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-RESEARCH ARTICLE-

IDENTIFYING UNDERLYING FACTORS OF OECD BETTER LIFE INDEX DOMAIN COUNTRY PRIORITIES' SIMILARITIES THROUGH WARD DATA CLUSTERING

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—Abstract—

This study aims to analyze the national preferences regarding various socio-economic criteria as a measure of national welfare and overall life quality, discover factors potentially serving as reasons for affinity or discrepancies between said preferences through the use of data clustering algorithms. During the analysis different linkage methods were employed, of which some happened to be quite interpretable, seeing as how the results could be attributed to relevant patterns noticeable in the present geo-political, social and economic state of the world, proving existing theories regarding reasons for similarities between nations regarding their perceptions of the term "quality of life". This study may prove important in a way that it might explain why different countries often have similar hierarchy of preferences towards different domains of quality of life, as well as reassess the role of the economic factors in that matter. The results may be applied in various policies— by understanding what people value most in their lives and the reasons that lead them to such decisions, policymakers may exploit

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those reasons to increase the perceived level of quality of life, ensuring the publics satisfaction.

Keywords: Quality of life, Country quality of life perception, Composite index country weights, Ward hierarchical clustering, OECD BLI.

INTRODUCTION

What Is Quality of Life and How Is It Measured?

Quality of life, according to professors David Felce and Jonathan Perry, is "an elusive concept approachable at varying levels of generality from the assessment of societal or community wellbeing to the specific evaluation of the situations of individuals or groups" (Felce & Perry, 1995). When evaluating it, issues may arise, one of which is the following: from a socio-economic standpoint, which characteristic serves as the best measure available and where is the necessary information to be found (Nussbaum & Sen, 1993). Another complication lies in the two existing approaches to quality of life evaluation, first one supporting the idea of a "general agreement" on a consistent set of elements of which it comprises, and the second one stating that the term has a more subjective character, meaning quality of life could be defined by health, psychological problems, personal physiology and many others (Hunt, 1997). Often, a combination of the objective and subjective may take place, meaning that some aspects of life do not depend on the respondent and can be measured without his assistance, while others require the respondent's personal assessment of a certain indicator such as life satisfaction, for instance (Theofilou, 2013).

For the aforementioned reasons, there exists a great number of integral indicators, some of which have been formulated by various world-renowned entities including Eurostat, the World Bank, and the Organization for Economic Co-operation and Development, all of which use health, housing, education and others as factors crucial to the quality of life assessment process (Guliyeva, 2022). Such indicators' use is of great importance due to the scope of domains of human life it includes during the evaluation procedure. Traditional measures do not illustrate a country's quality of life accurately, as they mostly focus on the monetary aspects, namely the Gross Domestic Product, Inflation and Money mass among others. According to professor Swain's work "Measuring progress: Community indicators and the quality of life", two reasons exist as to why such approach does not allow to appropriately measure it (quality of life). Firstly, while increase in monetary transactions is regarded as a positive sign, it should be taken into account that some of those operations can signal, to the contrary, a negative tendency (e.g., higher environmental pollution consequences cleanup spending). Secondly, non-monetary activity, such as volunteer work or non-cash public assistance, is not

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

accounted for (Swain & Hollar, 2003). It seems reasonable, therefore, to expand the employed methodology. A reliable indicator has a set of distinctive features, some of which are the following (Barlybaev et al., 2020):

1. Focus is placed on consumption and income rather than on production.
2. Conclusions regarding quality of life and well-being are drawn based on the conditions and results of households' life.
3. Proper methods for measuring non-market activity are being used so as to not ignore the existence of an entire separate economic activity aspect
4. Both objective (level of education, health, environmental conditions) and subjective (psychological and emotional state of a person, personal assessment of one's own life) aspects are taken into account.

Weights: How People Perceive Quality of Life

An additional important aspect of quality of life calculation is weight assignment. In composite indices, the value of the output depends not only on the values of the inputs, which are represented by various socio-economic parameters (housing, health, income), but the multipliers (weights) assigned to them. One of the ways to interpret the multipliers is to regard them as the degree to which a certain input affects the result, its priority compared to the rest of the parameters. Weighting can be carried by different methods, most prominent of which are statistical analysis and expert weighting, with former using data and given formulae to calculate the values and the latter seeking opinions of the experts regarding a factor's significance (Dobbie & Dail, 2013).

Naturally, if weighting implies the existence of a system of values on which it is based, it is to be expected that every existing variation of weights would be up for debate, seeing as how the said systems of values differ, be it from a confessional, territorial, ethnical or any other standpoint. Even greater differences in such preferences (the treatment by respondents of certain factors as important or insignificant) could be noticed if they were to be derived personally, thus leading to the observation of not groups', but separate people's values hierarchy. Therefore, if an index were to be calculated for a country, increasing a number of respondents would allow for weighting that would lead to decreased disagreement and for, on average, an accurate representation of most of the respondents' values, potentially on a national level, meaning that a set of preferences could be derived for every country that met the number of responses requirement.

Though the use of the four aforementioned principles, inclusion of non-monetary statistics and the employment of composite indices an appropriate evaluation of quality of life can be carried out, however the comparison results would vary depending on the weights. Through the use of data clustering algorithms, this study intends to test whether

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

similarities between countries' weighting (values hierarchy) could be consistently attributed to various social, political and geographical factors, such as ethnicity, religion, territory and others akin to them as wells as test the validity of various claims regarding the economic factor's role as a preference determinant.

LITERATURE REVIEW

The Effect of Weighting on Ci Value. Existing Weighting Techniques

The establishment of composite indicator (further referred to as CIs) has allowed to include the previously neglected factors, measurement of which was less of a straightforward task due to their non-monetary character and the difficulties associated with the data collection process among many other reasons. Quality of life now represents not just the economic state of a country, but also the aspects not directly related to it— health, education, safety and others. As a result, CIs present a more detailed and veracious description of the degree to which welfare is developed in a country. Nevertheless, issues arise when comparison based on the calculated values takes place. The reason for that would be the previously discussed discrepancy between the compared countries' values (different sets of values within a culture or a country may result in different weights being assigned to the CI's elements), as alternative weighting may lead to a different index value despite the inputs remaining unchanged. The review presents some of the research conducted in this area, proving previous claims regarding the CIs subjective character.

Among the many notable ones and related to this study is research by professor (Hudrliková, 2013). As the work's abstract states, the main objective was to compare the European Union member states through the use of CI principles. It is noted that a single correct method of CI calculation does not exist: different techniques employed within the study result in 7 different variations of the index, each leading to different values. The indicators, to which the weights were being applied, were the following:

Employment rate by gender, age group 20-64 (EMP)
Gross domestic expenditure on R&D (GERD)
Greenhouse gas emissions, base year 1990 (GH)
Share of renewables in gross final energy consumption (RE)
Energy intensity of the economy (EN)
Early leavers from education and training (EL)
Tertiary educational attainment, age group 30-34 (TE)
Population at risk of poverty or exclusion (POV)

By utilizing the Equal Weighting, Principal Component Analysis (discussed further in the study) methods and the Benefit of Doubt Approach, all of which are described in

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

greater detail in the original study, different rankings of 27 countries were derived (see Table 1).

Table 1: EU Country Rankings by Different Weighting and Aggregation Methods

Country	EW LIN min-max	EW LIN z-score	PCA LIN min-max	PCA LIN z-score	C-E BOD	MCA Arrow -Raynaud rule	MCA Cope-land rule	Absolute maximum difference in rank	Median rank
Sweden	1	1	1	1	1	0	1	1	1
Finland	2	2	2	2	3	2	4	2	2
Denmark	3	3	3	3	2	2	3	1	3
Austria	5	4	4	4	6	4	5	2	4
Netherlands	4	5	5	6	4	7	2	5	5
Germany	7	6	6	5	7	5	6	2	6
France	6	7	7	7	5	6	7	2	7
Slovenia	9	8	8	8	12	9	8	4	8
United Kingdom	8	9	9	10	9	8	12	4	9
Estonia	10	10	10	9	13	12	11	4	10
Belgium	12	12	12	13	11	12	9	4	12
Ireland	11	14	13	15	10	12	9	6	12
Lithuania	15	11	15	12	15	12	12	4	12
Luxembourg	13	13	14	14	8	11	12	6	13
Latvia	14	15	11	11	14	12	16	5	14
Czech Republic	16	16	16	16	16	10	12	6	16
Cyprus	17	17	17	18	17	24	19	7	17
Slovakia	20	18	18	17	18	24	19	7	18
Poland	19	19	19	19	19	21	21	2	19
Spain	18	20	20	21	21	18	18	3	20
Portugal	21	21	21	20	24	12	17	12	21
Greece	22	22	22	22	20	20	21	2	22
Italy	23	23	23	23	23	20	24	4	23
Hungary	24	24	24	24	22	22	27	5	24
Romania	25	25	25	25	25	24	16	9	25
Bulgaria	26	26	26	26	27	24	23	4	26
Malta	27	27	27	27	26	23	25	4	27

Source: Hudrliková, 2013

Many other methods of calculating a CI exist, however the core idea remains the same for almost all of them. According to Rahman et al. (2005), quality of life is a multidimensional concept, meaning that multiple domains are involved in the calculation process, meaning quality of life can be expressed as the following function:

$QOL = QOL(D_1, \dots, D_J)$, where J equals the number of domains included

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

In their work they also note that each of the domains' values is determined by its own sub-indicators, meaning:

$D_i = f(x_1^i, \dots, x_n^i)$, where n equals the number of sub indicators of the i-th domain

When dealing with CIs, one has to deal with multidimensional data. Sometimes, methods that allow to decrease the dimensionality of that data are employed. Thus, a principal component is a vector, onto which the observations are projected, resulting in a fewer-dimensional representation of a formerly multi-dimensional input. The weights are therefore determined not by individual perception of a certain domain, but purely through mathematical optimization procedures, inputs for which are only the objective (not taking into account opinions, be they respondents' or experts') measurements. A similar approach was utilized by Rahman et al. (2005), however without the use of weights, instead relying on simply calculating the coefficients based on the domain covariance data by calculating its eigenvectors and eigenvalues and dividing the latter by the sum of all of the eigenvalues— a process described in greater detail by Kherif and Latypova (2020) and Karamizadeh (2013).

