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THE ORDERED WEIGHTED AVERAGE: A NEW FORMULATION FOR ELABORATING THE TRAVEL & TOURISM COMPETITIVENESS INDEX

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This work aims to generate a new ranking of the travel and tourism competitiveness index (TTCI) using the ordered weighted average (OWA) operator and its extensions. This method and its extensions generate a new competitiveness score for 140 countries. Applying this technique not only allows these nations to be ordered according to the relative importance of each criterion but also makes it possible to generate different scenarios highlighting the relevance of these elements. The main contribution is to provide new rankings based on specific weight for each factor and where all has the same importance to the score. Among the results, it is possible to notice important changes in the higher and middle spots of the ranking, indicating how much the rank can change if the elements of the TTCI aren't equally important. On the other hand, the case of the lowest part of the ranking is interesting because they don't present a real change, indicating that even when the importance of the elements is changed, they will remain at the bottom.

Keywords*: competitiveness, travel and tourism competitiveness index, OWA operator.*

JEL Classification*: Z32, Z38, C10.*

1. INTRODUCTION

Due to globalization and the global dynamism of tourism, competitiveness has become a central element of any tourism system (Kubickova and Martin, 2020).

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This relevance has captured the attention and interest of researchers who intend to address this concept (Novais *et al.*, 2018). However, achieving it has become challenging because its definition and measurement remain fragile (Kubickova and Martin, 2020).

In addition, there is a diversity of perspectives and methods when using this term, which makes it difficult to provide a concrete definition for this conception (Novais *et al.*, 2018). Despite this complexity, Fernández *et al.* (2020) state that many investigations have been developed where the authors have proposed many models to measure tourism competitiveness.

However, one of the most complete studies is the one proposed by Crouch and Ritchie (1999), which focuses on the Porter diamond and each destination's factors. On the other hand, one of the most popular tools is the measurement of the Travel and Tourism Competitiveness Index (TTCI) designed by the World Economic Forum (WEF) in 2019 (Uppink Calderwood *et al.*, 2019). However, this instrument has been criticized because it is an unweighted average of individual indicators (Fernández *et al.*, 2020).

In other words, it presents an arbitrary weighting of the variables within each pillar (Rodríguez-Díaz and Pulido-Fernández, 2019). In addition, to determine competitiveness, all factors have the same importance or influence, which is unlikely to happen (Fernández *et al.*, 2020). Therefore, this study aims to identify new formulations to elaborate the TTCI using different weighted average operators. This information presents a more flexible and adaptable way of evaluating the competitiveness of tourist destinations through these aggregation operators.

Among the useful ways to address this problem is the use of aggregation operators. Among them, the ordered weighted average (OWA) operator developed by Yager (1988) is one of the most important (Blanco-Mesa *et al.*, 2019) and helpful in this type of problem because with the use of a weighting vector is possible to obtain the maximum and the minimum results. Also, different extension of the OWA operator has been developed. For this specific study, the induced OWA (IOWA) operator (Yager and Filev, 1999) and the heavy OWA (HOWA) operator (Yager, 2002) prove to be useful. The IOWA operator because it is possible to generate new scenarios based on a reorder process of the weights and the arguments using induced variables (Avilés-Ochoa *et al.*, 2017). With the HOWA operator, it is possible to use weighting vectors with sums different from one (Espinoza-Audelo *et al.*, 2019).

The paper's objective is to analyze the 2019 TTCI index using the OWA operators and their extensions to visualize how the ranking of the countries can change if the elements that compose the index are not equally important. The idea is to prove if the relative importance of the elements can change the ranking and make a new approach of how the TTCI index must be analyzed. The novelty of the paper is to prove that the ranking can change drastically when the weights of the

factors that compose the TTCI index are different, this idea is important because will demonstrate how the value of the weights plays an important role to the score for each country and how the relative importance in this type of rankings provides new scenarios of the topic that is being analyzed.

This document is organized as follows: section 2 shows the theoretical framework for tourism competitiveness and the application of fuzzy logic to measure this concept. Then, section 3 presents the definition of the aggregation operators used for the new measurement of the TTCI. Finally, section 4 summarizes the main conclusions.

2. THEORETICAL AND CONCEPTUAL FRAMEWORK

2.1. A Review of the Literature on the Competitiveness of Tourist Destinations

In recent years, tourism has become the main economic activity for various countries (Carayannis *et al.*, 2018). But it has also positioned itself as one of the fastest-growing sectors (González Rosales *et al.*, 2019). To the extent that more and more regions are turning to this sector because they recognize the potential rewards that this industry offers to companies receiving communities.

On the other hand, tourist destinations worldwide are constantly competing to attract more visitors due to the increasing global mobility of tourists (Zainuddin *et al.*, 2016). Likewise, they see the need to operate in more competitive environments due to this great offer of tourist products. For this reason, the competitiveness of recreation sites has become a central element in tourism management (Goffi, 2013; Lušticky and Štumpf, 2021).

In the words of Kubickova and Martín (2020), this global dynamism within tourism has caused a growing interest in studying competitiveness since destinations can benefit from this interest, and many researchers have addressed it. However, it has also been considered a challenging task because its definition and measurement remain fragile.

There is a lack of consensus on the most rigorous and effective way to identify the factors that intervene in tourism competitiveness (Abreu-Novais *et al.*, 2016; Fernández *et al.*, 2020). In addition, there is a diversity of perspectives when using this term, which makes it difficult to provide a concrete definition of this concept (Novais *et al.*, 2018).

Despite this complexity, the main idea is that competitiveness extends beyond optimizing tourist attractions (Fernández *et al.*, 2020). Thus, Crouch and Ritchie (1999) describe it as the ability of destinations to increase tourist spending and attract more and more tourists. It also refers to providing a high standard of living to the destination's residents.

For their part, Amaya Molinar *et al.* (2017) point out that this concept is closer to the ability of a recreation site to create and integrate added value and become an attraction for visitors, but also to stay in touch with visitors over time through innovation strategies. However, competitiveness is a process that depends not only on microeconomic factors but also on the capabilities that the territory offers to facilitate economic activities and, therefore, becomes a favorable environment to generate wealth (Begg, 2002; Lever and Turok, 1999; Porter *et al.*, 2004; Sobrino, 2002).

On the other hand, the technique proposed by Crouch and Ritchie (1999) includes some aspects that increase or decrease competition between recreational places. Some of these factors are related to the locality's attraction resources and the management that the destination carries out with said goods. For example, road or air infrastructure, that is, access to the recreation site could become a determining criterion for a tourist to decide to visit one space, not another.

Subsequently, Dwyer and Kim (2003) took as a central part of their instrument the postulates of Crouch and Ritchie (1999) to design a holistic approach consisting of a set of linked indicators that define the competitiveness of places of leisure. Among the main elements were the endowment of resources, the support factors, the administration of the destination, and the market performance, to mention a few.

