers' data, have gained wide acceptance, especially in studies of intercultural communication in the business world. Hofstede's (1983) four key dimensions; power distance, uncertainty avoidance, individualism-collectivism and masculinity-

femininity. There are many studies investigating the regional and cultural differences of European countries. In 1997, Inglehart presented one of the groundbreaking studies in developing a world cultural map. The discussion revolved around the correlation between cultural shifts in societies and advancements in the economy, drawing upon the framework of modernization theory (Inglehart, 1997). Kaasa et al. (2014) research focused on cultural differences within countries as well as differences between countries. This study benefited greatly from Hofstede's theory. There is another study that draws the political-cultural map of European countries within the framework of grid-group theory, which is an important and comprehensive theory on cultural research. Taking two periods of the WVS survey, principal component analysis was applied to the data of European countries in 1981 and 1990. The findings indicate that egalitarianism prevails in Northern European countries and the Netherlands, while fatalism predominates in Great Britain, Ireland, and Southern Europe (Grendstad, 1999). There is also another study that draws attention to the cultural differences not only between countries but also in sub-regions within countries. Accordingly, in the research aiming to examine the clustering of 316 European regions on value measures, it was tried to determine whether European countries have national cultures. According to their results, most European countries showed a certain tendency to cluster, indicating national cultures. However, large randomly selected sample groups from various nationalities could not be clearly classified according to their national identity (Minkov & Hofstede, 2013). In recent years, with increased accessibility to data, there has been a rise in the use of quantitative approaches in cultural research. This study examining cultural exchanges among European countries will serve as an example of this trend. These data, which are presented to the public in every research period, have been the subject of many scientific studies and have paved the way for theoretical issues in the literature to be tested with statistical methods.

1. MATERIAL AND METHODOLOGY

In this section, detailed explanations are given under subheadings regarding the data set and method used in the study. First of all, the IVS data set is introduced, and which countries have how much data is given on the basis of research waves. Subsequently, general information was given about the factor-clustering approach used in the research. The reasons why this approach was used in this study are discussed. Finally, basic information about the CLARA clustering algorithm applied to determine the cultural clusters of countries is presented.

1.1 Data: integrated values survey

In WVS, in 7 research periods since 1981, and in EVS, in 5 research periods; a large amount of data was collected by interviewing hundreds of participants in dozens of countries. General information about the research periods of the Integrated Values Survey (EVS, 2022; Haerpfer et al., 2022), the data set to be used in this study, is given in Table 1 below. In this study, 45 European countries located on the European continent were included in 4 periods of the data set covering the last 20 years.

Table 1: General Information about IVS Dataset

Waves	IVS Time Period	Number of cases	Number of countries
Wave 4	1999-2004 (EVS3, WVS4)	51198	38
Wave 5	2005-2010 (EVS4, WVS5)	86333	43
Wave 6	2010-2014 (WVS6)	19554	13
Wave 7	2017-2021 (EVS5, WVS7)	64155	35
All Wave	1999-2021	221240	45

Not every country has data for every period. Table 2 shows the period in which data are available for the countries and the number of observations.

Table 2: Number of Observation in European Countries (for 4 Wave)

Country	Country Code (S003)	Wave 4	Wave 5	Wave 6	Wave 7	Total
Germany	276	2036	4139	2046	3698	11919
Andorra	20	0	1003	0	1004	2007
Albania	8	1000	1534	0	1435	3969
Austria	40	1522	1510	0	1644	4676
Belarus	112	1000	1500	1535	1548	5583
Belgium	56	1912	1509	0	0	3421
Bosnia and Herzegovina	70	1200	1512	0	1724	4436
Bulgaria	100	1000	2501	0	1558	5059
United Kingdom	826	1000	2602	0	1788	5390
Czech Republic	203	1908	1821	0	1811	5540
Denmark	208	1023	1507	0	3362	5892
Estonia	233	1005	1518	1533	1304	5360
Finland	246	1038	2148	0	1199	4385
France	250	1615	2502	0	1870	5987
Croatia	191	1003	1525	0	1487	4015
Netherlands	528	1003	2604	1902	2404	7913
Ireland	372	1012	1013	0	0	2025
Spain	724	2409	2700	1189	1209	7507
Sweden	752	1015	2190	1206	1194	5605
Switzerland	756	0	2512	0	3174	5686
Italia	380	2000	2531	0	2277	6808
Iceland	352	968	808	0	1624	3400
Cyprus	196	0	2050	1000	1000	4050
Northern Ireland	909	1000	500	0	0	1500
North Cyprus	197	0	500	0	0	500
North Macedonia	807	1055	1500	0	1117	3672
Latvia	428	1013	1506	0	0	2519
Lithuania	440	1018	1500	0	1448	3966
Luxemburg	442	1211	1610	0	0	2821
Hungary	348	1000	2520	0	1514	5034
Malta	470	1002	1500	0	0	2502
Moldova	498	1008	2597	0	0	3605
Norway	578	0	2115	0	1122	3237
Poland	616	1095	2510	966	1352	5923
Portugal	620	1000	1553	0	1215	3768
Romania	642	1146	3265	1503	2870	8784
Russia	643	2500	3537	2500	3635	12172
Serbia	688	1200	2732	0	2545	6477
Slovakia	703	1331	1509	0	1432	4272
Slovenia	705	1006	2403	1069	1075	5553
Türkiye	792	4607	3730	1605	2415	12357
Ukraine	804	1195	2507	1500	2901	8103

Country	Country Code (S003)	Wave 4	Wave 5	Wave 6	Wave 7	Total
Greece	300	1142	1500	0	1200	3842
Total		51198	86333	19554	64155	221240

Source: Integrated Values Survey

1.2. Method: factor-cluster approach

Literature discussions delve into the combined application of factor analysis and clustering. Certain sources propose the utilization of factor loadings or factors derived from factor analysis as input variables for clustering. Some sources emphasize the harms of using hybrids in this way.