The subjective method, as the name implies, shifts focus to the respondents' or experts' personal assessment of various domain's significance. Despite the fact that methods akin to regression or principal components analysis can produce highly reliable forecasts, the subjective approach remains superior when it comes to logical interpretation and understanding of the process. Schmitt and Levine (1977) in their study state, that "if the research goal is prediction in some practical situation an adequate description (linear) will serve, but if the goal is to understand the process, then we must beware of analyses (i.e., regression) that can mask complexities". Another important aspect of subjective/objective weighting conflict is the observed correlation between the two weighting approaches: the domains included in the CIs correlate stronger when they share an assessment type, meaning that the subjective ones correlate with the subjective, and the objective correlate with the objective, but when the types are combined correlation becomes weaker (Cummins, 2000), meaning that if a connection between variables exist, it is most likely non-linear (see table 3).

In our previous study ten experts were to provide their opinions regarding the significance of selected factors of quality of life on a scale from 1 to 10. The core principle of this method is the respondents' (in this case— experts) experience regarding the topic, meaning that the weighting results would accurately display the significance of each variable and would therefore lead to a correct assessment of a country's quality of life.

However, in Table 3 of the original study it can be seen that the weight vectors provided by each of the respondents differ strongly, with the correlation coefficient's absolute value rarely exceeding the mark of 50%, implying relatively low linear dependence.

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

This means that employing experts' weighting does not necessarily imply quality of life evaluation accuracy— if experts' weight vectors are distinct from each other to great extent, then that would result in some of them being strongly different from those of the, for example, countries' residents as well, deviating from the countries' relevant (true) weights.

Table 2: The relationship between general objective and subjective QOL measures.

Study	Objective vs. Objective (r)	Subjective vs. Subjective (r)	Objective vs. Subjective (r)
(N = 3018)	Education vs. income (0.40)	Life satisfaction vs. happiness (0.33)	Combination (0.07, 0.12, 0.11, 0.18)
(N = 443)	Health	Life satisfaction vs. positive affect (0.23)	Combination (0.10, 0.01)
(N = 217)	Salary vs. hours worked (0.31)	Satisfaction vs. positive affect (0.36)	Combination (0.17, 0.10, 0.02, −0.02)
(N = 2529)	Income vs. education (0.31)	Satisfaction	Combination (0.33, 0.17)
(N = 241)	Education vs. income (0.24)	Subjective well-being vs. stress (−0.22)	Combination (0.23, 0.06, 0.23, 0.13)
(N = 665)	Income	Happiness	0.11
(N = 1422)	Income, education	Life satisfaction, life purpose	Combination (0.08, 0.08, −0.01, 0.04)
(N = 2251)	Income vs. education (0.31)	Life satisfaction vs. financial satisfaction (0.64)	Combination (0.14, 0.28, 0.07, 0.07)
(N = 430)	Physical fitness	Subjective QOL vs. perceived health (0.40)	Combination (0.14, 0.21)
(N = 804)	Education vs. Wage (0.30)	Life satisfaction vs. Job satisfaction (0.41)	Combination (0.07, 0.17, 0.02, 0.12)

Source: (Cummins, 2000)

The Underlying Factors of Selected Weights

According to professor Hudrliková's calculations, in some countries' instance, the change in weighting technique does not affect the ranking, resulting in consistent placement of the EU members with respect to the remaining 26 countries (e. g., Sweden constantly ranking first), meaning that relative placement of countries in the ranking is predominantly defined not by the formula used, but by a set of certain attributes of the countries themselves (their neighbors, language and others), effects on the ranking of which cannot be eliminated by changing the calculation method and remains observable through all 7 techniques used. The weights calculated by Hudrliková and presented in Table 2 of the original study also illustrates similarities between the EU members. Displayed in Table 2 of the present study are the Pearson correlation coefficients calculated for the arbitrarily chosen pairs of country-specific optimal weights from Table 2 of Hudrliková's study, four cases out of five displaying linear dependence of at least 80%.

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

Table 3: Correlation between countries' weight vectors.

Belgium	0.115	0.128	0.115	0.128	0.186	0.019	0.241	0.217	0.9
Germany	0.182	0.171	0.182	0.171	0.194	0.05	0.236	0.199	
Netherlands	0.204	0.089	0.204	0.089	0.142	0.015	0.202	0.177	0.999894273
Denmark	0.19	0.078	0.19	0.078	0.131	0.009	0.187	0.165	
Germany	0.182	0.171	0.182	0.171	0.194	0.05	0.236	0.199	-0.31
Austria	0.281	0.255	0.281	0.255	0.208	0.239	0.066	0.316	
United Kingdom	0.168	0.085	0.168	0.085	0.13	0.022	0.268	0.217	0.99991749
Ireland	0.163	0.082	0.163	0.082	0.125	0.022	0.262	0.213	
Estonia	0.238	0.075	0.238	0.075	0.274	0.121	0.116	0.206	0.83
Latvia	0.233	0.017	0.233	0.017	0.297	0.2	0.222	0.203	

Source: Calculated by authors of present study based on Hudrliková, 2013 data

It would therefore, hopefully, not be wrong to assume the similarities between each of the countries' weight vectors are a result of geographical proximity, historical factors or others alike.

Professor White et al. (2021), for instance, emphasizes the role of religion as a factor that determines (not necessarily solely) the cultural distances between countries, stating that "exposure to particular religious traditions is also related to people's orientations toward education and economic pursuits". In her study she uses the responses of the World Values Survey (took place in three waves between 2005 and 2019) participants to calculate the Cultural Fixation Index (CF), through which cultural distances are being derived. A value of 0 indicates complete cultural similarity between the selected groups, while a value of 1, contrarily, complete difference. When analyzing the cross-country cultural distances, White and colleagues divide the religious part of respondents into four categories— Buddhist, Christian, Hindu and Muslim, as presented in Figure 1.

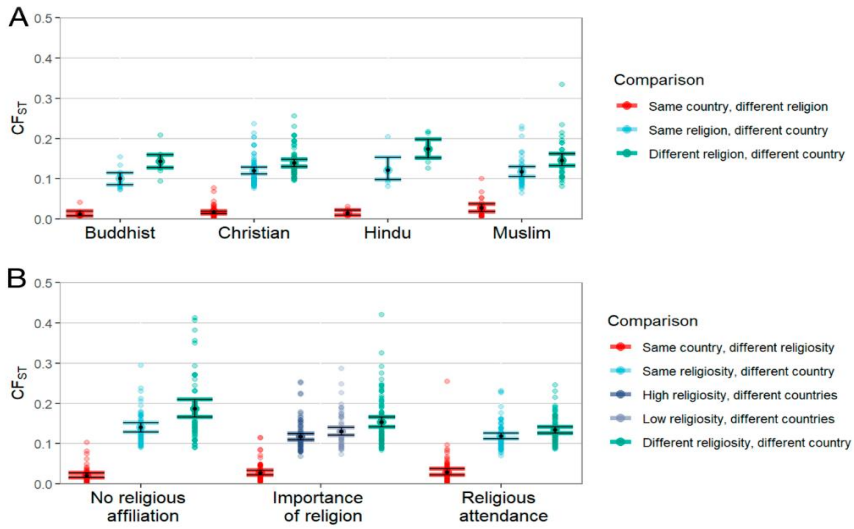

Figure 1: Source: (White et al., 2021)

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

According to Figure 1-A, people belonging to different religions but living in the same country share culture to a great extent (red dots are lower than the rest in every religion category). Although not as noticeably as in the first case, practicing the same religion in different countries (blue dots) also results in cultural similarity with CF equal to approximately 0,11, also depicting connectedness, Buddhist to the greatest extent.

Figure 1-B supports the claim about religion's influence in cultural similarities, seeing as how the average cultural distance between respondents of high religiosity from different countries (dark violet) is lower than the distance between respondents of low (light violet) and absent (blue in the "no religious affiliation" section of the chart) religiosity, illustrating that high religiosity, not necessarily in the same religion, results in greater cultural similarity. Consequently, it can be assumed that religion and the geographical (belonging to a country) factors affect the similarity in culture and, therefore, the value hierarchy.

Previously in this study it has been stated that monetary factors such as income do not serve as reliable variables for quality of life CIs due to the fact that the subjective factors such as happiness are not measured by money, let alone the non-market activity. However, this claim itself was not entirely accurate. Various studies referenced by professor Cummins have discovered curvilinear relationship between the two types of factors, which strengthens once objective well-being declines, and fades once the latter increases or, as the author himself says it: "the inter-correlation of QOL measures between the O and S dimensions will increase as objective life quality decreases to low levels". This tendency can be observed in Table 4.