According to Dwyer and Kim (2003), this tool's main advantage is that it allows comparisons between countries and sectors. It also identifies the strengths and weaknesses that this industry and governments can use to increase arrival figures and tourism-related spending.

Something similar was designed by Enright and Newton (2004) since these authors developed a methodology that puts the concept of competitiveness into practice in a helpful way for the interested parties. This approach highlights the influence of commercial factors and the image of a city on tourism competitiveness. It also states that by applying this tool, it is possible to identify the most relevant competitors and understand their relative importance in planning tourism attractions.

For his part, Hassan (2000) presents a model of tourism competitiveness in which its central element is sustainability. His instrument highlights the role played by relationships between actors involved in creating and integrating high-value-added products, maintaining the resources that the destination possesses, and focusing on those tourists who demand sustainable recreation sites.

Similarly, Goffi *et al.* (2019) developed an approach where sustainability was a central issue for tourism development and, therefore, for the competitiveness of destinations. Among the results, it is found that sustainable factors are positively associated with the ability of localities to compete to attract more visitors. The

preceding strengthens the postulates on sustainability's key role in promoting tourism competitiveness.

Finally, among the most popular tools for this measurement is the TTCI, designed by the WEF (Uppink Calderwood *et al.*, 2019). This composite index is given from integrating 90 indicators structured in four categories. The central elements of this tool are the environment, the tourist infrastructure, the natural and cultural resources that each territory has, and the management of those factors that allow travel and tourism (Fernández *et al.*, 2020).

Despite this popularity, Croes and Kubickova (2013) point out that several authors have criticized this model because the TTCI is calculated as an unweighted average and does not eliminate duplicate data. Instead, it presents an arbitrary weighting of the variables within each pillar (Rodríguez-Díaz and Pulido-Fernández, 2019). Likewise, it has been shown that applying unweighted averages to determine the index may not be appropriate because not all indicators exert the same influence on competitiveness (Roman *et al.*, 2020).

Gómez-Vega and Picazo-Tadeo (2019) point out that a critical aspect is that the averages cannot be representative because the dimensions are made up of different amounts of items, where the minor criterion is made up of 3 indicators, while the broadest is made up of 12 reagents. Therefore, some indicators may contribute more to the index than others.

Finally, according to Martínez-González *et al.* (2021), this composite index also has some limitations related to methodological aspects and issues not only of content but also of applicability, which could affect its validity and reliability. As Andrades and Dimanches (2017) argue, the comments not only focus on using variables with little theoretical support and comparing territories with different levels of development, but also focus on localities that do not have the same performance in the indicators. Hence, to meet these limitations, this document proposes a new formulation for the calculation of the TTCI through the application of OWA operators.

2.2. TRAVEL AND TOURISM COMPETITIVE INDEX

The TTCI is an index published by the WEF every two years and has been carried out since 2007 to evaluate the attributes a country has to be more competitive (Perez Leon *et al.*, 2021). For Gómez-Vega and Picazo-Tadeo (2019), this measurement is one of the most used tools to determine the competitiveness of tourist destinations. According to the WEF (Uppink Calderwood *et al.*, 2019), this instrument measures the competitiveness of 140 economies through those elements and policies that allow the sustainable development of the travel and tourism sector and, in turn, its contribution to the competition of each nation.

For the WEF, this evaluation tool allows a strategic comparison to being made so that the public and private sectors make better decisions and promote the

progress and competition of global economies. Said index comprises four sub-indices, 14 pillars, and 90 individual indicators distributed among the pillars (Table 1).

Table 1. Composition of TTCI

Travel and Tourism Competitiveness Index				
Subindex	Enabling Environment	TandT Policy and Enabling Conditions	Infrastructure	Natural and Cultural Resources
Pillars	Business Environment	Prioritization of Travel and Tourism	Air Transport Infrastructure	Natural Resources
	Safety and Security	International Openness	Ground and Port Infrastructure	Cultural Resources and Business Travel
	Health and Hygiene	Price Competitiveness	Tourist Service Infrastructure	
	Human Resources and Labour market	Environmental Sustainability		
	ICT Readiness			

On the other hand, in the words of the WEF, the results of the report on the TTCI 2019 show the ten most outstanding economies, placing Spain as the best country in its levels of competitiveness, followed by France, Germany, Japan, the United States, United Kingdom, Australia, Italy, Canada, and Switzerland, respectively.

Now, analyzing the index's performance across regions, the WEF argues that Europe and Eurasia continue to be the most competitive region compared to the rest. In addition, this distinction is home to six of the ten nations with the highest score. It contains the best cultural resources in the world and a solid infrastructure based on good roads, large ports, and excellent tourist services.

In contrast, according to the WEF, the Middle East and North Africa is the territory that ranks among the scores with the lowest performance. In general, this differentiation is very competitive in prices, but it has challenges with security and international openness related to tourism. Finally, South Africa is positioned as the most competitive country within that region because of its growth in tourism receipts and arrivals. Also, due to low levels of economic development, the region continues to face complications in health and hygiene, infrastructure, and the sale of cultural trips. However, the area has significant untapped potential for nature tourism, which could be used for more investment.

3. METHODOLOGY

This section defines the TTCI methodology, the OWA operator, and its extensions.

3.1. TTCI METHODOLOGY

In the words of the WEF, the 2019 edition of the TTCI comprises 14 pillars organized into four sub-indices, each with an assigned weight (Table 2).

Table 2. Composition and weights of TTCI 2019

Travel and Tourism Competitiveness Index				
Subindex	Enabling Environment (25% weight)	TandT Policy and Enabling Conditions (25% weight)	Infrastructure (25% weight)	Natural and Cultural Resources (25% weight)
Pillars	Business Environment (5% weight)	Prioritization of Travel and Tourism (6.25% weight)	Air Transport Infrastructure (8.33% weight)	Natural Resources (12.5% weight)
	Safety and Security (5% weight)	International Openness (6.25% weight)	Ground and Port Infrastructure (8.33% weight)	Cultural Resources and Business Travel (12.5% weight)
	Health and Hygiene (5% weight)	Price Competitiveness (6.25% weight)	Tourist Service Infrastructure (8.33% weight)	
	Human Resources and Labour market (5% weight)	Environmental Sustainability (6.25% weight)		
	ICT Readiness (5% weight)			

As WEF comments, the 14 pillars are made up of 90 indicators that are calculated on the basis of data extracted from the Executive Opinion Survey of the World Economic Forum and various quantitative data obtained from other sources. These parameters vary in value from 1 (worst) to 7 (best).

The TTCI is calculated as an average of the four component sub-indices, calculated as averages of their pillars. Each pillar is calculated as an unweighted average of the individual component variables. On the other hand, the WEF explains that the weights of each pillar are assigned according to the relevance of said factor in tourism competitiveness.