The combined use of factor analysis and any clustering algorithm is critiqued for various reasons. Firstly, there is a limitation to the total explained variance of factor analysis in survey datasets. This constraint implies that a portion of the total explained variance is left out from the data during cluster analysis. Secondly, the nature of the data obtained in factor analysis undergoes a transformation when presented for clustering. Consequently, it is advised against using the original variables for interpreting clustering results. Some studies evaluating the performance of the factor-clustering hybrid method argue that clustering with raw data yields better results (Dolnicar & Grün, 2008, p. 66). Direct clustering of raw data is believed to more accurately capture the information in the data, particularly in reflecting the heterogeneity of the clusters. However, most of the time, exceeding the processing capacity in big data makes it impossible to use clustering algorithms.

It is argued that using factor analysis and any clustering algorithm together has drawbacks. First, the total explained variance of factor analysis in survey data sets is limited. This means that the part of the total explained variance that cannot be explained is excluded from the data in the cluster analysis. Secondly, it means that the nature of the data obtained in factor analysis and presented for clustering is changed. For this reason, it is mentioned that it is undesirable to use the original variables when interpreting the results of clustering. Thirdly, in some studies evaluating the performance of the factor-clustering hybrid method, it has been argued that clustering with raw data gives better results in some studies (Dolnicar & Grün, 2008, s. 66). It has been argued that direct clustering of raw data will better reflect the information in the data to the heterogeneity of the clusters. At the same time, it was emphasized that some variables excluded in factor analysis may be important in cluster analysis.

There are studies in the literature that use the factor-clustering approach. The factor is often used in big data for feature extraction and dimensionality reduction. Clustering analysis is performed with the obtained indicators. Thus, the results obtained are less complex and interpretable. In a study focused on assessing the impact of virtual reality in tourism on tourists, researchers utilized 6 components derived from factor analysis as input for the k-means clustering algorithm (Errichiello, Micera, Atzeni, & Chiappa, 2019). Another study that aimed to compare the attitudes and behaviors of financial customers in Switzerland and Vietnam, the factor-clustering approach was employed (Phan, Rieger, & Wang, 2019). Hickson et al. (2023) employed a factor-clustering approach to explore the motivations of individuals opting for SUVs and light trucks. Utilizing data from 2,203 vehicle owners, the study achieved an optimal total explained variance rate of 58.7%, and the resulting factor dimensions were applied to k-means cluster analysis.

Before cluster analysis in high-dimensional data, it is meaningful to perform dimensionality reduction on the data in order to reduce the processing load and produce more summary indicators. Although debates continue in the literature in terms of the factor-clustering approach, it should be at the initiative of the researcher to choose the method according to the condition of the data set. When properly justified, it can also be argued that the factor-clustering approach is an advantageous use. Examples of both situations can be seen in the literature.

In light of all these discussions, considering the volume of the IVS data set, reducing the dimensions with a dimension reduction method and then subjecting it to cluster analysis would be an application that would yield meaningful results. The most important reason for using the factor-clustering approach in this study is that clustering the IVS data set in its raw form is almost impossible due to processing capacity.

In contemporary computing, decimal numbers are typically represented using 64 bits, equivalent to 8 bytes. Performing an analysis of this scale poses challenges when utilizing a method that takes an external distance matrix as input. To address this, certain enhancements such as Memory Mapped IO or on-demand distance matrix may be necessary (Satman, 2023, s. 42-49). The raw data matrix employed in this study is of size 221,240 x 79. Creating and storing a distance matrix of size n x n from such data, even with dimension reduction, becomes impractical. This limitation extends to the feasibility of running multiple clustering algorithms on the reduced dimensions. Even if each of the four waves is studied separately, the size of the distance matrices produced is at a level that exceeds the application capacity.

In consideration of the discourse thus far, it would be beneficial to employ a dimension reduction technique on the extensive IVS dataset and subsequently apply cluster analysis. The primary rationale for opting for the factor-clustering method in this research stems from the practical difficulty of directly clustering the raw IVS dataset due to processing constraints.

1.3. Clustering: CLARA

Partitioning Around Medoids (PAM), a variant of the k-medoids algorithm, is designed to group data points into a specified number of clusters. However, PAM proves impractical for clustering high-dimensional data. In response to this limitation, Clustering LARge Applications (CLARA) was introduced by Kaufman and Rousseeuw in 1986. Unlike PAM, CLARA is tailored to handle high-dimensional data effectively. The primary concept behind the CLARA algorithm is its order of magnitude, denoted as O(n), which signifies that both the number of computations and storage requirements increase linearly with the size of the dataset. This characteristic distinguishes CLARA from other clustering algorithms and makes it well-suited for managing large datasets efficiently (Kaufman & Rousseeuw, 1986, s. 428). In particular, instead of the entire dissimilarity matrix as in the PAM method, CLARA accepts only the n x p data matrix as input. (Struyf, Hubert, & Rousseeuw, 1997).

In the algorithm, the sample and its size are predefined criteria. Specifically, the samples are required to be 40 + 2k, where k represents the number of clusters. In the current scenario, the number of clusters varies between 1 and 30, resulting in sample sizes ranging from 42 to 100 (Kaufman & Rousseeuw, 1990, s. 145). The CLARA method emerges as a valuable solution, effectively addressing memory constraints and computational difficulties encountered when dealing with large datasets.

2. APPLICATION

In this paper, a quantitative analysis has been applied to observe the cultural changes and their codes experienced by European countries in the last 20 years. In this context, 45 European countries have been selected, and these countries are geographically located within the continent of Europe. Additionally, Northern Cyprus and Cyprus, which have data, were included in the research. The list of countries is provided in Table 2.

Figure 1: Research Steps

R software and programming language was used in all stages of this study. The *mvdalab* package was used to fill in missing values in the dataset, the *ClusterR* package was used for analysis, and the *rworldmap* package was used for visualization (Afanador, Tran, Blanchet, & Baumgartner, 2022) (South, 2011) (Little & Rubin, 2019).

When evaluated in the context of missing data, there are instances of negative coding in the dataset. -5 has been used for missing data and -4 has been used for missing data in unasked questions in the survey. During the selection of common variables, 160 questions that were not asked in any survey in European countries throughout the four waves were directly excluded from the analysis. Upon further examination of the remaining dataset, it is observed that questions containing -4 still exist. This implies that in some countries, certain questions may not have been asked in all waves. To address this, all columns containing a -4 coding more than 0.25 have been excluded from the analysis. This resulted in the exclusion of an additional 501 columns. Thus, after removing columns containing survey information and demographic data from the remaining 179 columns, 79 variables were retained. By minimizing the cases containing -4, the adverse effects on the analysis have been reduced to a minimum, and necessary screenings have been conducted for an efficient analysis.