Table 4: The relationship between general objective and subjective QOL measured in people living with a major putative threat to their QOL

Study	Objective vs. Objective (r)	Subjective vs. Subjective (r)	Objective vs. Subjective (r)
Spinal injury (N = 140) LS = 48.8 ± 23.8	Mobility vs. Functional independence (0.58)	LS vs. Perceived health (0.41)	Combination (0.21, 0.22, 0.07, 0.13)
Spinal injury (N = 80)	Functional status vs. No. of medications (0.38)	Self-efficacy vs. Helplessness (-0.47)	Combination (-0.25, 0.31, -0.21, 0.32)
Home carers for disabled (N = 296) LS = 54.5 ± 11.3	Health vs. income (0.19)	LS vs. optimism (0.49)	Combination (0.31, 0.26, 0.10, 0.09)
Arthritis (N = 58)	Functional status	Control vs. pain (-0.51)	Combination (0.45, -0.55)
Psychiatric (N = 1393)	Income	LS	(0.34)
Elderly (N = 618)	Contact with siblings vs. Social activity (0.18)	LS vs. vitality (0.18)	Combination (0.15, -0.04, 0.31, 0.27)
Home carers (N = 105)	Income vs. health (0.39)	Denial vs. depression (0.36)	Combination (-0.25, -0.19, -0.11, -0.27)

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

Table 4 (continued): The relationship between general objective and subjective QOL measured in people living with a major putative threat to their QOL

Study	Objective vs. Objective (r)	Subjective vs. Subjective (r)	Objective vs. Subjective (r)
Home carers (N = 389)	(0.33)	(0.34)	(-0.24, -0.24, -0.19, -0.36)
Home carers (N = 60)	Amount of assistance vs. patient symptom severity (0.26)	Gratification vs. intimacy (0.78)	Combination (0.13, -0.32, -0.40, -0.41)
Arthritis (N = 203)	Activity limitations	PA vs. NA (-0.25)	Combination (-0.17, 0.22)
Unemployed (N = 78) LS = 50.4 ± 18.0	Health vs. duration of unemployment (−0.22)	LS	Combination (0.58, -0.24)
N	8	9	35
SD	0.325±0.138	0.440±0.131	0.255±0.124

Source: (Cummins, 2000)

LS = Life Satisfaction
PA = Positive affect
NA = Negative effect

In each of the three cases, where there is a given LS (Life Satisfaction) value, it lies below the general population mean of 75% of scale maximum, signaling low objective well-being, which results in correlation coefficients in the combination section that exceed the correlation coefficients in the second and third columns of the table, confirming the previously described phenomenon.

Summarizing the review, it can be stated that an extensive amount of work and its results are available on the subject of quality of life, composite indicators, their objective and subjective character, methods of their calculation and existence of social, political, ethnical, historical and other factors inferred from value hierarchies' similarities. Hopefully, the present study will prove to be of some use in further inquiries in this topic.

METHODOLOGY

Hierarchical Clustering

As was mentioned before, the goal of this work is to identify what countries have similar preferences and the reasons that lead to such similarities through data clustering. Jarman (2020) states: "the primary purpose of cluster analysis is to build a classification system to group cases that are relatively homogeneous within themselves.", said groups being referred to as clusters. In other words, this method allows to identify separate clusters and discover the reasons for such connectedness. In his study, professor Jarman describes the steps that the algorithm follows:

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

1. Each item of the original sample represents a cluster of cardinality 1 (one non-zero element, meaning at the current moment the countries are clusters that contain themselves as the single element).
2. Pairwise distances are calculated for every country-cluster pair. Those with minimum pairwise distance is merged into a new cluster, which contains the two countries. There exist different ways of calculating distance between clusters, however this study uses only the Euclidian distance, which happens to be the most common one and is calculated the following way:

$$d(x,y) = \sqrt{\sum_{i=1}^{n}(x_i - y_i)^2}$$, where x_i and y_i are the i-th elements of n×1 vectors x and y.

3. Pairwise distances are calculated again, taking into account the new cluster replacing the two previously merged ones.
4. Steps 2 and 3 are to be repeated until there is only one cluster with cardinality equal to the original sample size remaining.

Many types of clustering are being used in various studies; however this study utilized the following seven: single, complete, average, weighted, centroid, median and Ward. The 4 steps formulated by professor Jarman apply to all seven types. The key difference between them is how the newly formed cluster's pairwise distances are calculated. To be more specific, the Euclidean distance formula is the same for the algorithms. It is the way that its value is being used that varies across the types.

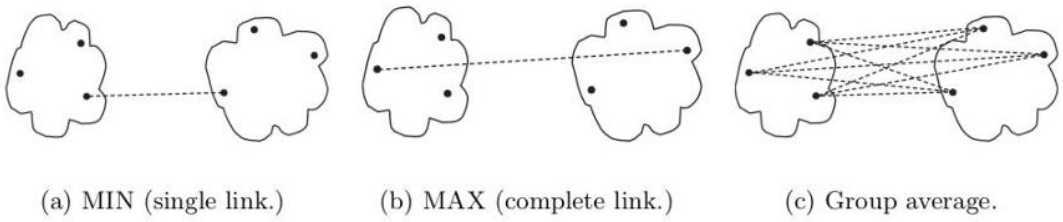

Figure 2: Single, complete and average linkage types. Source: Jarman (2020)

The first group of linkage types is described in Figure 2. The single linkage method calculates all pairwise distances between points in different clusters. The Euclidean distance between the clusters is declared equal to the smallest pairwise distance between points of these clusters. The complete linkage follows the same pattern, only the Euclidean distance between clusters is set equal to the greatest pairwise distance between points of these clusters. Average linkage, as the name implies, calculates all of the pairwise distances and then determines their average, which is treated as the Euclidean distance between the two clusters.

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

The second group, which includes centroid and median follows a different approach, calculating distances once rather than k×m times (k and m being cardinalities of the two clusters). In centroid linkage's instance, the distance is calculated between the clusters' centroids. A centroids in its turn is calculated as the average of the elements of the cluster (in this study that would mean the sum of the country aggregated weight vectors divided by the cluster's cardinality). The median linkage type follows a similar procedure. The difference becomes noticeable when Euclidean distance is being calculated between two clusters, at least one of which contains a smaller cluster as its element. In that case, the median linkage would calculate a clusters' center as the average not of the original vectors, but of the "internal" clusters' centroids. The median linkage method is not described in Jarman's work, but it is in the linkage manual from SciPy available online.

The weighted linkage method, according to the SciPy linkage manual, calculates the distance the following way:

$d(u,v) = \frac{d(s,v)+d(t,v)}{2}$, where u is a cluster formed by merging clusters s and t, v is a remaining cluster

In words, the distance between two clusters is the average of the distances between one cluster and the two clusters that constitute the second one.

The final method is the Ward linkage type. The distances are calculated as

$$\sqrt{\frac{2|A||B|}{|A|+|B|}\|\mu(A)-\mu(B)\|^2} \quad \text{(Kaufman \& Rousseeuw, 1990)}$$

and show the increase in variance resulting after the merge of clusters A and B, where:

$|A|, |B|$ are the cardinalities of clusters A and B respectively
$\mu(A), \mu(B)$ are the centroids of clusters A and B respectively

This formula allows to minimize the post-merge increase in variance (Nielsen, 2016)—an approach that seemed rather fitting for the research goals, which is why the results yielded by Ward's method were analyzed more attentively, which allowed to identify various patterns in the clustering process.

The Better Life Index

For the analysis, the OECD BLI (Better Life Index) was selected. The index, as many others, comprises of 11 elements, each of which consists of its own elements that determine its value (Figure 3). What makes the BLI different from some of the other composite indicators is the absence of predefined weights, which results in leaving the countries' quality of life evaluation to the users based on their own preferences

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

regarding the 11 available factors. In its report titled "How's Life? Measuring well-being" OECD (2011) provides 3 reasons for that, which are the citizen involvement in the discussion of the required type of progress, the identification of the parameters that best describe the state of people's lives improvement and, finally, the optimization of public policy by targeting the factors that contribute to the quality of life the most. The OECD also provide reasons as to why economic measures, such as GDP, are not reliable in the quality of life value calculation due to the fact that, albeit representing consumption and production by households, they do not provide information on how it (consumption, resource base) is shared between each of the households. Another reason, also stated by other researchers mentioned in the literature review in the present work, is the omission (the act of not including) of services produced by households for own-consumption such as parenting and child-care, which theoretically are a vital element of quality of life analysis.

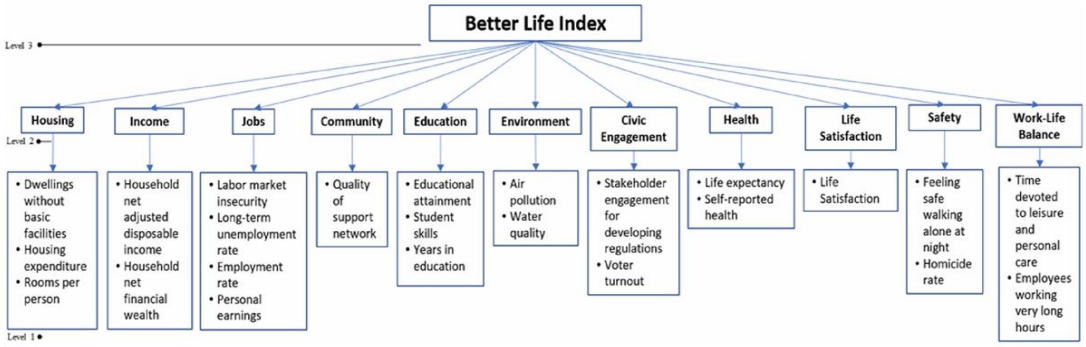

Figure 3: The BLI structure. Source: Koronakos et al. (2020)

The use of the domains presented in Figure 3 can potentially allow for a relatively accurate representation of the selected countries' overall quality-of-life-related preferences. Winn et al. (2025) conducted a study, in which various self-reported multidimensional instruments used to measure quality of life were analyzed. Among several thousand existing ones a few instruments were sorted out based on the authors' set of criteria, whose range of domains varied from 2 to 15 and included: 'standard of living', 'health', 'achievement in life', 'relationships with people you know', 'personal safety', 'community engagement', 'future security', 'time use', 'quality of environment', 'educational life', 'freedom', 'where you live', 'body', and 'self and personality', some of which happen to be part of the OECD Better Life Index, meaning that the aspects of human life that the BLI covers happen to be the same for the indices identified by Winn and colleagues, signaling BLI's probable usefulness and reliability in quality of life analysis.

However, difficulties arise when attempting to use BLI for cross-country comparison as well, mainly because of the absence of predefined weights. Attempts have been made to conduct analysis through various techniques: Koronakos et al. (2020) reports use of

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

the Benefit of Doubt approach, previously described in this work, which did not provide a desired solution since the approach calculates a set of weights for each separate country that maximizes its BLI value, meaning there is no common basis for comparison. Be it use of mathematical models or surveys, in both cases disagreement may take place because values of one social group may not be shared by a different one. Thus, in some countries, income could play a defining role in quality of life calculation, while in others a non-material aspect would be favored.