In addition, according to the WEF, the indicators used are normalized on a scale of 1 to 7 to align them with the results of the Executive Opinion Survey. The standard formula for doing that conversion is:

$$x\left(\frac{country\ score-sample\ minimum}{sample\ maximum-sample\ minimum}\right)+1 \quad (1)$$

In this way, the WEF indicates that the minimum and maximum of the sample are the lowest and highest scores of the general sample, respectively. For those indicators where the highest value indicates a worse result, the following formula is applied:

$$-6\,x\left(\frac{country\ score-sample\ minimum}{sample\ maximum-sample\ minimum}\right)+7 \quad (2)$$

Finally, in some cases, it was necessary to make adjustments to account for extreme outliers in the data. For the WEF, as part of the ongoing refinement of the TTCI, no longer published or non-existent indicators were exchanged. The indicators changed for 2019 are access to improved sanitation, access to improved drinking water, fishing pressure on the fishing platform, and total protected areas. It should be noted that specific indicators are subject to exclusion filters, leading to a value of "n/a" even if there is underlying historical data.

3.2. OWA Operator and Extensions

This section will define different aggregation operators based on the OWA operator and its extension. The objective is to aggregate the information using different weighting vectors, considering that not all the arguments have the same importance as the actual TTCI methodology has defined. The primary purpose is to improve the decision-making process by considering qualitative and quantitative information and the expectations and knowledge of the decision-maker. The definitions are the following.

Definition 1. It is an OWA operator (Yager, 1988) if there is a model $OWA: R^n \rightarrow R$ with dimensions n such that it has associated weights vector W as $w_i = \in [0,1]$, $\sum_{i=1}^{n} w_i = 1$, then:

$$OWA(a_1, a_2, \ldots, a_n) = \sum_{j=1}^{n} w_j b_j \quad (3)$$

where b_j is the j-th most extensive argument a_i. The OWA operator satisfies some conditions as Monotonicity if $F(a_1, \ldots, a_n) \geq F(\hat{a}_2, \ldots, \hat{a}_n)$ for $a_i \geq \hat{a}_i$ for i; Commutativity if the initial indexing of de arguments does not matter; Idempotent when $a_j = a$ for all j, then $F(a_i, \ldots, a_n) = a$.

Definition 2. An Induced aggregation operator (Yager and Filev, 1999) is an extension of the OWA operator of dimension n is an application $IOWA: R^n \times R^n \rightarrow R$ that has a weighting vector associated, W of dimension n where the sum of the weights is one and $w_j \in [0,1]$, where an induced set of ordering variables are included (u_i) such that the formula is

$$IOWA(\langle u_1, a_1\rangle, \langle u_2, a_2\rangle, \ldots, \langle u_n, a_n\rangle) = \sum_{j=1}^{n} w_j b_j \quad (4)$$

where b_j is the a_i value of the OWA pair $< u_i, a_i >$ having the j-th largest u_i. u_i is the order inducing variable and a_i is the argument variable.

Definition 3. A heavy aggregation operator (Yager, 2002) is an extension of the OWA operator for which the sum of weights is bounded by n. Thus, a HOWA operator is a map $R^n \to R$ that is associated with a weight vector w, with $w_j \in [0,1]$ and $1 \leq \sum_{j=1}^{n} w_j \leq n$, such that:

$$HOWA(a_1, a_2, \dots, a_n) = \sum_{j=1}^{n} w_j \, b_j \quad (5)$$

where b_j is the j-th largest element of the collection $a_1, a_2, \dots, a_n$ and the sum of the weights w_j is bounded to n or can be unbounded if the weighting vector W, $-\infty \leq \sum_{j=1}^{n} w_j \leq \infty$.

Definition 5. An IHOWA operator of dimension n is a mapping $IHOWA: R^n \times R^n \to R$ that has an associated weighting vector W of dimension n with $w_j \in [0,1]$ and $1 \leq \sum_{j=1}^{n} w_j \leq n$, such that

$$IHOWA(\langle u_1, a_1 \rangle, \langle u_2, a_2 \rangle, \dots, \langle u_n, a_n \rangle) = \sum_{j=1}^{n} w_j b_j \quad (6)$$

where b_j is the a_i value of the IHOWA pair $< u_i, a_i >$ having the j-th largest u_i, u_i is the order inducing variable, and a_i is the argument variable. It is possible to expand the weighting vector from 1 to ∞ or even from $-\infty$ to ∞.

4. TTCI CALCULATION USING AGGREGATION OPERATORS

Step 1. The information provided by the TTCI report 2019 was taken to obtain the score of each country in each of the categories (Appendix Table A1).

Step 2. The paper aims to present new weights to obtain the ranking of each country, considering that the 14 elements that consider the report don't have the same importance for each continent/country because of their specific characteristic. To obtain the weights, the Personal Construction Theory (PCT) was used (Roger *et al.*, 2000). This process lets the experts compare the elements between them with three different scores: H (higher important than), S (same important as), and L (less important than). In the end, the sum of all H values is obtained. Then, two new columns are done. The first one is the sum of H plus one (to avoid having an element with 0 and that their weights will be 0%), and then the weight column is obtained by dividing the score of those elements between the total sum of the column Sum+1.

In the case of the paper, three different Experts were used. The requirements to be considered were: a) More than ten years of experience in the tourism sector, b) To know the TTCI report and its methodology, and c) At least two participations in the different international tourism congress in the last three years. To avoid any possible conflict, the names of the Experts were omitted from the document.

Finally, to understand the process better, the matrix and weights for Expert 1 are presented in Tables 3 and 4.

Table 3. Matrix of importance for Expert 1

Elements	Business Environment	Safety and Security	Health and Hygiene	Human Resources and Labor Market	ICT Readiness	Prioritization of T&T	International Openness	Price Competitiveness	Environmental Sustainability	Air Transport Infrastructure	Ground and Port Infrastructure	Tourist Service Infrastructure	Natural Resources	Cultural Resources and Business Travel
Business Environment	0	L	L	S	S	L	L	L	H	S	H	H	L	L
Safety and Security	H	0	S	H	H	H	H	L	H	H	H	S	H	H
Health and Hygiene	H	S	0	H	H	H	H	L	S	H	H	S	H	H
Human Resources and Labor Market	S	L	L	0	H	H	H	L	S	H	S	S	S	S
ICT Readiness	S	L	L	L	0	S	S	L	L	S	L	S	L	L
Prioritization of TandT	H	L	L	L	S	0	L	L	L	H	S	S	S	S
International Openness	H	L	L	L	S	H	0	L	L	L	L	L	L	L
Price Competitiveness	H	H	H	H	H	H	H	0	H	H	H	S	S	H
Environmental Sustainability	L	L	S	S	H	H	H	L	0	H	H	S	S	H
Air Transport Infrastructure	S	L	L	L	S	L	H	L	L	0	L	L	L	L
Ground and Port Infrastructure	L	L	L	S	H	S	H	L	L	H	0	S	S	S
Tourist Service Infrastructure	L	S	S	S	S	S	H	S	S	H	S	0	S	H
Natural Resources	H	L	L	S	H	S	H	S	S	H	S	S	0	
Cultural Resources and Business Travel	H	L	L	S	H	S	H	L	L	H	S	L	H	0

Table 4. Weights for each element based on Expert 1

Elements	**Sum of H**	**Sum+1**	**Weights**
Business Environment	3	4	5.19%
Safety and Security	10	11	14.29%
Health and Hygiene	9	10	12.99%
Human Resources and Labor Market	4	5	6.49%
ICT Readiness	0	1	1.30%
Prioritization of TandT	2	3	3.90%
International Openness	2	3	3.90%
Price Competitiveness	11	12	15.58%
Environmental Sustainability	6	7	9.09%
Air Transport Infrastructure	1	2	2.60%
Ground and Port Infrastructure	3	4	5.19%
Tourist Service Infrastructure	3	4	5.19%
Natural Resources	4	5	6.49%
Cultural Resources and Business Travel	5	6	7.79%

Step 3. With the information of the three different experts, an average of the three results has been done to obtain the final weights (Table 5).