Missing data containing -5 has been imputed using the Expectation Maximization method. Since the average for each country may differ in each period, the dataset has been separated by periods and countries. The EM algorithm has been applied to each of the obtained datasets. (For example, the 4th period Türkiye dataset and the 5th period Türkiye dataset have been imputed separately.).

Although the number of cases containing -5 in the entire dataset is 21,354, and the ratio is 0.15%, it has been deemed appropriate to impute them. Omitting these cases in the dataset would have led to a significant loss of data, especially for Türkiye.

The number of countries varies in each wave of research depending on how data is collected. There are 38 countries in Wave 4, 43 countries in Wave 5, 13 countries in Wave 6 and 35 countries in Wave 7. In this article, where the factor-clustering approach is adopted, each research wave is approached as a new case. However, since the number of countries in Wave 6 was quite low, the factor structures of the previous period -Wave 5- were directly copied and the missing countries of the previous period -Wave 5- were included in Wave 6. The main goal here is to prevent inappropriate clustering behavior in 13 countries. For example, the fact that Russia and Sweden were in the same cluster in the preliminary experiment is due to the fact that Orthodox European countries with which Russia is culturally close did not have data in Wave 6. However, countries taken from the previous period will not be interpreted in Wave 6 and will remain constant. In a study by Inglehart and Baker, in order to avoid data loss, they used the survey result of the previous period/another period in the same country in order not to lose a variable (Inglehart & Baker, 2000, s. 25).

2.1. Factor analysis

First of all, the most important reason for applying factor analysis in this research is to reduce the dimensions of a high-dimensional survey data. In the IVS data set, factor analysis was applied to the questions that had data in 4 periods. In this section, the factor analysis results for each of the 4 research periods are presented and interpreted in summary tables.

Table 3: Factor Loadings of Wave 4 and Wave 5

			Wave 4						Wave 5					
Factors	**Questions**	Survey Code	F1	F2	F3	F4	F5	F6	F1	F2	F3	F4	F5	F6
Child Qualities	Important child qualities: independence	A029	0.77											
	Important child qualities: hard work	A030	0.77											
	Important child qualities: feeling of responsibility	A032	0.83											
	Important child qualities: imagination	A034	0.83											
	Important child qualities: tolerance and respect for other people	A035	0.82											
	Important child qualities: thrift saving money and things	A038	0.77											
	Important child qualities: determination perseverance	A039	0.78											
	Important child qualities: religious faith	A040	0.82											
	Important child qualities: unselfishness	A041	0.80											
	Important child qualities: obedience	A042	0.78											
Neighbors	Neighbors: People of a different race	A124_02		0.90					0.75					
	Neighbors: Heavy drinkers	A124_03		0.85										
	Neighbors: Immigrants/foreign workers	A124_06		0.90					0.77					
	Neighbors: Drug addicts	A124_08		0.87										
	Neighbors: Homosexuals	A124_09		0.86					0.52					
Justifiable	Justifiable: Homosexuality	F118			0.71					0.56				
	Justifiable: Abortion	F120			0.82					0.77				
	Justifiable: Divorce	F121			0.86					0.77				
	Justifiable: Suicide	F123			0.65									
Religious	Important in life: Religion	A006				0.71					0.73			
	How often do you attend religious services	F028				0.66					0.56			
	How important is God in your life	nF063*				0.72					0.74			
	Religious Person	F034												
Political action	Political action: signing a petition	E025					0.71					0.72		
	Political action: joining in boycotts	E026					0.75					0.79		
	Political action: attending lawful/peaceful demonstrations	E027					0.74					0.78		

Political System	Political system: Having a strong leader	E114						0.75					0.76	
	Political system: Having experts make decisions	E115						0.65					0.67	
	Political system: Having the army rule	E116						0.68					0.66	
Confidence	Confidence: The Police	E069_06												0.68
	Confidence: Parliament	E069_07												
	Confidence: The Civil Services	E069_08												0.55
	Confidence: Justice System/Court	E069_17												0.70
	SS Loadings		6.39	3.87	2.62	1.70	1.67	1.58	1.77	1.68	1.58	1.57	1.47	1.30
	Proportion Var		0.23	0.14	0.09	0.06	0.06	0.06	0.10	0.09	0.09	0.09	0.08	0.07
	Cumulative Var		0.23	0.37	0.46	0.52	0.58	0.64	0.10	0.19	0.28	0.37	0.45	0.52
	Variance Explained							64%						52%
	Cronbach Alpha		0.95	0.94	0.87	0.69	0.78	0.75	0.71	0.79	0.65	0.81	0.75	0.68

*The answers to the relevant questions have been rearranged to create a scale pattern for the minimum and maximum values of the indicators.

Table 4: Factor Loadings of Wave 6 and Wave 7

			Wave 6						Wave 7				
Factors	**Questions**	Survey Code	F1	F2	F3	F4	F5	F6	F1	F2	F3	F4	F5
Child Qualities	Important child qualities: independence	A029											
	Important child qualities: hard work	A030											
	Important child qualities: feeling of responsibility	A032											
	Important child qualities: imagination	A034											
	Important child qualities: tolerance and respect for other people	A035											
	Important child qualities: thrift saving money and things	A038											
	Important child qualities: determination persever-ance	A039											
	Important child qualities: religious faith	A040											
	Important child qualities: unselfishness	A041											
	Important child qualities: obedience	A042											
Neighbors	Neighbors: People of a different race	A124_02	0.76										
	Neighbors: Heavy drinkers	A124_03							0.76				
	Neighbors: Immigrants/foreign workers	A124_06	0.75										
	Neighbors: Drug addicts	A124_08							0.80				
	Neighbors: Homosexuals	A124_09	0.64						0.50				
Justifiable	Justifiable: Homosexuality	F118		0.57						0.64			
	Justifiable: Abortion	F120		0.77						0.79			
	Justifiable: Divorce	F121		0.77						0.78			
	Justifiable: Suicide	F123											
Religious	Important in life: Religion	A006			0.74						0.71		
	How often do you attend religious services	F028			0.65						0.65		
	How important is God in your life	nF063*			0.73						0.79		
	Religious Person	F034									0.56		

