Grouping OECD Countries According to Better Life Index Indicators by Multidimensional Scaling Analysis

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Abstract— The aim of this study is to group OECD countries using the better life index indicators through multidimensional scaling analysis. The Better Life Index consists of thirty-three variables under the dimensions of material living conditions (income and wealth, work and earnings, housing conditions) and quality of life (health status, work-life balance, education and skills, social connections, civic engagement and governance, environmental quality, personal safety and life satisfaction). These thirty-three indicators constitute the variables of the multidimensional scaling analysis. As a result of the analysis, the positions of countries in two-dimensional space were obtained and it was observed that some countries formed distinct clusters. In this way, OECD countries are compared not on the basis of a selected indicator, but on the basis of an approach that encompasses all the indicators of the Better Life Index.

Keywords— Better life index, clustering, multidimensional scaling

I. INTRODUCTION

The Better Life Index (BLI) as a measure of well-being, developed by The Organization for Economic Co-operation and Development (OECD) has multifaceted components. The BLI is part of the OECD's Better Life Initiative, developed to make it easier for people to understand what drives their well-being [1], [2].

The BLI is also a composite index including eleven topics, where some of them are a single variable and some others measured with an average of more than one related variables. The final database in Table 1 contains 11 topics from 36 countries [3], [4].

TABLE 1

ELEVEN TOPICS OF THE BETTER LIFE INDEX

Housing	**Dwellings with basic facilities**
	Housing expenditure
	Rooms per person
Income	**Household net wealth**
	Household net adjusted disposable income
Jobs	**Job security**
	Personal earnings
	Long-term unemployment rate
	Employment rate
Community	**Quality of support network**
Education	**Years in education**
	Student skills
	Educational attainment
Environment	**Water quality**
	Air pollution

Civic engagement	Stakeholder engagement for developing regulations
	Voter turnout
Health	Self-reported health
	Life expectancy
Life Satisfaction	Life Satisfaction
Safety	Homicide rate
	Feeling safe walking alone at night
Work-Life Balance	Time devoted to leisure and personal care
	Employees working very long hours

They also evaluate which nations have the best performances and, therefore, are references. Furthermore, they can be a source of information to analyze how different aspects of a society can influence each other [5]. On the BLI website, countries are represented by a flower with 11 petals. Each petal represents a dimension of prosperity. The length of the petal is proportional to the country's success in that dimension [6]. There are many studies on the better life index in the literature. Lorenz et al. ranked countries based on the composite indicator through a mathematical optimization problem [7]. In his study, Decancq concluded that Scandinavian countries are at the top of the distribution of wealth, while Greece, the Russian Federation and Turkey are at the bottom [8]. Markovic et al. investigated the possibilities of improving the Better Life ranking methodology available on the Better Life initiative website using the I-distance method [9]. do Carhaval Monteiro et al. presented an alternative approach based on a clustering algorithm to measure Quality of Life by considering each dimension of the OECD welfare indicator, the Better Life Index [10]. Balestra et al. examined what are the most important indicators of well-being with Evidence from the Responses of Users of the OECD Better Life Index [6]. Based on the mentioned studies, in this article, oecd countries are grouped by multidimensional scaling method. In this way, countries are evaluated not according to a single indicator, but with the whole set of indicators belonging to the Better Life Index..

II. MATERIAL AND METHOD

Multidimensional Scaling (MDS) is a multivariate statistical method in which units or variables are grouped according to their similarities [11]. The main objective of multidimensional scaling is to find a point configuration, usually in a Euclidean space with distances between units or variables[12]. Metric MDS is applied to data based on quantitative and metric distances, while non-metric multidimensional scaling is applied to ordinal and categorical data [13]. MDS is a technique that produces the geometric position of complex objects and is used to analyze similarities in data. MDS was first used in behavioral sciences to understand individuals' judgments of various elements. Today, a wide variety of real data such as finance, marketing, sociology, physics, communication networks, biology and biomedicine are also subject to MDS [14]. MDS allows for dimension reduction, visual assessment of units or variables, and identification of outliers and gradients. In this way, multivariate systems are better understood [15]. The MDS' goodness of fit statistic is called stress. Stress takes a value between 0 and 1. As the stress value approaches 0, the fitness increases [15]. Another statistical measure is called RSQ indicates the variance explained obtained by solution [16]. As the RSQ value approaches 1, the fitness increases. In this study, data are obtained from OECD website for the year 2019 [17]. The few missing data in the data set were completed with the arithmetic mean of the variable to which they belonged [18]. Metric MDS findings are obtained from unstandardized data by using SPSS 26.