Table 5. Weights for each of the elements

Elements	Expert 1	Expert 2	Expert 3	Unified Weight
Business Environment	5.19%	6.49%	2.60%	4.76%
Safety and Security	14.29%	15.58%	12.99%	14.29%
Health and Hygiene	12.99%	11.69%	12.99%	12.55%
Human Resources and Labor Market	6.49%	5.19%	6.49%	6.06%
ICT Readiness	1.30%	2.60%	9.09%	4.33%
Prioritization of TandT	3.90%	5.19%	3.90%	4.33%
International Openness	3.90%	3.90%	6.49%	4.76%
Price Competitiveness	15.58%	14.29%	10.39%	13.42%
Environmental Sustainability	9.09%	10.39%	11.69%	10.39%
Air Transport Infrastructure	2.60%	1.30%	2.60%	2.16%
Ground and Port Infrastructure	5.19%	6.49%	5.19%	5.63%
Tourist Service Infrastructure	5.19%	6.49%	5.19%	5.63%
Natural Resources	6.49%	3.90%	3.90%	4.76%
Cultural Resources and Business Travel	7.79%	6.49%	6.49%	6.93%

Step 4. The induced values and heavy weighting vector are obtained with the weights calculated. To obtain the induced values, the standard deviation of each of the elements was obtained and then ranked based on lower to higher (Table 6). In the case of the heavy weights the weights from Table 6 were multiplied by 1.10 because the three experts considered that the information must be overestimated.

Table 6. Induced and heavy weighting values

Element	Standard Deviation	Induced value	Heavy weights
Business Environment	0.6527	4	5.24%
Safety and Security	0.7360	5	15.71%
Health and Hygiene	1.2788	12	13.81%
Human Resources and Labor Market	0.6408	3	6.67%
ICT Readiness	1.1931	11	4.76%
Prioritization of TandT	0.8341	6	4.76%
International Openness	0.8683	7	5.24%
Price Competitiveness	0.5903	2	14.76%
Environmental Sustainability	0.5144	1	11.43%
Air Transport Infrastructure	1.1876	10	2.38%
Ground and Port Infrastructure	1.0770	9	6.19%
Tourist Service Infrastructure	1.3175	13	6.19%
Natural Resources	0.9254	8	5.24%
Cultural Resources and Business Travel	1.3382	14	7.62%

Step 5. In this step, the new value for each element is calculated with the weighted average, OWA, IOWA, HOWA, and IHOWA operators. The results are presented in Table A2 (Appendix).

Step 6. Considering the results obtained in Table A2 (Appendix), it is possible to visualize how much the ranking can change if the information isn't equally important. Because there is a lot of information to process, three different sections will be done to make a more comprehensive analysis and to visualize how much the ranking can change.

The first section will be about the top 10 in the actual ranking (Table 7). As can be seen, the number one country according to the different operators must be Germany, which in the actual TTCI is number 3, and Spain, which in TTCI is number 1, can change to 2 or 3. A more interesting change can be seen in Italy, which can go as low as 21, considering that in TTCI, number 8 significantly changes the ranking. This type of change demonstrates how much the way the information is processed can change the interpretation of the same. In this case, each element's weight can drastically change the results. Considering that not all countries have the same Travel and Tourism politics, this can serve as a new way to analyze the information considering what is more critical for the travelers.

Table 7. Top 10 countries analyzed based on different aggregation operators

Country	TTCI Ranking	WA Ranking	OWA Ranking	IOWA Ranking	HOWA Ranking	IHOWA Ranking
Spain	1	3	2	3	2	3
France	2	4	5	4	5	4
Germany	3	1	1	1	1	1
Japan	4	2	3	2	3	2
United States	5	7	8	5	8	5
United Kingdom	6	14	10	9	10	9
Australia	7	8	11	8	11	8
Italy	8	19	21	15	21	15
Canada	9	11	12	11	12	11
Switzerland	10	6	4	6	4	6

The second section considers the 60 to 70 ranking, and the middle of the table considers 140 countries (Table 8). As in the case of the top 10, we can visualize that the ranking changes and the relative importance of each element play an important role in deciding the ranking. For example, South Africa is number 61 and can go as low as 96, more than 30 positions below. This result can be interpreted as South Africa having very high results in some elements and low in others. Specifically, his higher score is 5.60 for Price Competitiveness, and his lower score is 2.50 for International Openness. When the results have that high variance, each criterion's relative importance affects the result's strength.

Table 8. Top 60-70 countries analyzed based on different aggregation operators

Country	TTCI Ranking	WA Ranking	OWA Ranking	IOWA Ranking	HOWA Ranking	IHOWA Ranking
Slovak Republic	60	46	54	58	54	58
South Africa	61	96	92	80	92	80
Seychelles	62	75	61	65	61	66
VietNam	63	73	74	72	74	72
Bahrain	64	54	48	56	48	56
Egypt	65	70	72	70	72	70
Morocco	66	65	69	64	69	64
Montenegro	67	56	59	62	59	62
Georgia	68	48	52	59	52	59
Saudi Arabia	69	57	56	65	56	65
Ecuador	70	74	83	76	83	76

The third section considers the last ten countries in the ranking (Table 9). In this case, is possible to visualize that there is not a big change at all, maybe there are changes in the ranking, but the top 10 worst countries nearly always remain in that part of the rank and even when they leave the rank the change is not that important. So, for example, Burkina Faso can change to 129, Haiti to 128 or 129, and Mauritania to 127. This analysis is important because these countries are the worst in all indicators, and even when the relative importance is changed, there is no real change in the ranking.