Political action	Political action: signing a petition	E025				0.84						0.70	
	Political action: joining in boycotts	E026				0.88						0.78	
	Political action: attending lawful/peaceful demonstrations	E027				0.88						0.79	
Political System	Political system: Having a strong leader	E114					0.75						
	Political system: Having experts make decisions	E115					0.67						
	Political system: Having the army rule	E116					0.64						
Confidence	Confidence: The Police	E069_06						0.70					0.61
	Confidence: Parliament	E069_07											0.71
	Confidence: The Civil Services	E069_08						0.56					0.69
	Confidence: Justice System/Court	E069_17						0.70					0.65
	SS Loadings		2.28	1.68	1.67	1.51	1.45	1.33	2.10	1.84	1.79	1.77	1.50
	Proportion Var		0.13	0.09	0.09	0.08	0.08	0.07	0.12	0.11	0.11	0.10	0.09
	Cumulative Var		0.13	0.22	0.31	0.40	0.48	0.55	0.12	0.23	0.34	0.44	0.53
	Variance Explained							55%					53%
	Cronbach Alpha		0.70	0.78	0.68	0.90	0.74	0.69	0.72	0.82	0.70	0.80	0.76

*The answers to the relevant questions have been rearranged to create a scale pattern for the minimum and maximum values of the indicators.

Factor analysis was applied to each period of the data set. The results obtained are given in Table 3 and Table 4. The KMO values for each research period are as follows, respectively; 0.9, 0.83, 0.84 and 0.84. The KMO criterion evaluates whether the common variance between variables, which is one of the basic assumptions required for factor analysis, is sufficient. Therefore, it is important to use the KMO criterion before factor analysis. The KMO criterion measures the magnitude of common variance between variables in the data set. The fact that the correlation between variables is generally high indicates that it is a suitable data set for factor analysis. The KMO criterion takes values between 0 and 1. A KMO value of 0.5 or higher indicates that the data set is suitable for factor analysis, while a value of 0.6 and above indicates that it is quite suitable. However, a KMO value of 0.8 and above indicates that the data set fits very well (Field, 2009, s. 647).

The total explained variance rates are as follows; 64%, 52%, 55% and 53%. The total explained variance is at an acceptable level for a sociological data set. In a similar study aiming to investigate the patterns of regional cultural differences within European countries, similar disclosure rates were obtained in the analysis using ESS and EVS data (Kaasa, Vadi, & Varblane, 2014).

When the factor analysis results are evaluated, at first glance, common factors in all four research periods stand out; religious, justifiable, political action. Common factors will enable the interpretation of general country trends for the last 20 years in this study, which investigates the cultural trends of European countries. Unique variables that are not common in the four waves are child qualities, neighbors, political system, and confidence.[1]

Figure 2: Common and Unique Factors

Although there are mostly the same number of variables in the common factors in each wave, in some cases there may be missing or excessive variables. For example, in the religious factor, question F034 (religious person) was also included in Wave 7, unlike other periods. Another example, in Wave 7, unlike other periods, there is E069_07 (confidence parliament) variable in the confidence factor. This situation strengthens the structure of the factors. It does not preclude general comparability.

The *religious* factor includes individuals' general attitudes towards their religious beliefs. While the lowest number of this factor is 4 (religious person), the highest number 25 (not at all important) indicates tendencies with weak religious beliefs. Individuals' religious beliefs are evaluated by grading them on this scale. The *political action* factor refers to the attitude of individuals to evaluate the impact of political decision-making processes and to intervene when necessary. The lowest value of this factor is 3 (have done) indicating taking action, and 9 (would never do) indicating not taking action against these situations. In this study, the *justifiable* factor examines society's perspective on homosexuality, abortion, suicide and divorce issues. The lowest value of the factor is 4, indicating never acceptable views, while the highest value, 40, indicates generally acceptable views. *Child qualities* is a factor that was significant only in the 4th research period. Individuals are asked to evaluate some qualities they consider important in raising children. The highest value of 10 indicates that many qualities are important for children, while 0 indicates that they are not important. The *neighbors* factor prompts individuals to make an assessment of the people they would like to be neighbors with. In this study, an evaluation is made for

[1] For more detailed information about the questions included in the factors; (GESIS)

people of different ethnic origins, alcoholics, immigrants/foreign workers, homosexuals and drug addicts within the neighborhood factor. The highest value of the factor, 5, means that one does not want to be a neighbor, and 0 means that it does not matter. The *political system* factor aims to get individuals' opinions on some situations regarding the system. Giving opinions on the issues of having a strong leader, having experts make decisions, and having military management will show individuals' satisfaction with the political system. The highest value of 12 describes such situations as bad, while the lowest value of 3 is considered good. *Confidence* factor expresses the trust individuals have in the country's institutions. The lowest level of 4 indicates trust in institutions, while going up to 16 indicates distrust. This simple interpretation of the factors will make differences between countries easier to see.

2.2. Clustering with CLARA

Taking the data set as reference, the optimal number of clusters was determined as 6 using the Elbow method. In order to increase the power of comparison between periods, the same number of clusters was preferred in other periods. By determining the optimal number of clusters as 6, some metrics that would be preferred when using the CLARA algorithm were calculated. In CLARA applied for each research period, the sample was determined as 52 (40+2k, k=6) and the sample size was 0.2.