Despite the absence of weights, the OECD BLI was chosen due to the fact that its approach allows users to create their own "weight vectors", which represent the assessment by a person of the components' significance on a scale from 0 to 5. The weight vectors within a country's territory are then aggregated, resulting in a new vector:

$V = \begin{pmatrix} v_1 \\ \vdots \\ \vdots \\ v_{11} \end{pmatrix}$, where v_i is a "share" of the component, meaning the sum of the elements of vector V equals 1.

Data is available on the official OECD BLI website and is updated every time a new individual weight vector is submitted, recalculating the component shares in the respondent's stated country aggregate weight vector, depicting the nation's present average preferences regarding the significance of certain factors in terms of quality of life. Data used in the study represents the weight vectors as of May 30th, 2025. The number of countries, from which respondents submit their chosen weights, exceeds two hundred, however the number of responses from each country varied significantly. For this reason, countries, the number of responses from which lay below 100 were excluded from the observations list, resulting in sample size of 93 countries (92 countries and the European Union, to be specific). However, despite exceeding the set minimum responses mark, the country Cyprus was rejected as well due to it being an outlier. The reason for this decision is that Cyprus' vector differs from the rest very strongly. Because of the correlation and cosine similarity matrices' dimensions (93×93), it is problematic to present them in the work, which is why only relevant values will be reported. Firstly, based on the correlation matrix, on average Cyprus' weight vector correlated with the rest (including its own) at a level of 43.6%, Angola being the only country to correlate less with the rest at a level of 42.4%.

Secondly, according to the pairwise cosine similarity matrix, which contains values from -1 to 1, the former value representing a 180˚ angle between vectors (opposite to each other) and the latter indicating a 0˚ angle (vectors are identical), all of the countries from the sample achieved an average value no less than 0.99, while Cyprus accounted for cosine similarity of 0.97, which is still a high value, but it is lower than all of the

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

rest that approximately equal 1. The difference is more noticeable after the clustering process (Figure 4). Here it can be seen that Cyprus is not just the last country, but also the last element (among both the 93 countries and newly created clusters) to be merged with a cluster in six out of seven available algorithms.

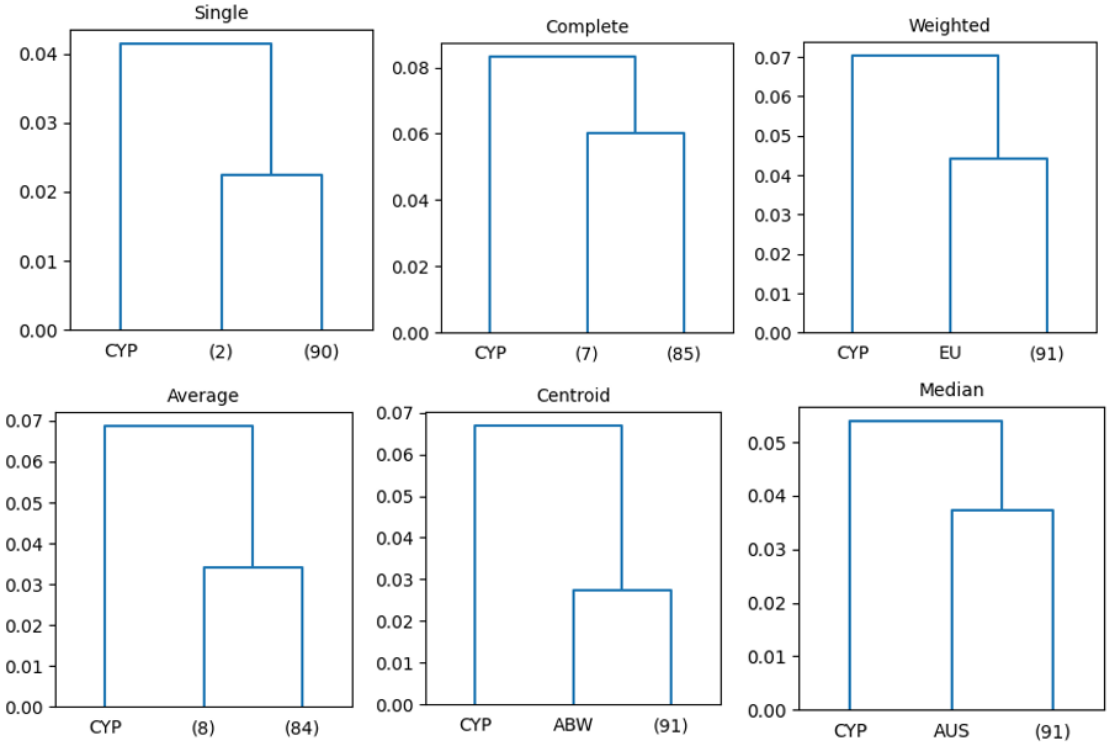

Figure 4: Applying 6 clustering algorithms to the sample

Such strong difference could probably be attributed to the fact that Cyprus has the highest value share of 0,152 in the Work-Life Balance section (Figure 5-A), as it exceeds the average value by 62% (Figure 5-B), while other factors remain relatively close to their corresponding means.

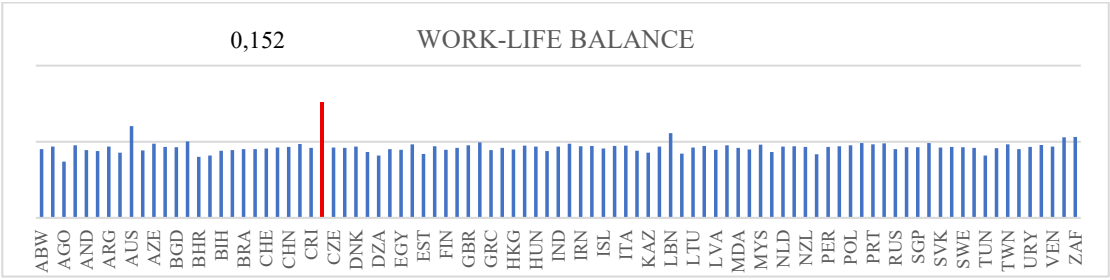

Figure 5. A: Work-Life Balance weight value across countries.

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

	CIVIC ENGAGEMENT	LIFE COMMUNITY	EDUCATION	ENVIRONMENT	HEALTH	HOUSING	INCOME	JOBS	LIFE SATISFACTION	SAFETY	WORK-LIFE BALANCE
CYP	0.057	0.072	0.095	0.081	0.087	0.091	0.107	0.082	0.085	0.081	0.152
Average	0.067	0.078	0.097	0.088	0.1	0.093	0.092	0.088	0.098	0.094	0.093
Difference	-14%	-8%	-2%	-8%	-13%	-2%	17%	-7%	-13%	-14%	63%

Figure 5. B: Cyprus weight vector and the average country weight vector

Such strong difference could probably be attributed to the fact that Cyprus has the highest value share of 0,152 in the Work-Life Balance section (Figure 5-A), as it exceeds the average value by 62% (Figure 5-B), while other factors remain relatively close to their corresponding means.

Keeping in mind the low correlation coefficient and cosine similarity, as well as the clustering results and deviation from the mean in the WL Balance section, interpreting Cyprus' weighting preferences appears to be a difficult task, which is the reason due to which it was removed from the original sample.

DATA ANALYSIS AND RESULTS

Once countries' weight vectors have undergone the clustering procedures, various groups were arbitrarily selected for analysis of possible factors influencing the result of the merge.

Figure 6 illustrates the results of data clustering. The branches show what countries are being joined, while the height of the node where the branches join represents the distance between the clusters preceding the merge.

After choosing the height at which the tree is to be separated into branches 9 groups five of which were superficially analyzed to assess the influence of various factors on the results.

Countries were analyzed in terms of their relative location (neighboring or distant), religion (data from the 2023 report in international religious freedom from the U.S. Department of State- most recent available as of June 7th 2025), language and others.