Table 9. Top 10 worst ranked countries analyzed based on different aggregation operators

Country	TTCI Ranking	WA Ranking	OWA Ranking	IOWA Ranking	HOWA Ranking	IHOWA Ranking
Sierra Leone	131	135	132	130	132	130
Burkina Faso	132	132	129	134	129	134
Haiti	133	128	130	129	130	129
Angola	134	130	134	136	134	136
Mauritania	135	127	131	131	131	131
Congo	136	138	138	138	138	138
Burundi	137	133	133	132	133	132
Liberia	138	134	136	137	136	137
Chad	139	140	140	139	140	139
Yemen	140	139	139	140	139	140
Sierra Leone	131	135	132	130	132	130

This analysis is important because it proves how the interpretation of the information can change drastically depending on the relative importance of the data. Also, this paper presents new ways to visualize the actual TTCI ranking. With that in mind, this new ranking is helpful for travelers that give more importance to one component than another, and their preferences can change. But on the other hand, it is possible to generate better public policies considering

the specific characteristics of the countries because not all countries are the same. Therefore, although they cannot work in all the components simultaneously with these new methodologies, they can see how much their place will change and consider the most important thing for them.

5. CONCLUSIONS

The paper's objective was to present an analysis of the TTIC index, considering that not all the elements have the same relative importance to the final score. Therefore, three experts were consulted to obtain the weights used. First, with the PCT methodology, it was possible to obtain the individual weights, and then an average was used to unify the information. Finally, with that weighting vector, different rankings were obtained using the OWA, IOWA, HOWA, and IHOWA operators.

The study was done with the results of the 2019 TTCI index, where 140 countries were studied and ranked according to different components and elements. Among the results, it is possible to affirm that relative importance plays a huge role in the ranking of the TTCI. For example, countries like Italy, ranked eighth, can go as down as 21, and Bahrain, ranked 64, can go to 48. However, another interesting finding is how the countries at the bottom of the rank don't present an important change; this is because their scores are low in nearly all the elements that are hard for them to move out of the bottom ten countries.

The main contribution of these analyses is that it is possible to visualize how much the countries can go up or down in the ranking just by changing the weights. This idea is very important because maybe the government doesn't change their public policies in tourism when you find that your score is high (for example, Italy, that is 8). Still, when the data is analyzed differently, the country can be down to 21. With that score, the government will make changes in its public policies. Because of that, maybe the score doesn't show the reality of the topic and making new scenarios will help to understand how sensible the rank is.

Also, for future research, new extensions of the OWA operator can be used to aggregate the information, such as Prioritized, Probabilistic, Distance or Bonferroni operators (Alfaro-García *et al.*, 2021; Avilés-Ochoa *et al.*, 2018; Merigó, 2012; Perez-Arellano *et al.*, 2021). Also, new approaches in the fuzzy decision-making process and aggregation operators can be done in different fields such as economics, business, sustainability, and innovation (Calabrese *et al.*, 2019; Kacprzyk *et al.*, 2021; Kahraman *et al.*, 2015).

Finally, another future research proposal includes new factors on the TTCI index or other rankings. This idea is very important because the relative importance of the actual factors can change the ranking and interpretation. Also, including factors depending on the geographical or economic specifications of the country will be necessary. For example, the tourism destination competitiveness cannot

be the same for countries with a warm climate and excellent beaches to others whose tourism is based on cultural activities. With that in mind, a ranking including specific factors based on that differentiation will be important to know real competitiveness.

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Table A1. Weights by country

Country	Enabling Environment				T&T Policy & Enabling Conditions				Infrastructure			Natural & Cultural Resources		Score	Ranking
	Business Environment	Safety & Security	Health & Hygiene	Human Resources & Labor Market	ICT Readiness	Prioritization of T&T	International Openness	Price Competitiveness	Environmental Sustainability	Air Transport Infrastructure	Ground & Port Infrastructure	Tourist Service Infrastructure	Natural Resources	Cultural Resources & Business Travel		
Weights	**5%**	**5%**	**5%**	**5%**	**5%**	**6.25%**	**6.25%**	**6.25%**	**6.25%**	**8.33%**	**8.33%**	**8.33%**	**12.50%**	**12.50%**		
United States	5.8	5.6	5.8	5.8	6	5.5	4	4.7	4.1	5.9	4.9	6.6	5	4.7	5.3	5
Canada	5.2	6.1	5.7	5.5	5.8	5.1	3.6	4.9	4.9	6.6	3.9	6.1	4.8	4	5.1	9
Mexico	4.2	4.2	5.4	4.5	4.4	5.2	3.9	5.3	3.9	4	3.2	4.8	6	5.3	4.7	19
Costa Rica	4.5	5.4	5.1	4.9	5.6	5.6	4.3	5.1	4.9	3.1	3	5.4	4.9	1.6	4.3	41
Panama	4.7	5.3	5.1	4.1	4.6	4.9	4.5	5.6	4.7	4.5	3.7	4.7	4	1.6	4.2	47
Dominican Republic	4.1	4.7	5	4.4	4	6	3.3	5	4.1	3	3.6	4.8	3	1.5	3.8	73
Jamaica	4.8	3.9	4.9	4.8	4.3	6.2	4	4.3	3.4	2.5	4.6	4.9	2.6	1.4	3.8	76
Trinidad and Tobago	4.4	3.9	5.7	4.5	5	4	3.6	5.6	3.9	3.1	4	4.1	2	1.2	3.6	87
Nicaragua	3.4	5.6	4.6	4.2	3.6	4.9	4.2	5.6	4.2	2.1	2.8	3.4	3.1	1.3	3.5	91
Honduras	4.1	3.6	4.5	3.9	3.4	5.1	4.3	5.5	4.5	2.1	3.1	3.4	3.1	1.3	3.5	94
Guatemala	4.2	4	4.5	3.9	4	4.5	3.9	5.7	3.9	1.8	2.4	3.8	3	1.5	3.4	99
El Salvador	3.6	3	5.1	3.7	4.2	4.3	4.6	5.7	3.8	2.1	2.9	3.1	2.2	1.3	3.2	108
Haiti	3	4.8	3.7	3.6	1.8	3.6	3.9	5.6	3.3	1.8	1.9	2.6	1.8	1.2	2.8	1.3
North/Central America Average	**4.3**	**4.6**	**5**	**4.4**	**4.4**	**5**	**4**	**5.3**	**4.1**	**3.3**	**3.4**	**4.4**	**3.5**	**2.1**		
Brazil	3.7	4.3	5.4	4.3	4.8	4	3	5.4	4.3	3.7	2.4	4.5	5.8	5.4	4.5	32
Peru	4.1	4.7	4.9	4.6	4.1	4.7	4.5	5.3	4.4	2.8	2.5	5.3	4.7	3.1	4.2	49
Argentina	3.3	5.1	6.5	4.5	4.9	4.6	3.1	4.9	3.4	3.1	2.7	4.5	4.5	4.2	4.2	50
Chile	4.9	5.7	5.2	4.8	5.4	4.7	4.7	5.6	4.2	3.1	3.4	4.3	3.2	2.4	4.1	52
Colombia	3.8	3.8	5.2	4.6	4.6	4.1	4.6	5.8	4.4	3	2.5	3.8	4.4	3.2	4.0	55
Ecuador	3.8	5.2	5.2	4.3	4.3	4.5	4	5.5	4.3	2.4	3.5	4	4.2	1.8	3.9	70
Uruguay	4.4	5.3	6.2	4.7	5.7	5.3	3	5	4.2	2.3	2.8	4.8	2.5	1.8	3.8	74
Bolivia	2.8	5.2	4.8	4	4.1	3.7	3.2	5.5	4.2	2.2	2.1	3.3	4.1	2	3.5	90
Paraguay	4.3	4.9	5.1	3.9	3.9	5	2.7	5.4	3.8	1.6	2.3	3.2	2.5	1.4	3.2	109
Venezuela	2.4	3.3	5.1	3.6	3.6	3.4	2.2	5.1	3.7	1.8	2	3	4.1	2.1	3.1	117
South America Average	**3.7**	**4.8**	**5.4**	**4.3**	**4.5**	**4.4**	**3.5**	**5.4**	**4.1**	**2.6**	**2.6**	**4.1**	**4**	**2.7**		
America Average	**4.1**	**4.7**	**5.2**	**4.4**	**4.4**	**4.7**	**3.8**	**5.3**	**4.1**	**3**	**3.1**	**4.3**	**3.7**	**2.4**		