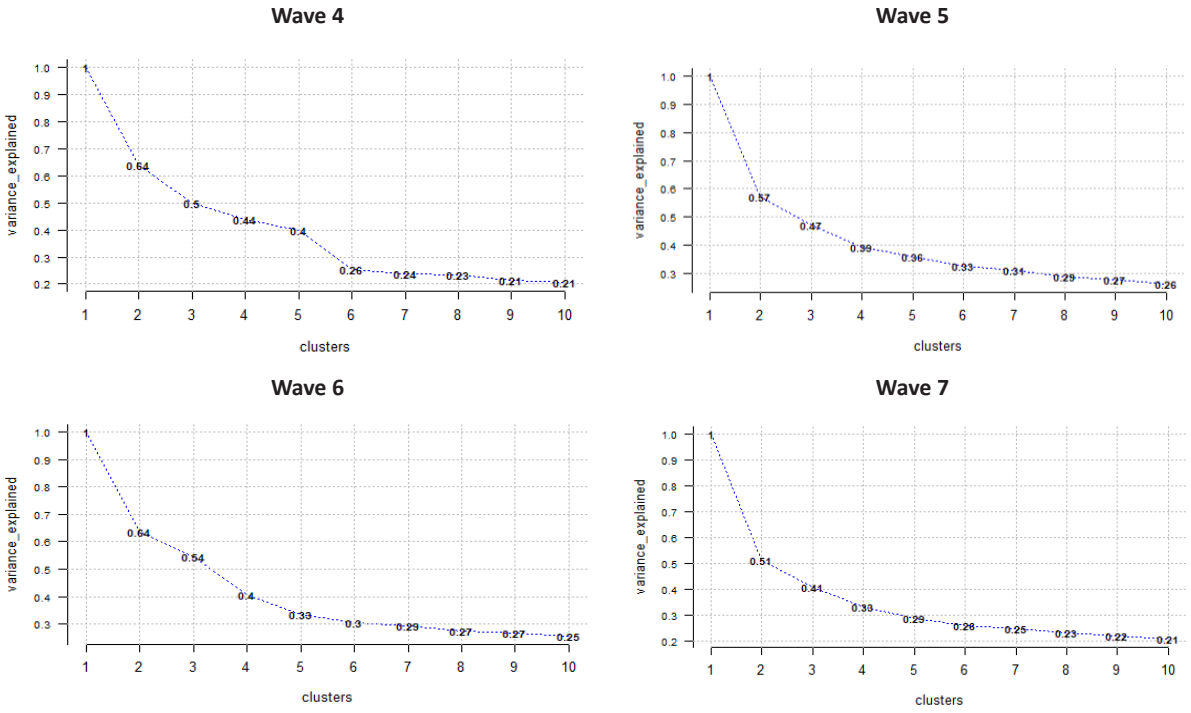

Figure 3: Elbow Method for Optimal Number of Cluster

*In the elbow graph drawn for Wave 6, country data used in Wave 5 has also been added.

The clustering results are given in Table 5, and the map visualization of the clustering results is given in Figure 4. In order to express the clusters to which countries belong on the map and to facilitate tracking between waves, colors have been kept constant between periods in clusters that are similar to each other. No specific naming will be made for the 6 clusters obtained within the scope of this study.