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

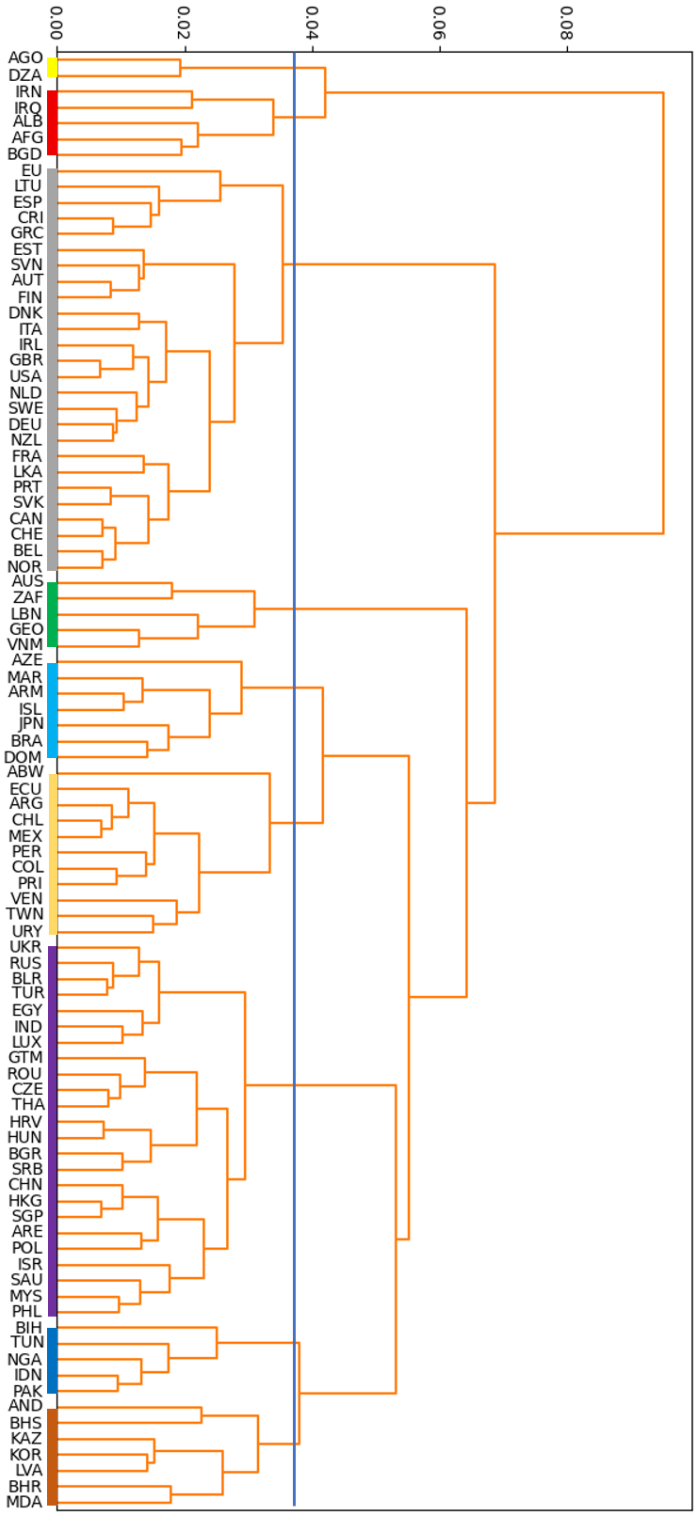

Figure 6: Ward linkage country dendrogram

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

ANALYSIS OF GROUPS

The yellow group has two members, both of which happen to be countries on the continent of Africa. Angola and Algeria, however, are not neighboring and they do not share a national language. Angola is a predominantly Christian country with 41% of the population is represented by Roman Catholics and 38% by Protestants (this information is outdated, however the report states that it happens to be the most recent available). Angola, on the other hand, is mostly a Muslim country (99% of the population are Sunni Muslims).

Health, housing and income appear to be prioritized in both countries (jobs as well in Algeria) according to Figure 7. According to the World Population Review, Angola has a GDP per capita of 2310 USD and Algeria— 5260 USD (as of 2023) and are therefore described as countries living in poverty, which could probably justify such weight selection.

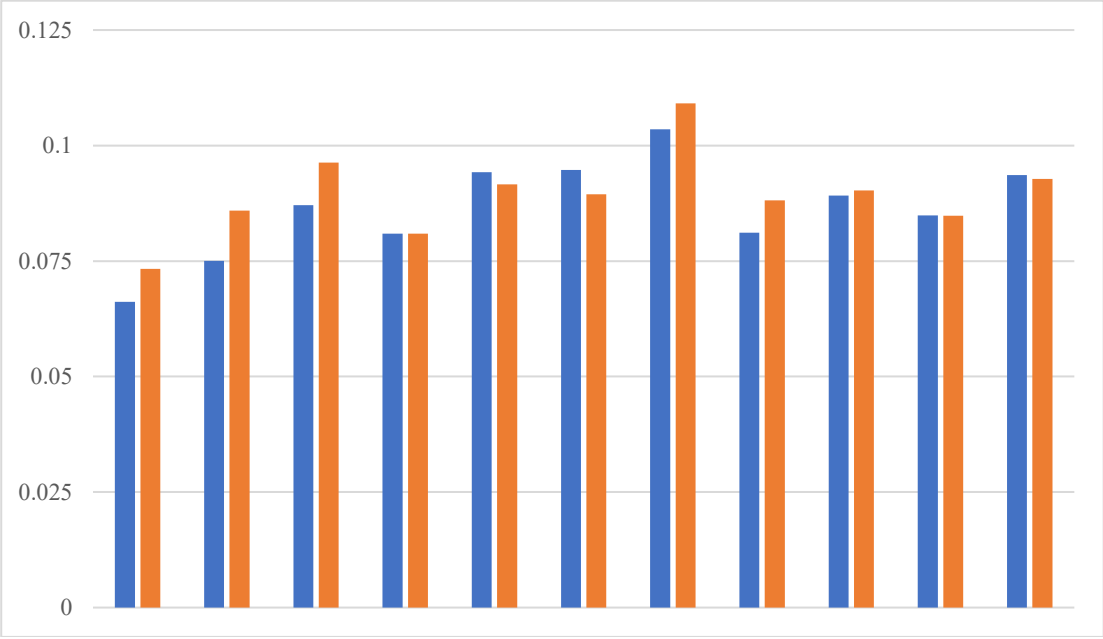

Figure 7: Angola (blue) and Algeria (orange) value shares in the order: Civic Engagement, Community, Education, Environment, Health, Housing, Income, Jobs, Life Satisfaction, Safety, Work-Life Balance

The red group consists of countries that are mostly Muslim, Albania, Afghanistan and Bangladesh belonging to the Sunni Muslims category and Iran and Iraq— Shia Muslims (information regarding Iran is absent in the IRF report). Interestingly, before the red cluster was formed, the Shia countries of the red group were members of a separate cluster, as were the Sunni countries, meaning, potentially, that the religious factor played a significant role in the process (for Iran and Iraq it could be the territorial factor

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

as well, seeing as how they are neighboring countries, although not necessarily, since Afghanistan is also a neighboring country to Iran, however the former was not merged with it directly in the first place). Still, according to Figure 8 on average both sub-groups of the red group tend to have similar preferences. Sunni countries prioritize Income, Housing and Work-Life balance, while Shia— Income, Safety, Housing, Jobs.

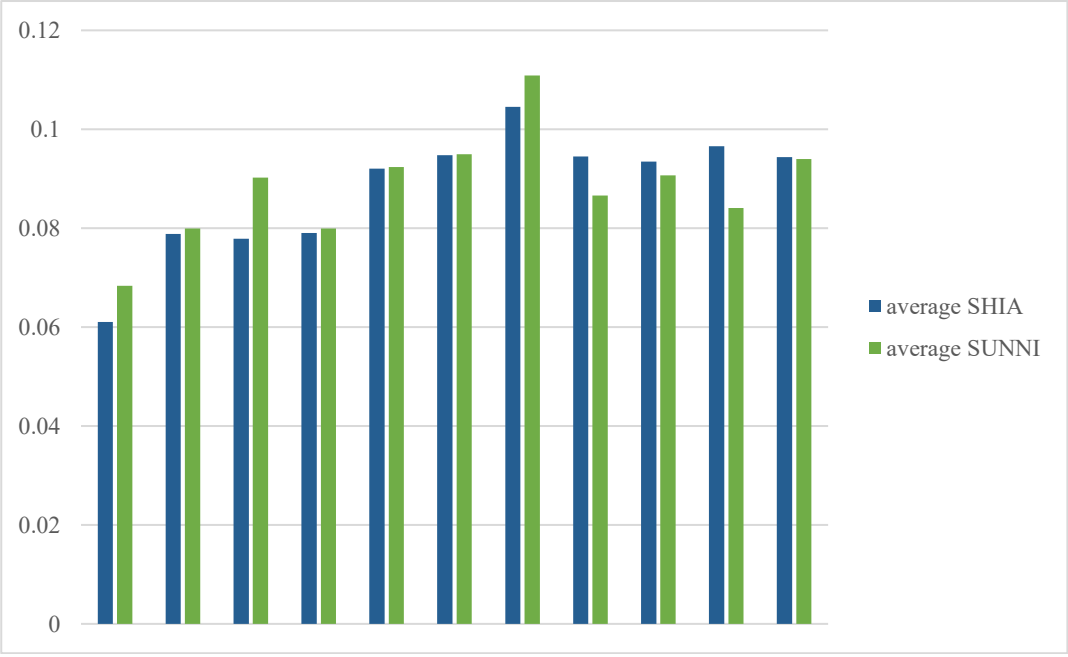

Figure 8: The division of red group's countries based on dominant religion and their value shares in the order: Civic Engagement, Community, Education, Environment, Health, Housing, Income, Jobs, Life Satisfaction, Safety, Work-Life balance

According to World Population Review, all of the "red" countries have GDP per capita significantly lower than 50K USD, thus identifying them as countries living in poverty, which could probably describe the prevalence of monetary factors as the determinants of quality of life in this group. According to a study of multiple Islamic countries conducted by professor (Majeed, 2017), GDP per capita impacts quality of life positively and significantly, which not only explains the weights observed in the red cluster, but also contradicts some of the statements made and shown in the "Literature Review" section of this work regarding the influence of economic factors.

Green group members do not share many characteristics. The countries are not situated near each other, nor are their religious demographics similar.