III.FINDINGS

A total of 33 variables of 11 topics are used for MDS analysis. Metric MDS is used since all variables are quantitative. Measures are created by squred Euclidean distances from data. Stress and RSQ values are respectively 0,00617 and 0,99989. Both show the model is a perfect fitted model. In figure 1, derived stimulus configuration, location of countries is shown on a 2-dimensional space.
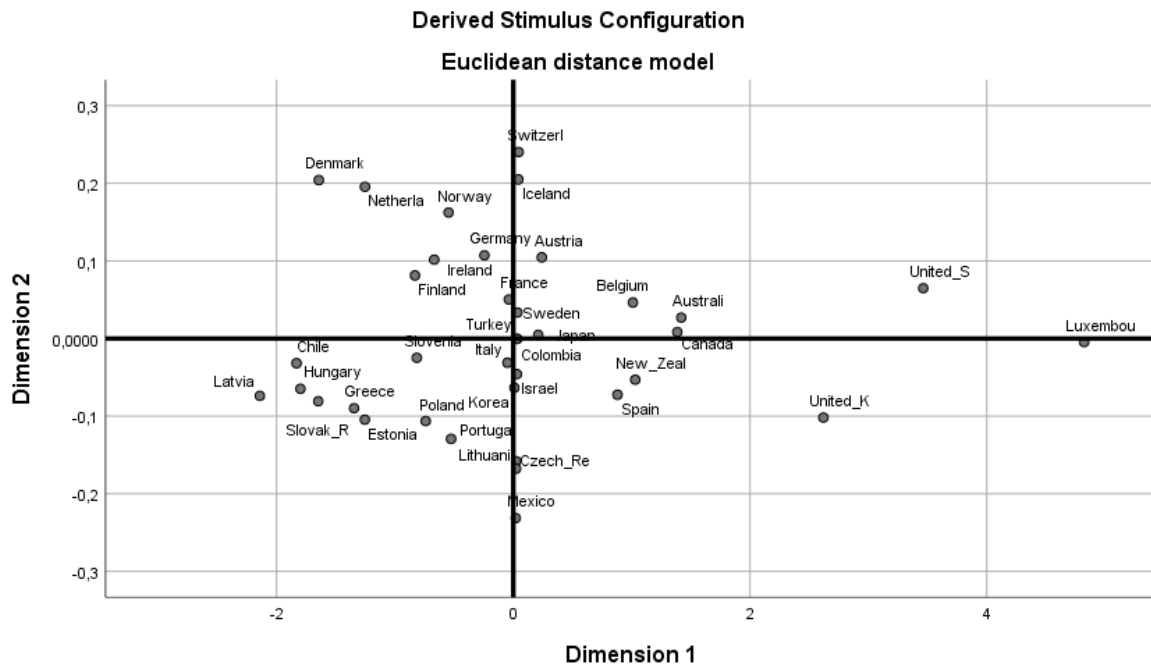
Fig. 1 Location of OECD countries

According to dimension 1, The United Kingdom, The United States and Luxembourg appear as outliers on the right side. Belgium, Australia, Canada, New Zealand and Spain also appear as a cluster on the right. Another cluster on the bottom of the left side includes Latvia, Chile, Hungary, Slovakia R., Greece and Estonia. Poland and Portugal are closer. Denmark, Netherlands, Norway, Germany, Ireland and Finland are close to each other on the top.

According to Dimension 2, Switzerland, Iceland appears together above the origin while Mexico and Czech R. and Lithuania are below.

France, Sweden, Turkey, Italy, Japan, Colombia, Israel and Korea appear as a cluster around the origin.

IV. CONCLUSION

Luxemburg, The United Kingdom and, the United States are above average in terms of economy, education, safety and life satisfaction. Belgium, Australia, Canada, New Zealand and Spain perform well in many indicators of the Better Life Index however Belgium under the average in social connections and Spain in jobs, education, and life satisfaction.

Latvia, Hungary, the Czech Republic and Estonia are above average in social connections but below average in income, health and life satisfaction indicators. Chile has been successful in reducing poverty since the 1990s, but compared to other countries in the Better Life Index, it performs below average in income, jobs, education, environmental quality, social connections, civic engagement, civic participation, security and life satisfaction.

Poland and Portugal perform well on some indicators of the Better Life Index. In particular, they are above average in education and social connections. They are below average in income, health, environmental quality and life satisfaction. Portugal performs above average in housing security and environmental quality, but below average in income, social connections, civic engagement and life satisfaction.

Denmark, the Netherlands, Norway, Germany and Finland perform well on most indicators of the Better Life Index. Denmark and Ireland perform well in work, education, health, environmental quality, social connections and life satisfaction. Ireland is below average only in civic engagement.

Switzerland and Iceland perform well in most dimensions of well-being. They are above average in income, employment, education, health, environmental quality, social connections, security and life satisfaction. Iceland's performance in education is below average.

Mexico has made great progress in improving its quality of life in recent years. However, it underperforms in many dimensions of the Better Life Index. It is below average in income, employment, education, health, environmental quality, social connections, security and life satisfaction. The Czech Republic performs above average in work, education, social connections, safety and life satisfaction, but below average in income and civic participation. Lithuania also performs below average in income, health, social connections and life satisfaction.

France and Sweden perform well in the well-being indicators of the Better Life Index. Turkey, which has made significant progress in improving the quality of life of its citizens over the last two decades, performs well in a limited number of well-being dimensions. Italy is above average in health, work-life balance and civic engagement. It performs below average in income, employment, education, environmental quality, social connections and life satisfaction. Japan performs better than average in education, safety and environmental quality, but below average in income, social connections, civic engagement and life satisfaction. Colombia is a below-average performer in most well-being indicators. Israel is better than average in health, social connections and life satisfaction, but below average in environmental quality. Korea is above average in education, health and civic participation, but below average in environmental quality, social connections and life satisfaction.

The Better Life Index indicators allow countries to be examined and compared on the basis of a selected topic. Each country is assessed as having below or above average performance according to a selected indicator. It is believed that the multidimensional scaling analysis used in the study allows countries to be compared according to all indicators of the Better Life Index. It is suggested that the data also be clustered with different grouping methods other than MDS and that the clusters obtained with MDS be compared with the clusters obtained with other methods. It is thought that such clustering methods can be used as a helpful tool in determining policies related to the development and welfare of countries.

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