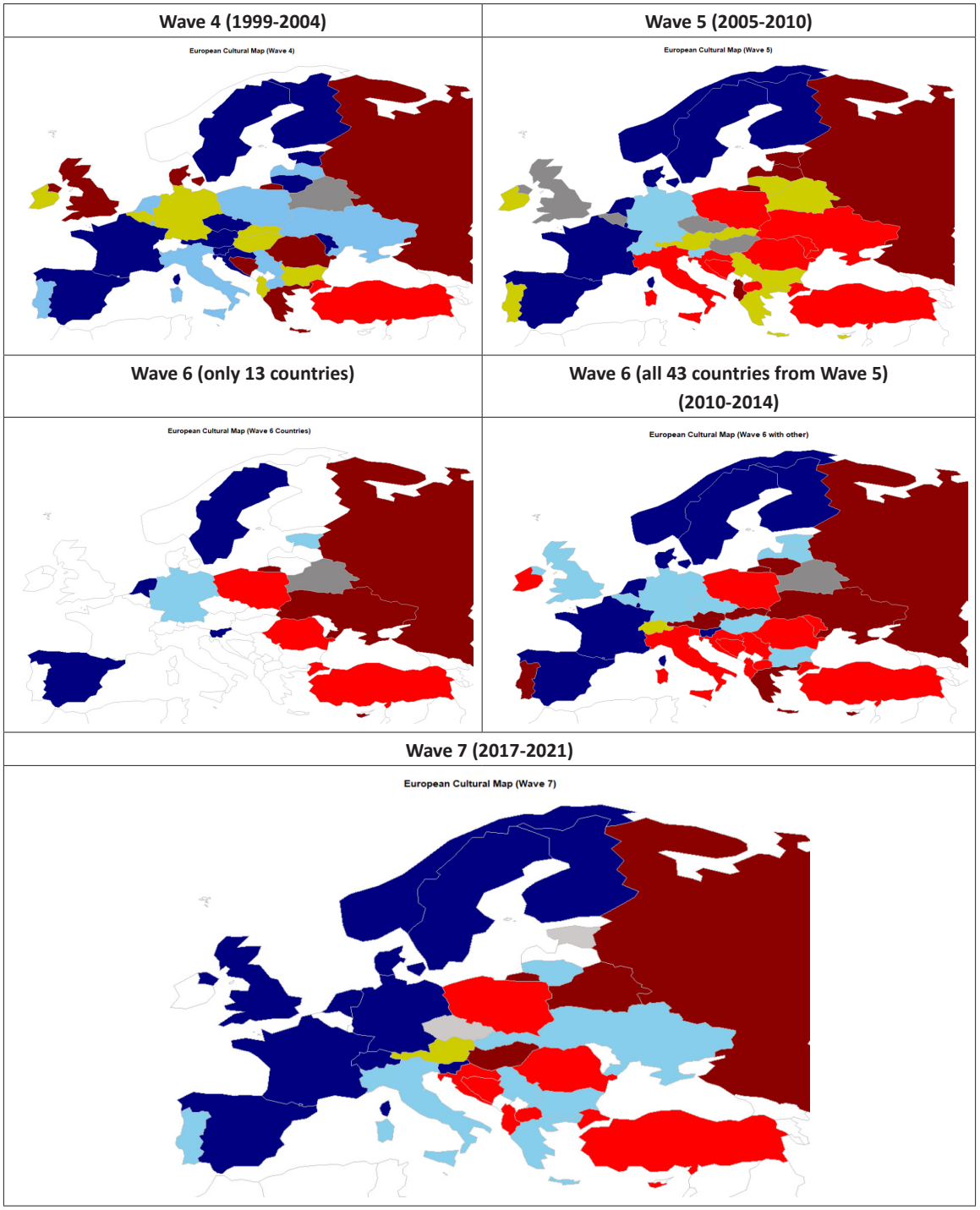

Figure 4: Maps of European Countries

Table 5: Distribution of countries by clusters and waves

	Cluster Color	Wave 4	Wave 5	Wave 6	Wave 7
Cluster 1		Austria, Croatia, Czech, Estonia, Finland, France, Lithuania, Moldova, Slovenia, Spain, Sweden	Andorra, Denmark, Finland, France, Luxembourg, Netherlands, Norway, Spain, Sweden	Andorra, Denmark, Finland, France, Luxembourg, **Netherlands**, Norway, **Slovenia**, **Spain**, **Sweden**	Andorra, Denmark, Finland, France, Germany, Iceland, Netherlands, Norway, Slovenia, Spain, Sweden, Switzerland, United Kingdom
Cluster 2		Türkiye	Bosnia and Herzegovina, Croatia, Italy, Malta, Moldova, *Northern Cyprus**, Macedonia, Poland, Romania, Türkiye, Ukraine	Albania, Bosnia and Herzegovina, Croatia, Ireland, Italy, Malta, *Northern Cyprus**, Macedonia, **Poland**, **Romania**, Serbia, **Türkiye**	Albania, Bosnia and Herzegovina, Croatia, Cyprus, Macedonia, Poland, Romania, Türkiye
Cluster 3		Bosnia and Herzegovina, Denmark, Greece, Romania, Russia, United Kingdom,	Albania, Estonia, Latvia, Russia	Austria, **Cyprus**, Greece, Lithuania, *North Ireland**, Portugal, **Russia**, Slovakia, **Ukraine**	Belarus, Hungary, Russia
Cluster 4		Iceland, Italy, Latvia, Luxembourg, Malta, Netherlands, Macedonia, *North Ireland**, Poland, Portugal, Serbia, Ukraine	Germany, Iceland, Slovenia, Switzerland	Belgium, Bulgaria, Czech, **Estonia**, **Germany**, Hungary, Latvia, United Kingdom	Bulgaria, Greece, Italy, Lithuania, Portugal, Serbia, Slovakia, Ukraine
Cluster 5		Belarus	Belgium, Czech, Hungary, United Kingdom	**Belarus**	Czech, Estonia
Cluster 6		Albania, Belgium, Bulgaria, Germany, Hungary, Ireland, Slovakia	Austria, Belarus, Bulgaria, Cyprus, Greece, Ireland, Lithuania, *North Ireland**, Portugal, Serbia, Slovakia	Iceland, Switzerland	Austria

* The clusters to which Northern Cyprus and North Ireland belong cannot be colored on the map due to technical impossibility, but are given in the table.

Countries in bold in Wave 6 are countries with Wave 6 data. Countries other than these countries in Wave 6 are those whose data were taken directly from Wave 5 and are considered constant.

3. DISCUSSION

In this research, an attempt was made to draw a framework regarding the cultural trends of European countries in the last 20 years by examining the data of approximately 220 thousand people in 4 research periods of the IVS data set. As a result of the application, 6 clusters were obtained by analyzing 45 European countries in all periods. In this section, the averages of the factors obtained in each research period according to 6 clusters are given in Figure 5, Figure 6, Figure 7 and Figure 8. The first 3 graphs in each figure express common factors. The last three graphs in each figure represent unique factors. Only in Wave 7, the number of indicators obtained as a result of factor analysis is 5. Thus, it will be possible to make a comparative interpretation of the common indicators produced from the data within the scope of the study.

Iron curtain is a term that separates Eastern Europe and Western Europe from each other politically, ideologically and economically. This period existed between 1947 and 1991. The term "Iron Curtain" was used by British politician Winston Churchill in a speech he gave in Fulton, USA in 1946 (Brager, 2004). It refers to an obstacle not physically but ideologically. It is not a coincidence that different views emerged between the eastern and western countries in Europe around the indicators we determined in the four periods presented in this study.

According to the results of a similar survey conducted on questions about national identity, religious minorities and cultural superiority, there are signs that there is a clear division between Eastern and Western Europe. In this context, a significant difference is noted between the tendency towards high levels of religious nationalism observed in Eastern Europe and the multiculturalism and openness prevailing in Western Europe. Other questions asked in the survey highlight the values gap that exists between Eastern and Western Europe regarding key social issues such as same-sex marriage and legal abortion (Pew Research Center, 2018).

In this study, it can be said that the reason why Germany was included in different cluster groups in each period was the cultural dynamics underlying the north-east and west division. Germany, which was formed by the unification of many small principalities at the end of the 19th century, remained separated into east and west for half a century. It is possible to say that cultural differences are preserved at the regional level (Kaasa, Vadi, & Varblane, 2014, s. 25).

When Wave 4 trends are examined in general, it is seen that the clusters with the highest religious tendencies are 2, 4 and 6. Strikingly, the clusters with lower religious affiliation compared to the other clusters are clusters 1 and 3. In Wave 5, the countries with the highest religious tendencies were the countries in cluster 2 and cluster 6, similar to the previous period. In Wave 6 and Wave 7, the religious tendencies of these countries are generally the most religious among European countries. Although its place in the belief scale increased slightly in Wave 6 due to some special circumstances of the data, when we look at Wave 7, it is seen that individuals living in these countries are still believers. When the four periods are examined in general, it can be said that religious beliefs in the countries in cluster 1 and cluster 3 are weak throughout European countries. In fact, over the past 20 years, the countries in Cluster 1 have had an increasing (decreasing) trend in the religious belief scale.

Again, when the four periods are evaluated together, it can be said that individuals living in Cluster 2 and Cluster 3 are the most reluctant societies among European countries when it comes to accepting political axioms. Since the countries in Cluster 4 were different in each period, they were not included in the overall evaluation on this subject. However, this reluctance has become an increasing situation in all clusters formed across Europe. Looking at Wave 7, the countries in Clusters 2, 3, 4 and 5 consist of societies that are reluctant in this regard.