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

	Civic engagement	Community	Education	Environment	Health	Housing	Income	Jobs	Life satisfaction	Safety	Work-life balance
AUS	0.059	0.07	0.092	0.079	0.098	0.088	0.084	0.078	0.091	0.088	0.121
GEO	0.067	0.079	0.094	0.085	0.105	0.09	0.097	0.088	0.093	0.095	0.099
LBN	0.06	0.083	0.092	0.078	0.099	0.088	0.102	0.085	0.095	0.092	0.111
VNM	0.062	0.077	0.095	0.092	0.103	0.091	0.093	0.084	0.091	0.094	0.106
ZAF	0.059	0.071	0.092	0.082	0.094	0.088	0.089	0.084	0.094	0.091	0.106

	AUS	GEO	LBN	VNM	ZAF
AUS	1.00	0.83	0.89	0.91	0.95
GEO	0.83	1.00	0.91	0.94	0.92
LBN	0.89	0.91	1.00	0.88	0.92
VNM	0.91	0.94	0.88	1.00	0.95
ZAF	0.95	0.92	0.92	0.95	1.00

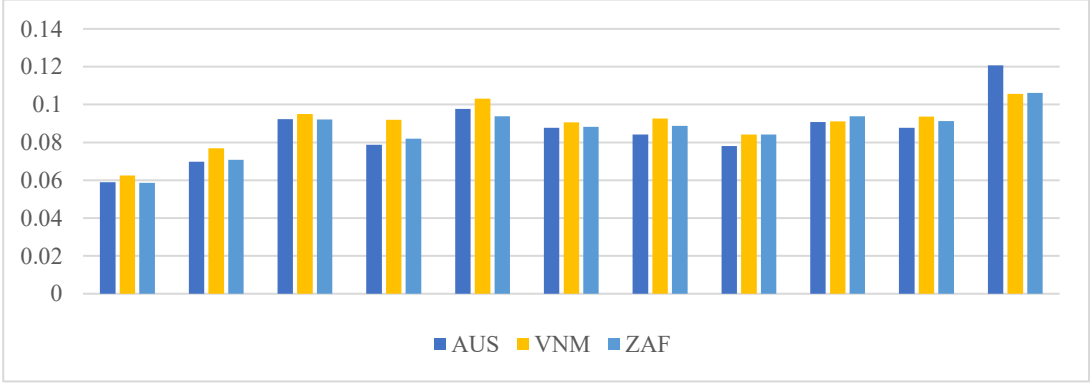

Figure 9. A: Green group weight vectors; **B:** Green group weight vector correlation matrix; **C:** ZAF, VNM, AUS value shares in the order: Civic Engagement, Community, Education, Environment, Health, Housing, Income, Jobs, Life Satisfaction, Safety, Work-Life Balance

However, most of the countries, excluding Australia, where nearly 39% of the country's population declares no religious affiliation, are predominantly religious (more than 90% of population), sometimes mostly Islamic, sometimes mostly Christian, sometimes a combination of a great number of religions including folk beliefs and others, which could potentially serve as a plausible explanation for the fact of these countries' merge and high correlation (Figure 9-B).

The GDP per capita of these countries varies: Australia's exceeds 50K USD, while the Central African Republic's GDP per capita stands at 445 USD, Lebanon— 3350 USD, Georgia— 8120 USD and Vietnam— 4347 USD. Also, according to the United Nations'

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

"World Economic Situation and Prospects 2025" report, the countries' markets do not belong to the same categories. Thus, Australia is classified as a developed economy, Georgia as transitioning and the rest as developing. This could describe the values assigned to Housing, Education and Work-Life balance by each country (Figure 9-A) and, perhaps, even explain, like religion, why the selected countries' weight vectors correlate so strongly.

The gold group's contents seem to be easier to interpret intuitively. Firstly, many of the countries within it (Argentina, Uruguay, Chile, Mexico, Venezuela and the rest) are Latin-American— a situation which may signal the presence of the territorial factor, influence of cultural and language-related similarities between some of these countries-— a phenomenon that can be observed in some of the violet group's subclusters, such as Ukraine-Belarus-Russia, Belgrade—Serbia, Croatia—Hungaria and others. Most of the gold group countries are developing economies, which could also explain such merging outcome. Table 5 illustrates that, on average, BLI's most prioritized domains are Health (0.1), Education (0.099) and Safety (0.095).

Table 5: Gold group countries' weight vectors

	Civic engagement	Community	Education	Environment	Health	Housing	Income	Jobs	Satisfaction	Safety	Work-life balance
ABW	0.087	0.089	0.090	0.092	0.092	0.091	0.091	0.089	0.091	0.090	0.090
ARG	0.069	0.078	0.102	0.088	0.103	0.092	0.086	0.093	0.094	0.095	0.094
CHL	0.071	0.076	0.106	0.090	0.102	0.092	0.088	0.091	0.094	0.090	0.092
COL	0.072	0.076	0.101	0.091	0.099	0.091	0.090	0.089	0.094	0.091	0.097
ECU	0.068	0.075	0.100	0.087	0.099	0.093	0.086	0.088	0.091	0.096	0.090
MEX	0.073	0.074	0.104	0.089	0.101	0.094	0.091	0.091	0.094	0.094	0.090
PER	0.075	0.076	0.103	0.086	0.095	0.090	0.089	0.090	0.099	0.096	0.093
PRI	0.071	0.083	0.099	0.091	0.102	0.091	0.089	0.088	0.094	0.093	0.098
TWN	0.074	0.081	0.092	0.090	0.104	0.090	0.089	0.086	0.092	0.100	0.097
URY	0.082	0.074	0.097	0.086	0.097	0.092	0.091	0.087	0.090	0.099	0.093
VEN	0.069	0.074	0.098	0.084	0.100	0.092	0.092	0.097	0.091	0.101	0.094
AVERAGE	0.074	0.078	0.099	0.088	0.100	0.092	0.089	0.090	0.093	0.095	0.093

Blue group countries correlate with each other strongly (fig. 10-A)— the lowest correlation coefficient value is equal to 0.77. This could probably be explained by the fact that these countries are predominantly religious (90% of the population of Azerbaijan are Muslims, in Japan 48.8% are followers of Shintoism and 48.4% are Buddhists, in Iceland 7.7% of the population do not profess any religion, in Morocco

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

99% of the population are Sunni Muslims, in Armenia more than 97% are adherents of the Armenian Apostolic Church, in Brazil 14% do not identify themselves with any religious group, in the Dominican Republic more than 50% of the population are Catholics and more than 20% are Protestants). It may appear contradictory that Azerbaijan was not joined with the red group's countries and that their weight vectors' correlation is relatively low (fig. 10-B). It means that religiosity is not always the dominant factor during CI element (domain) weighting. Perhaps this situation is a result of the classification differences: Azerbaijan is an economy in transition, while the rest (except for Albania, which is also an economy in transition) are developing economies.

	AZE	BRA	DOM	JPN	ARM	ISL	MAR
AZE	1	0.82	0.77	0.78	0.82	0.83	0.84
BRA	0.82	1	0.94	0.91	0.9	0.94	0.93
DOM	0.77	0.94	1	0.92	0.84	0.89	0.84
JPN	0.78	0.91	0.92	1	0.92	0.94	0.87
ARM	0.82	0.9	0.84	0.92	1	0.97	0.93
ISL	0.83	0.94	0.89	0.94	0.97	1	0.96
MAR	0.84	0.93	0.84	0.87	0.93	0.96	1

	AFG	ALB	AZE	BGD	IRN	IRQ
AFG	1	0.93	0.58	0.86	0.79	0.85
ALB	0.93	1	0.36	0.91	0.8	0.86
AZE	0.58	0.36	1	0.39	0.51	0.56
BGD	0.86	0.91	0.39	1	0.64	0.74
IRN	0.79	0.8	0.51	0.64	1	0.93
IRQ	0.85	0.86	0.56	0.74	0.93	1

Figure 10. A: Blue group countries' weight vectors correlation; **B:** Example- presence of the religion factor does not guarantee similarity (Azerbaijan correlation with "red" countries)

Taking that into account, as well as the fact both Albania and Azerbaijan are predominantly Muslim countries, them not being merged into the same cluster could imply that the CI weights are not always influenced by economic factors (the issue of this statement's validity will be addressed later).

From this one could also infer the religious factor's insignificance, however previous groups' cases seem to refute such conclusion.

PREFERENCES IN COUNTRIES WITH HIGH GDP PER CAPITA

Thus, religion and location tend to be quite influential in the value hierarchy formulation, while GDP per capita difference between countries does not prevent them from being merged into clusters. UN's economy development classification also does not seem to affect weighting: Japan, a developed economy, is merged with a sub-cluster containing the Dominican Republic and Brazil, developing economies, while none of the G7 countries were merged with each other directly except for the United States of

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

America and Great Britain, however it is unclear whether this merge is a result of a cultural (as well as a historical) or economic factor. This may have happened for the following reason: the degree of economic factors' impact changes when analyzing countries with higher GDP per capita. To be more specific, GDP per capita may be influential at all levels, seeing as how, theoretically, it represents the average income of a person in a country, meaning that people's perception of what constitutes the quality of life may be affected by that value. However, as previous observations have shown, dissimilarity between the countries' GDP per capita does not always obstruct their joining into a new cluster.

To analyze the difference nine countries were selected, in all of which the GDP per capita value as of 2023 exceeds 50K USD: Ireland, Belgium, Switzerland, USA, Great Britain, United Arab Emirates, Finland, Canada and Germany. Figure 11 illustrates the countries' weight vectors.

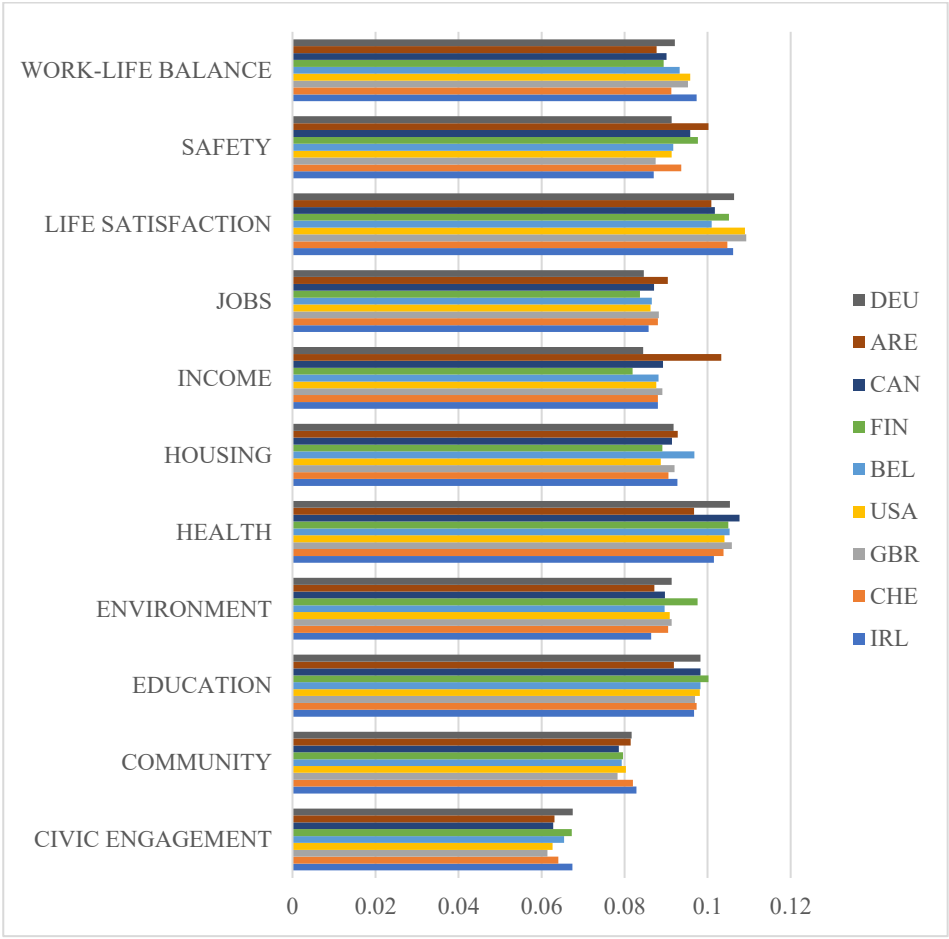

Figure 11: Countries with relatively high GDP per capita weight vectors (above 50K USD), selected based on data provided by World Population Review.