Country	Enabling Environment					T&T Policy & Enabling Conditions				Infrastructure			Natural & Cultural Resources		Score	Ranking
	Business Environment	Safety & Security	Health & Hygiene	Human Resources & Labor Market	ICT Readiness	Prioritization of T&T	International Openness	Price Competitiveness	Environmental Sustainability	Air Transport Infrastructure	Ground & Port Infrastructure	Tourist Service Infrastructure	Natural Resources	Cultural Resources & Business Travel		
Japan	5.4	6.2	6.4	5.3	6.2	5.3	4.6	4.8	4.4	4.8	6	5.7	4.1	6.5	5.4	4
Australia	5.1	6.1	6.2	5.1	5.8	5.3	4.9	4.4	4.4	6	3.6	6.1	5.5	4.4	5.1	7
China	4.7	5.6	5.6	5.2	5	4.8	3.1	5.7	3.8	4.3	3.9	3.5	5.1	7	4.9	13
Hong Kong	6.1	6.4	6	5.6	6.6	5.9	3.8	4.5	4.6	5.6	6.4	4.3	3.6	2.4	4.8	14
Korea	4.8	5.9	6.4	5	6.3	4.9	4.3	5	4.7	4.6	5.2	5.6	2.4	4.8	4.8	16
New Zealand	5.5	6.3	5.9	5.4	6.1	5.6	5.5	4.7	4.7	4.9	3.8	5.8	4.3	2	4.7	18
Taiwan	5.1	6	6	5.3	5.6	4.7	3.7	5.4	4.4	3.9	5.1	4.8	2.6	2.6	4.3	37
Mongolia	4.3	5.6	6.1	4.5	4.3	4.5	1.9	6.2	3.6	2.2	2.2	2.9	3.1	1.9	3.5	93
Eastern Asia-Pacific Average	**5.1**	**6**	**6.1**	**5.2**	**5.7**	**5.1**	**4**	**5.1**	**4.3**	**4.5**	**4.5**	**4.8**	**3.8**	**3.9**		
Singapore	6	6.4	5.6	5.6	6.1	6.1	4.8	5	4.3	5.5	6.4	5.1	2.2	2.5	4.8	17
Malaysia	5.5	5.9	5.3	5.4	5.4	4.8	4.5	6.3	4	4.6	4.5	4.5	3.8	2.6	4.5	29
Thailand	4.9	4.8	5	5.1	5.2	5.2	3.9	5.8	3.6	4.6	3.3	5.9	4.8	2.6	4.5	31
Indonesia	4.7	5.4	4.5	4.9	4.7	5.9	4.3	6.2	3.5	3.9	3.3	3.1	4.5	3.2	4.3	40
Vietnam	4.4	5.6	5	4.8	4.3	4.1	3.7	5.9	3.8	3.4	3	2.8	3.8	2.9	3.9	63
Brunei	4.8	6.1	5.5	4.6	5.4	3.4	3.7	6.6	4.1	3.3	3.8	4	2.4	1.1	3.8	72
Philippines	4.3	3.6	4.8	5	4.4	4.9	3.5	5.9	4	3.2	2.8	3.6	3.8	1.8	3.7	75
Lao	4.4	5.3	4.5	4.6	3.4	4.8	3	5.9	3.7	2.4	2.5	3.4	2.9	1.3	3.4	97
Cambodia	3.8	5.1	4	4.2	3.9	5	3.5	5.6	3.4	2.3	2.5	3.2	3	1.6	3.4	98
South-East Asia-Pacific Average	**4.8**	**5.3**	**4.9**	**4.9**	**4.8**	**4.9**	**3.9**	**5.9**	**3.8**	**3.7**	**3.6**	**4**	**3.5**	**2.2**		
India	4.9	4.5	4.4	4.5	3.6	4.3	3.8	6.1	3.6	4.2	4.5	2.8	4.5	5.5	4.4	34
Sri Lanka	4.4	5.4	5.3	4.4	3.9	5.2	2.7	5.4	4	2.8	3.7	3.3	3.6	1.7	3.7	77
Nepal	4	5.2	4.3	4.4	3.5	5	2.7	6	3.5	2.3	2	2.2	3.9	1.3	3.3	102
Bangladesh	4.2	4.9	4.5	3.8	3.4	3.6	2.5	5.3	3.8	2	3.5	1.9	2.3	1.6	3.1	120
Pakistan	4.2	3.7	4.5	3.4	3	3.6	2.2	5.7	3.6	2.2	3.3	2.7	2.3	1.9	3.1	121
South Asia Average	**4.3**	**4.7**	**4.6**	**4.1**	**3.5**	**4.3**	**2.8**	**5.7**	**3.7**	**2.7**	**3.4**	**2.6**	**3.4**	**2.4**		
Asia-Pacific Average	**4.8**	**5.4**	**5.3**	**4.8**	**4.8**	**4.9**	**3.7**	**5.6**	**4**	**3.8**	**3.9**	**4**	**3.6**	**2.9**		
Spain	4.5	6.1	6.2	4.9	5.8	5.9	3.9	5	4.7	5	5.2	6.6	4.8	6.7	5.4	1
Italy	4	5.5	6.3	4.6	5.5	4.8	4.1	4.4	4.3	4.4	4.7	6	4.9	6.5	5.1	8
Portugal	4.7	6.3	6	5.1	5.5	5.7	4.2	5.1	4.2	4.7	4.2	6.7	4	4.1	4.9	12
Greece	3.9	5.6	6.5	4.7	5.2	5.6	4.1	4.9	4.5	4.8	3.8	5.8	3.5	3.3	4.5	25
Croatia	3.8	5.9	6.3	4.1	5.2	4.9	4.2	5	5.1	3.6	3.9	6.5	4.4	2.8	4.5	27
Malta	5	6	6.5	4.8	5.8	6.2	4	4.9	4.7	3.9	4.8	5.5	2.8	1.5	4.4	35
Turkey	4.4	4.3	5.5	4.2	4.6	5.1	3.8	5.6	3.7	4.7	3.6	5	2.8	3.8	4.2	43
Cyprus	4.9	5.9	5.7	5.1	5.9	6.2	3.8	4.8	3.9	3.7	4.4	5.7	2.5	1.7	4.2	44
Southern Europe Average	**4.4**	**5.7**	**6.1**	**4.7**	**5.4**	**5.5**	**4**	**5**	**4.4**	**4.4**	**4.3**	**6**	**3.7**	**3.8**		