It can be said that in countries with high religious tendencies, there is a more negative perspective on issues such as abortion, divorce and suicide. When the Justifiable indicator is examined in all periods, especially the societies of the countries in Cluster 2 with high religious beliefs see such situations as unacceptable. In countries classified as Cluster 1 among European countries, societies evaluate these issues as Acceptable.

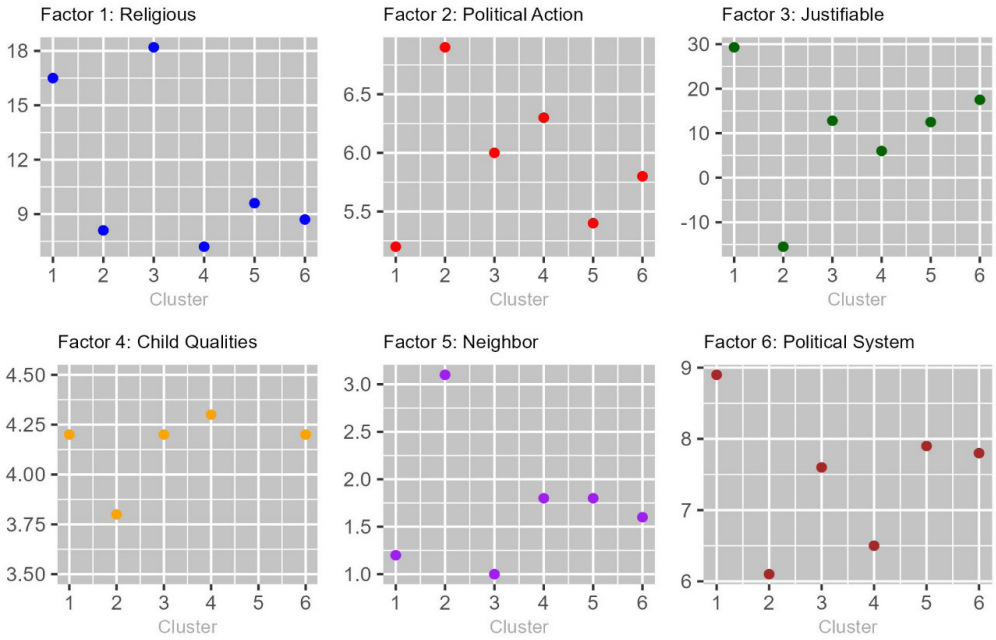

Figure 5: Wave 4 Factor Average

The Child Qualities indicator is only included in Wave 4. The criteria for raising children, which are considered equally important on average in all countries across Europe, are less important in Türkiye, which is in Cluster 2. In neighborhood relations, individuals living in extreme groups may be excluded by a segment of society. Especially individuals living in Cluster 2 do not want to establish neighborly relations with these groups. The countries that do not care about these situations are the countries in cluster 1 and cluster 3. In the political system indicator, the position of Cluster 1 is especially striking. He says that having a strong leader in his country is generally negative for the political system. Apart from this, Türkiye, which is in Cluster 2, attaches importance to having strong leaders and experts in decision-making processes, compared to other European countries.

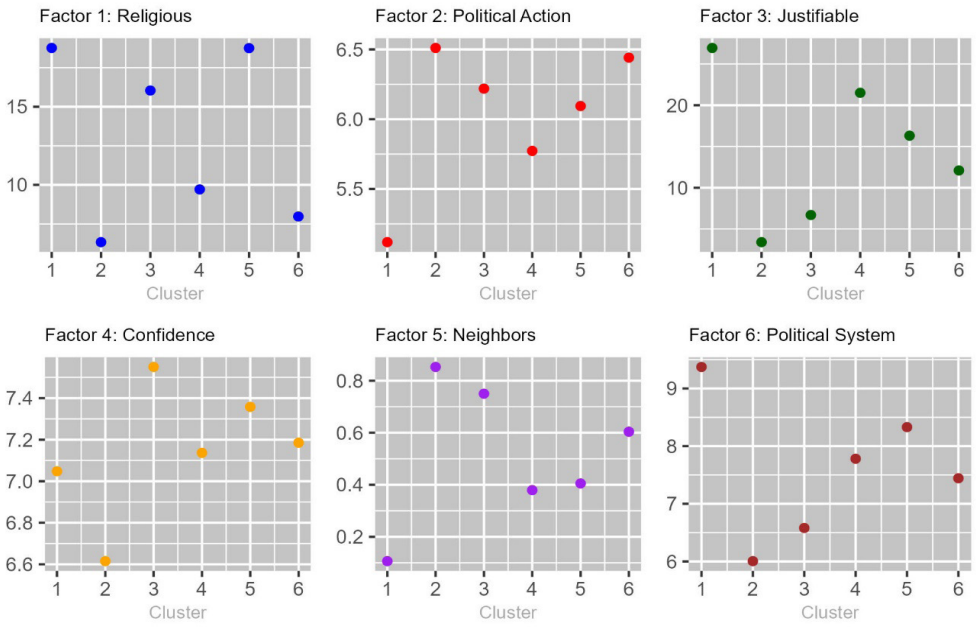

Figure 6: Wave 5 Factor Average

Confidence factor has been included as an indicator in the last three research periods. It can be said that in the last research period, there was generally an increase in trust in government institutions in all clusters.