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

Previously, the respondents from relatively poorer countries on average would often give preference to Work-Life, Income and Housing. In this case, however, countries prioritize Life-Satisfaction, Health and Education more than the previous countries did. Ward's linkage algorithm notes this phenomenon: most of these countries merged with the others from the chosen 9 (Germany was merged with Ireland after merging with New Zealand), and those that did not formed clusters with countries outside this list that followed the same weighting pattern (Figure 12) and also had GDP per capita exceeding 50K USD (except Poland with 22,113 USD and New Zealand with 48,528 USD): Finland and Austria, Belgium and Norway, UAE and Poland, Germany and New Zealand. Despite some of these countries being distant from the others within the same GDP-based group or having a different culture, they end up being merged, perhaps implying a decrease in previously identified factors' (religion, territory and culture) "decisive power" in terms of clustering or domain (element) weighting.

Sone of the aforementioned studies confirm the economic factor's importance in this matter, describing the positive effect of consumption and income on social well-being, implying the existence of a connection between these variables and quality of life.

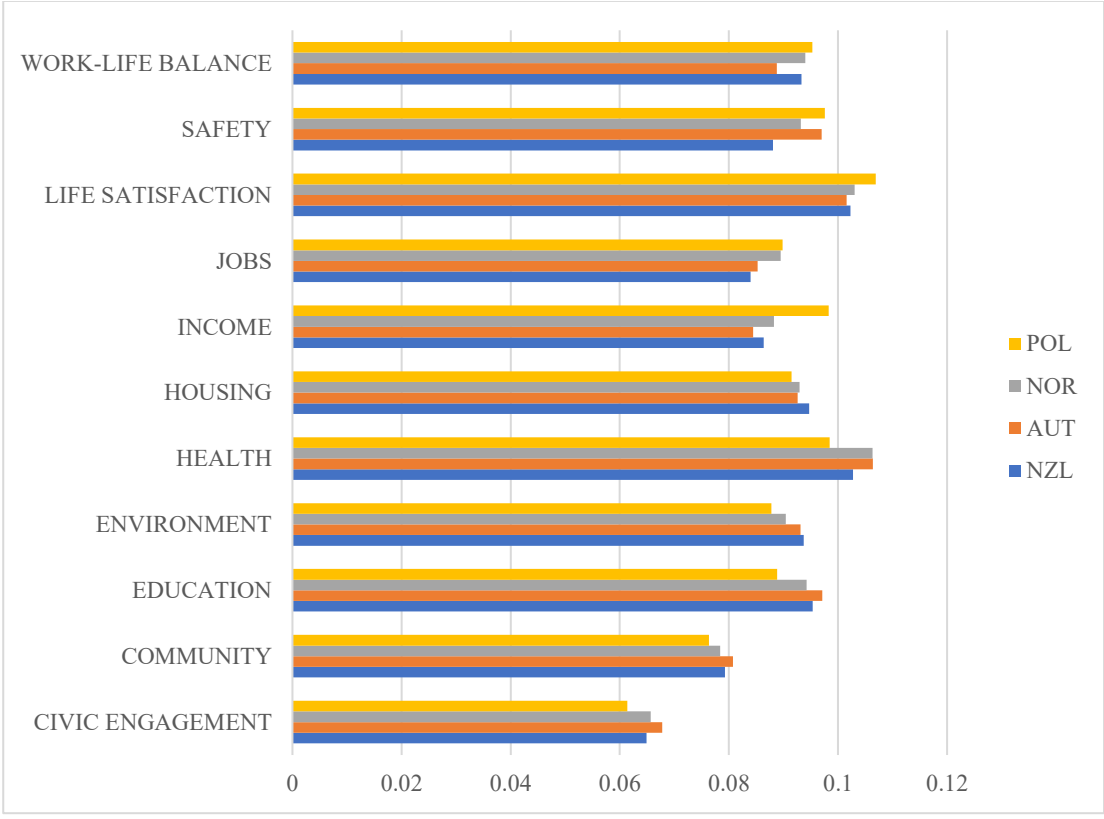

Figure 12: Countries outside the previously selected list generally also prioritize life-satisfaction and health

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

These results are also consistent with many sociological theories, namely Maslow's hierarchy of needs theory (Trivedi, 2019), according to which the needs can be divided into physiological, safety, belonging and other needs. The earlier categories serve as prerequisites for the latter ones' "satisfaction", meaning, for instance, the following: a man who seeks to satisfy his need for belonging is expected to have the previous two categories accounted for, otherwise it would not make sense for him to seek belonging without having taken care of his economic and bodily needs, which are the ones responsible for his existence and physical livelihood.

THE INCREASING INFLUENCE OF THE ECONOMIC FACTOR

Residents of countries with lower GDP per capita believe that quality of life mainly depends on income, housing and work-life balance— aspects related to the material, primary categories. In countries with higher GDP per capita people seek overall life satisfaction, health and education— aspects less related to a person's survival (health is related to survival, however it is assumed that here it does not represent safety from life-threatening conditions, otherwise it would also be given a greater weight in countries with lower GNP), seeing as how the economic-related issues are taken care of.

Table 6 presents the correlation between the indicators for each of the BLI domains in different countries (Taiwan, Cyprus and Venezuela are not taken into account; the latest available data, 2022, are used for Lebanon). Although the absolute values of the correlation coefficient are not very high, the inverse relationship between the Income element and Education, Environment, Health is quite pronounced (-0.54, -0.52, -0.45) — preferences for the first indicator are opposed to preferences for the last three, implying that relatively less favorable economic living conditions, presumably, form preferences related to satisfying needs of a more "material" nature. For example, the Housing (-0.25, -0.28, -0.28) and Work-Life Balance (-0.12, -0.14, -0.06) elements also correlate negatively with Education, Environment, Health, although in the latter case the correlation is relatively low. It is important to note the negative correlation between Housing and Work-Life Balance (-0.52)—economic conditions that shape the corresponding preferences do not necessarily lead to a simultaneous increase in the weights of the areas associated with these preferences—in different countries, the priority of work-life balance and housing is not the same, which is why the indicator of one of the indicators increases at the expense of the other. This probably explains the inverse relationship between these two elements. The obtained result may also be a consequence of the fact that the Work-Life Balance indicator is less "monetary" in nature than Housing and, for example, Income and Jobs, with which it also correlates negatively (-0.10 and -0.33, respectively).

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

Table 6: Correlation between BLI elements (domains) and GDP per capita.

	CIVIC ENGAGEMENT	COMMUNITY	EDUCATION	ENVIRONMENT	HEALTH	HOUSING	INCOME	JOBS	LIFE SATISFACTION	SAFETY	WORK-LIFE BALANCE	GDP per capita 2023
CIVIC ENGAGEMENT	1											
COMMUNITY	0.11	1										
EDUCATION	0.17	-0.17	1									
ENVIRONMENT	0.22	0.06	0.29	1								
HEALTH	-0.21	0.02	0.44	0.29	1							
HOUSING	0.04	-0.02	-0.25	-0.28	-0.28	1						
INCOME	-0.16	0.07	-0.54	-0.52	-0.45	0.29	1					
JOBS	0.13	0.01	-0.07	-0.13	-0.07	0	0	1				
LIFE SATISFACTION	-0.16	0.12	0.1	0.39	0.27	-0.23	-0.3	-0.03	1			
SAFETY	-0.11	-0.09	0.08	-0.06	0.14	-0.14	-0.15	-0.03	-0.06	1		
WORK-LIFE BALANCE	-0.26	-0.16	-0.12	-0.14	0.06	-0.52	-0.1	-0.33	-0.02	-0.09	1	
GDP per capita 2023	-0.11	0.16	0.03	0.29	0.39	-0.13	-0.32	-0.2	0.47	-0.03	0.12	1

Source: calculated based on data from World Bank

It is also noteworthy that GDP per capita correlates positively with Environment (0.29) and Health (0.39), as well as Life Satisfaction (0.47) and negatively with Income and Jobs (-0.32 and -0.2 respectively). Furthermore, it can be seen that preference for Income usually coincides with low weights of Education, Environment and Health and vice versa, which is illustrated by correlation coefficients equal to -0.54, -0.52 and -0.45.

Thereupon, it can be stated that the economic factor does matter when determining quality of life for following reasons:

1. As GDP per capita grows, more focus is placed on values lying higher in the hierarchy (less material, more related to comfort and intellectual needs) due to the basic (fundamental) needs being satisfied
2. As GDP per capita grows, non-economic factors (territory, culture) become less influential in terms of merging decision.