Country	Enabling Environment				T&T Policy & Enabling Conditions			Infrastructure			Natural & Cultural Resources		Score	Ranking
	Business Environment	Safety & Security	Health & Hygiene	Human Resources & Labor Market	ICT Readiness	Prioritization of T&T	International Openness	Price Competitiveness	Environmental Sustainability	Air Transport Infrastructure	Ground & Port Infrastructure	Tourist Service Infrastructure	Natural Resources	Cultural Resources & Business Travel		
France	4.8	5.7	6.5	5.1	5.9	5.1	4.2	4.5	5.3	4.8	5.6	5.7	4.9	6.8	5.4	2
Germany	5.4	5.8	7	5.7	6	5	4.3	4.6	5.3	4.9	5.7	5.9	4.1	6.5	5.4	3
United Kingdom	5.8	5.8	5.8	5.5	6.2	4.9	4.2	3.2	5.2	5.2	5.4	6.1	4.4	5.6	5.2	6
Switzerland	6	6.4	6.5	5.8	6.3	5.6	4.1	3.7	6	5	6.1	6.2	3.7	2.8	5.0	10
Austria	4.8	6.2	7	5.3	6.1	5.3	4	4.7	5.7	4.2	5.2	6.7	4.1	3.2	5.0	11
Netherlands	5.5	6	6.3	5.6	6.3	4.8	4.3	4.6	5.4	5.2	6.1	4.8	2.7	3.4	4.8	15
Luxembourg	5.8	6.3	6.2	5.4	6.2	5.1	4.3	5	5.6	3.7	5.5	5.9	2.8	1.6	4.6	23
Belgium	4.8	5.7	6.5	5.3	5.8	4.4	4.1	4.8	4.8	4.1	5.5	5.2	2.5	3.7	4.5	24
Ireland	5.2	6	5.8	5.3	5.7	5.5	4.5	4.6	4.9	4.5	4.5	5.8	2.6	2.9	4.5	26
Czech Republic	4.5	6.1	6.9	4.9	5.7	4.3	4.2	5.4	5	3.4	4.9	5.2	2.5	2.4	4.3	38
Western Europe Average	**5.3**	**6**	**6.5**	**5.4**	**6**	**5**	**4.2**	**4.5**	**5.3**	**4.5**	**5.4**	**5.8**	**3.4**	**3.9**		
Norway	5.3	6.1	6.4	5.5	6.3	5.4	4	4.2	5.8	5.6	3.9	5.1	3.2	2.2	4.6	20
Denmark	5.5	5.8	6.2	5.6	6.4	4.7	4.4	4.4	5.4	4.5	5.3	4.8	3.3	2.3	4.6	21
Sweden	5.3	5.9	6.2	5.5	6.4	4.5	4.1	4.3	5.2	5	4.7	4.8	3.2	2.9	4.6	22
Finland	5.7	6.7	6.4	5.5	6.1	5	4.1	4.7	5.6	4.9	4.5	4.7	2.9	2	4.5	28
Iceland	5.3	6.5	6.2	5.6	6.3	6.1	4.4	3.6	4.8	5	4	6	3.1	1.5	4.5	30
Estonia	5.1	6.2	6.3	5.1	6.1	5.4	3.7	5.4	5.2	2.5	4.5	5.4	2.4	1.6	4.2	46
Latvia	4.6	5.8	6.4	5	5.7	4.6	4	5.7	4.7	3.5	4.2	4.5	2.4	1.4	4.1	53
Lithuania	4.7	5.9	6.9	5.1	5.6	4.3	4	5.7	4.6	2.5	4.3	4.4	2.3	1.4	4.0	59
Northern Europe Average	**5.2**	**6.1**	**6.4**	**5.4**	**6.1**	**5**	**4.1**	**4.7**	**5.2**	**4.2**	**4.4**	**5**	**2.9**	**1.9**		
Slovenia	4.3	6.1	6.2	4.9	5.5	5.1	3.7	5.1	5.4	2.6	4.8	5.4	4.1	1.7	4.3	36
Poland	4.3	5.6	6.3	4.8	5.5	4.2	4.1	5.7	4.2	3.2	4.3	4.5	3.2	3	4.2	42
Bulgaria	4.4	5.2	6.7	4.6	5.2	4.7	3.9	5.7	4.8	2.7	3.2	6	3.7	2.1	4.2	45
Hungary	4.3	5.8	6.6	4.6	5.3	5.1	4.2	5.3	4.8	3.4	4.2	4.8	2.7	2.3	4.2	48
Romania	4.4	6	6.1	4.5	5.2	4.1	3.9	5.6	4.4	2.7	3.1	4.6	3.2	2.3	4.0	56
Slovak Republic	4.1	5.6	6.2	4.7	5.7	4.3	3.9	5.4	4.7	2	4.2	4.4	3.4	1.6	4.0	60
Montenegro	4.6	5.6	5.8	4.8	5.2	5	2.4	5.6	4.7	3.2	3.3	5.5	2.7	1.1	3.9	67
Serbia	4.4	5.5	6.3	4.7	5.1	3.9	3.2	5.5	4.5	2.6	3	3.9	2.1	1.7	3.6	83
Albania	4	5.8	5.3	5.1	4.7	5	2.4	5.3	4.3	2.1	3.1	4	2.9	1.2	3.6	86
North Macedonia	4.3	5.2	6	4.1	4.7	3.7	2.3	5.8	3.6	2.4	2.6	3.9	2.2	1.4	3.4	101
Moldova	4	5.5	6.1	4.4	4.6	3.7	3.1	6	4.3	2.1	2.6	2.9	1.7	1.2	3.3	103
Bosnia and Herzegovina	3.4	5.4	5.6	4.1	4.5	4.1	2.4	5.5	4.3	2	2.4	3.9	1.9	1.5	3.3	105
Balkans and Eastern Europe Average	**4.2**	**5.6**	**6.1**	**4.6**	**5.1**	**4.4**	**3.3**	**5.5**	**4.5**	**2.6**	**3.4**	**4.5**	**2.8**	**1.8**		