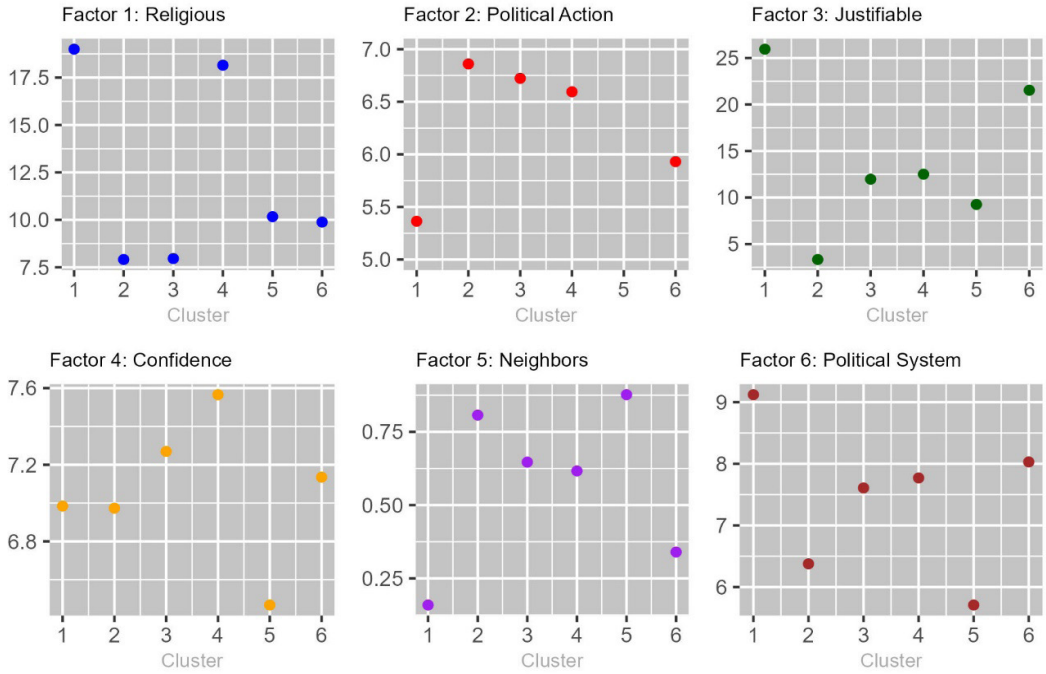

Figure 7: Wave 6 Factor Average

*In these scatter charts drawn for Wave 6, data from the countries taken from the previous period were also used.

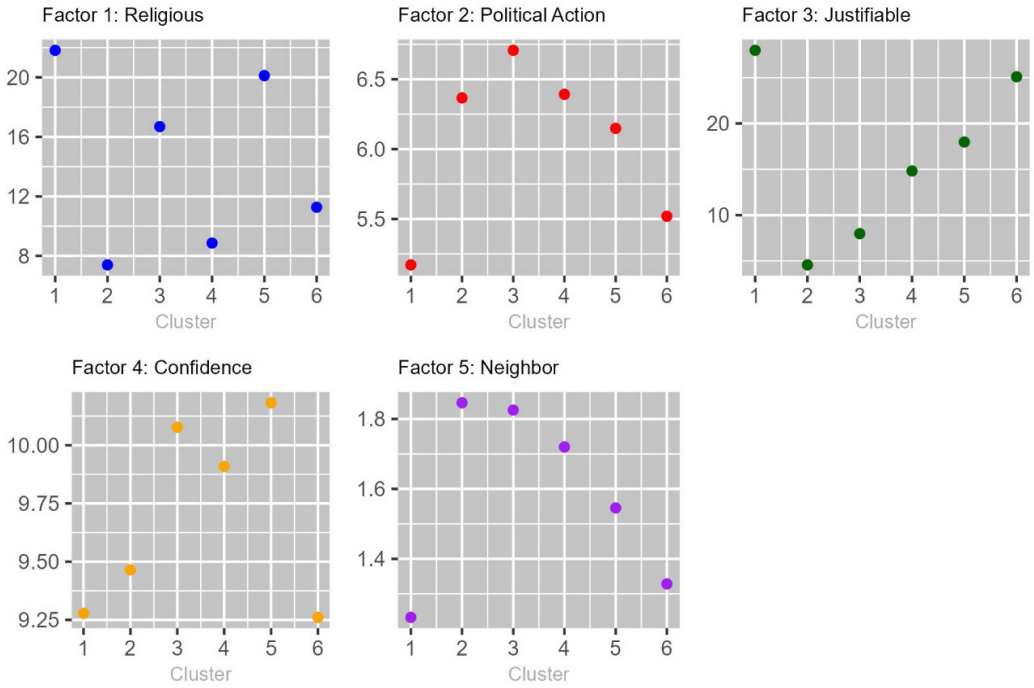

Figure 8: Wave 7 Factor Average

4. CONCLUSION

In this study, it was aimed to investigate the cultural changes of European countries since 2000 by using IVS, one of the largest sociological data sets. Considering the limitations of the data set, an attempt has been made to draw a broad perspective that can be presented methodologically about the cultural dynamics of European countries. A total of 45 European countries were analyzed in 4 research periods covering the years 1999-2021. During the implementation phase of this study, each research period was considered separately. Missing data were filled with the EM algorithm and exploratory factor analysis was applied. Then, European countries were divided into 6 clusters using the CLARA algorithm, which helps cluster large data sets with optimum efficiency.

A general picture of the last 20 years of Europe was drawn, especially by evaluating the common factors religious, justifiable and political action. In recent years, when religious values have decreased in some cultures and increased in others, and political tension has increased, hesitation in taking axioms on political issues has been observed. In this study, which is far from theoretical context, quantitative results on the general cultural structure are presented based on the data of the countries. When European countries divided into 6 clusters were examined in the last 20 years, Northern and Western European countries were generally in Cluster 1 and remained stable in most periods. Türkiye, which was alone in Cluster 2 between 1999 and 2004, joined some Eastern European countries in cluster combinations after 2005. It is possible to interpret the movements in Cluster 3 through Russia. Central European countries, with which Russia is culturally similar in Europe, have been in different clusters, especially in recent times. Other clusters may often be indicative of departures from the first 3 clusters and different cultural tendencies.

A final argument is that European values do not mean the same thing to every European. For some, it reminds us of Europe's Christian heritage, for some it reminds us of liberal and free thought, and for some it reminds us of economic prosperity or democratic institutions. Nevertheless, survey data is one of the most valuable tools to understand Europe's changing mentality and measure the emphasis on cultural values. How European you are actually depends on which European values you feel you belong to. Undoubtedly, the dynamics of European culture, the theories and methods presented will be among the valuable topics that will be discussed in the literature for a long time.

LIMITATIONS OF RESEARCH

Due to constraints in processing capacity, working with a sizable dataset such as IVS imposes various limitations. In this study, only the CLARA algorithm could be employed considering time and processing constraints. In addition, the lack of data for some countries in some waves in the data set was another limitation of the research. To overcome this situation, some assumptions were made.

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