Naturally, this “rule” may have exceptions. It is especially noticeable in dark-blue group’s case, which includes the following countries: Bosnia and Herzegovina, Indonesia, Pakistan, Nigeria, Tunisia, Israel, Morocco, Armenia and Iceland. Their weight vectors are presented in Table 7.

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

Table 7: Dark-blue group countries' weight vectors

	Civic Engagement	Community	Education	Environment	Health	Housing	Income	Jobs	Life Satisfaction	Safety	Work-Life Balance
BIH	0.067	0.073	0.096	0.080	0.103	0.111	0.090	0.096	0.100	0.086	0.088
IDN	0.066	0.078	0.106	0.087	0.095	0.099	0.091	0.086	0.097	0.093	0.088
NGA	0.067	0.074	0.099	0.080	0.099	0.101	0.096	0.091	0.099	0.094	0.087
PAK	0.068	0.076	0.101	0.086	0.100	0.099	0.094	0.086	0.096	0.091	0.084
TUN	0.066	0.072	0.107	0.080	0.100	0.095	0.095	0.097	0.096	0.095	0.082
AVERAGE	0.067	0.075	0.102	0.083	0.100	0.101	0.093	0.091	0.098	0.092	0.086

According to it, most of these countries prioritize education or Health, but none of these countries' GDP per capita exceeds 10K US dollars. They had not previously identified this trend: at the same time, Work-Life is 8th on average in terms of priority in this group (highest weight to lowest), Jobs is 7th, and Income is 5th, which indicates a strong difference between these countries' preferences and preferences of other countries that lie in the same GDP per capita.

The countries, according to the 2023 IRF report, are predominantly religious, most frequently either Muslim or Christian among others. The religious factor could probably explain why Indonesia and Pakistan— predominantly Islamic countries — were the first members of the group to be joined, and as for Nigeria and Tunisia— the territorial factor as well, although it is debatable, seeing as how both countries are located on the same continent, but could not be described as neighboring, which could imply a cultural or religious effect (both countries are predominantly religious, but have different shares of religions).

Figure 13 illustrates the average weight vectors for yellow, red, green, gold, blue and dark-blue groups.

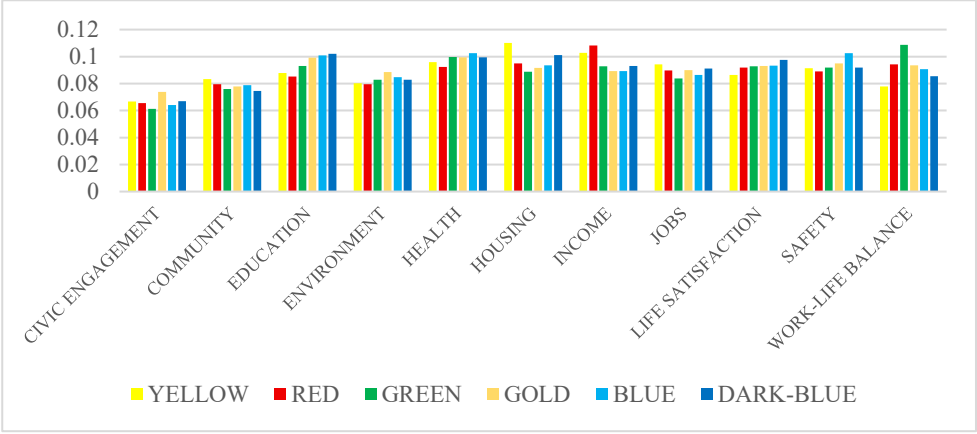

Figure 13: Average weight vectors of groups

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

Yellow group prioritizes Income, Housing and Health. Red— Income, Housing and Work-Life Balance, followed by Health. Green— Work-Life Balance. Health, Education and Safety, as well as Life Satisfaction. Blue— Health, Education and Safety, while Dark-Blue— Health, Education and Housing. The statement regarding economic factor's influence on preferences seems to be supported by red and yellow groups. Although less noticeable in other groups, it may not necessarily be the case that it is absent, rather not prioritized as much, seeing as how the share of countries with GDP per capita exceeding 50K USD (or close to it) in those groups is relatively low. In this case cultural and territorial factors seem to be more influential. For example, in gold group the three most frequently prioritized domains (elements) among Latin-American countries are Education, Health and Safety. According to Balestra et al. (2018), a country's location affects preferences: "The world-region of residence seems to affect views on life satisfaction, civic engagement and safety", which means that geographical proximity could theoretically explain the similarity in stated preferences (weight vectors), supporting previously made statements.

Figures 14-A and 14-B show the scatterplots of GDP per capita of countries in 2023 with Life Satisfaction, Education, Health and GDP per capita of countries in 2023 with Income, Housing, Jobs, respectively.

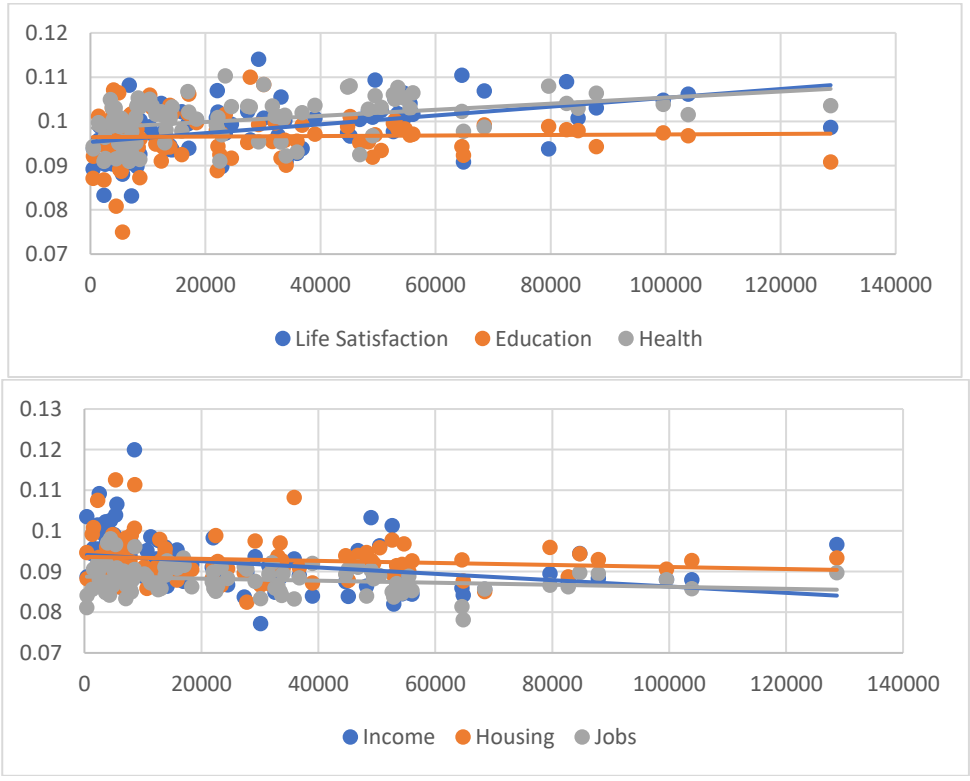

Figure 14: A: Scatterplot of GDP per capita 2023 with Life Satisfaction, Education and Health. **B:** Scatterplot of GDP per capita 2023 with Income, Housing and Jobs.

Vol: 17 **No:** 04 **Year:** 2025 **ISSN:** 1309-8055 (Online) (**pp.** 319-350) **Doi:** 10.34109/ijefs.202517415

Figure 14-A shows positive linear trends for all three indicators, and the growth of the GDP indicator is accompanied by a, albeit weakly noticeable, but decrease in the spread or a predominant shift in the weight values to the greater side. Figure 14-B shows the opposite situation - the trends are negative, the values of the weights of the spheres decrease as GDP per capita grows and the spread along the vertical axis decreases, also illustrating an increase in the decisive power in the weighting process of GDP per capita.

Judging by that, it can be deduced that the economic factor's influence is present on all GDP per capita levels, moreover at higher levels that influence becomes more definitive.

CONCLUSION

In this work, various assumptions have been made regarding the nature of weighting conducted by individual respondents. Some factors were proposed and proved to be, theoretically, plausible, as in several cases they have been confirmed by the data clustering procedure's results. Religion and territory served as reasonable explanation of merges that took place, but not weights assigned to different sections (e. g., how does being a Muslim or a Christian result in greater weights being assigned to Housing and Income and not Community and Education— not a description of a specific case). Although, sometimes the same factors did not lead to countries being joined (e. g., "red group" and Azerbaijan).

The results have shown that many countries share preferences and often have similar weight vectors, however the reasons that lead to such semblance are diverse— in many countries Work-Life Balance, Income and Housing were of highest importance in terms of quality of life measurement, however not all of them were assigned to a single cluster, seeing as how the linkage procedure steps were sometimes defined by religion, sometimes by territorial proximity, sometimes by other factors.

Apart from that, economic factors' effect on weighting and linkage has also been analyzed, allowing the authors of the study to reevaluate the economy's influence on both objective and subjective quality of life perception. According to Lopez-Calva and colleagues (2011), such phenomenon does not imply the economic factor's direct impact on the values, but it does acknowledge its role as a relevant predictor of social orientations.

The data show that the weights assigned to each area may be similar across countries with different levels of GDP per capita, but such differences between high-GDP countries are smaller than those between low-GDP countries. At low values GDP per capita does not influence weight distribution (preferences) as strongly, different factors are more significant. At higher levels, GDP's influence is stronger, meaning that less differences are going to occur.

For better understanding of the nature of the factors that direct the linkage process, a more thorough study is required. Additionally, the data needs to be reliable— the OECD BLI allows everyone to submit their own weight vectors from any location the respondent desires, meaning, most likely, that the used data contain intentionally or accidentally misleading information, which could have resulted in difficulties faced when attempts were made to identify factors preceding the cluster creation. When taking this into account, it makes sense that some merges that took place were of coincidental character an did not have any religious, geographic or economic grounds for their occurrence.

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