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Country	Enabling Environment					T&T Policy & Enabling Conditions				Infrastructure			Natural & Cultural Resources		Score	Ranking
	Business Environment	Safety & Security	Health & Hygiene	Human Resources & Labor Market	ICT Readiness	Prioritization of T&T	International Openness	Price Competitiveness	Environmental Sustainability	Air Transport Infrastructure	Ground & Port Infrastructure	Tourist Service Infrastructure	Natural Resources	Cultural Resources & Business Travel		
Russian Federation	4.3	5.1	6.7	5	5.3	4.4	2.2	5.8	4.2	4.6	3.3	4.1	3.8	3.7	4.3	39
Georgia	5.2	6	6	4.7	4.9	5.2	3.4	5.7	4.2	2.5	3.2	4.9	2.4	1.5	3.9	68
Azerbaijan	5.1	5.9	6.1	5.3	5	5	3.1	5.9	4.1	2.6	3.9	3.2	2.2	1.9	3.8	71
Ukraine	4.1	4.8	6.5	4.8	4.5	4.3	3.7	5.9	3.9	2.7	3.1	4.3	2.2	1.9	3.7	78
Armenia	5	5.8	6	4.8	4.7	4.7	3.2	5.7	4	2.4	2.8	4.3	2.5	1.4	3.7	79
Kazakhstan	4.7	5.6	6.5	4.7	5	4.3	2.5	6.3	3.8	2.7	2.9	3.4	2.6	1.7	3.7	80
Tajikistan	4.3	5.6	5.5	4.7	3.4	4.3	2.5	5.6	3.9	2.2	2.8	2	2.9	1.3	3.3	104
Kyrgyz Republic	4.4	5.2	5.7	4.3	4	3.8	3	6.1	3.7	2	2.1	2.1	2.5	1.5	3.2	110
Eurasia Average	**4.6**	**5.5**	**6.1**	**4.8**	**4.6**	**4.5**	**3**	**5.9**	**4**	**2.7**	**3**	**3.5**	**2.6**	**1.9**		
Europe and Eurasia Average	**4.7**	**5.8**	**6.2**	**5**	**5.4**	**4.9**	**3.7**	**5.1**	**4.7**	**3.6**	**4.1**	**4.9**	**3.1**	**2.6**		
United Arab Emirates	5.6	6.3	5.4	5.1	6.4	4.7	3	5.5	4.5	5.7	4.5	5.6	2.4	2.2	4.4	33
Qatar	5.6	6.3	5.3	5.1	5.6	4.4	3.5	5.9	4.4	4.5	4.7	5	1.8	1.4	4.1	51
Israel	5.1	5.5	6	5.3	5.9	5	2.5	3.6	4.3	3.6	4.4	5.4	2.3	1.7	4.0	57
Oman	5.3	6.5	5.3	4.6	5.3	4.7	2.8	5.7	4.4	3.4	4.4	4.1	2.3	2	4.0	58
Bahrain	5.4	5.9	5.2	4.9	5.8	4.5	2.9	5.8	4.1	3.5	5.2	4.6	1.6	1.2	3.9	64
Saudi Arabia	5.2	6	5.7	4.6	5.2	4.6	1.6	5.9	4	4.1	3.5	5.1	1.9	1.9	3.9	69
Jordan	4.6	5.7	5.4	4	4.8	5.1	3.3	5.3	4.3	2.7	2.9	3.8	2.2	1.3	3.6	84
Iran	3.9	5.4	5	4.1	4.5	3.7	2.4	6.7	3.9	2.5	3.1	2.8	2.4	2.8	3.5	89
Kuwait	4.7	5.8	5.6	4.3	5.5	3.6	1.9	5.6	4	2.6	3.3	3.9	1.8	1.1	3.4	96
Lebanon	4	4.8	5.6	3.9	4.1	5	2.5	5.5	4.1	2.6	2.8	4	2	1.4	3.4	100
Yemen	3.5	3.2	4.1	3	2.4	2.1	1.3	6	3.4	1.2	2	1.9	1.8	1.3	2.4	140
Middle East Average	**4.8**	**5.6**	**5.3**	**4.5**	**5.1**	**4.3**	**2.5**	**5.6**	**4.1**	**3.3**	**3.7**	**4.2**	**2.1**	**1.7**		
Egypt	4.4	4.8	5	4.3	4.3	5.2	2.2	6.5	4.7	3.3	3.4	3.2	3	3.3	3.9	65
Morocco	4.9	6	4.6	4.1	4.6	5.2	3.1	5.6	4.5	3.2	3.5	3.9	3.1	2.2	3.9	66
Tunisia	4.4	5.2	5.2	4.1	4.4	5	2.6	6.1	4.4	2.5	2.8	4.1	2.6	1.4	3.6	85
Algeria	3.9	5.6	5.2	4.1	4.2	3.1	1.5	6.2	3.5	2.2	2.8	1.8	2.1	2	3.1	116
North Africa Average	**4.4**	**5.4**	**5**	**4.2**	**4.4**	**4.6**	**2.3**	**6.1**	**4.3**	**2.8**	**3.1**	**3.3**	**2.7**	**2.2**		
Mena Average	**4.7**	**5.5**	**5.2**	**4.4**	**4.9**	**4.4**	**2.5**	**5.7**	**4.2**	**3.2**	**3.6**	**4**	**2.2**	**1.8**		

Country	Enabling Environment				T&T Policy & Enabling Conditions				Infrastructure			Natural & Cultural Resources		Score	Ranking
	Business Environment	Safety & Security	Health & Hygiene	Human Resources & Labor Market	ICT Readiness	Prioritization of T&T	International Openness	Price Competitiveness	Environmental Sustainability	Air Transport Infrastructure	Ground & Port Infrastructure	Tourist Service Infrastructure	Natural Resources	Cultural Resources & Business Travel		
South Africa	4.6	3.9	3.7	4.4	4.6	4.5	2.5	5.6	3.7	3.3	3.5	4.3	4.5	3.2	4.0	61
Namibia	4.8	5	3.5	4.4	4.2	4.8	2.8	5.7	4.3	2.9	3.4	4.6	3.5	1.2	3.7	81
Botswana	4.9	5.3	3.3	4.3	4.1	4.8	2.3	6	4.3	2.1	2.8	3.6	3.4	1.2	3.5	92
Zambia	4.4	5.3	2.6	3.8	3.2	3.9	2.9	5.1	4.4	1.8	2.4	2.5	3.6	1.3	3.2	113
Zimbabwe	3.3	5.4	3	3.6	3.2	4.2	3	5.3	4.1	1.8	2.3	3	3.6	1.3	3.2	114
Eswatini	4.4	5.5	3.1	3.8	2.3	4.6	2.7	6.1	3.7	2.2	3.1	3	2.2	1	3.1	118
Lesotho	4.1	5.4	3	3.6	3.2	5.1	2.6	6.1	4.8	1.3	1.8	2.8	2.2	1	3.0	124
Angola	3.5	5	3.2	3.2	2.3	3.2	1.9	5.3	4.1	1.7	2	2.7	2.2	1.2	2.7	134
Southern Africa Average	**4.2**	**5.1**	**3.2**	**3.9**	**3.4**	**4.4**	**2.6**	**5.7**	**4.2**	**2.1**	**2.7**	**3.3**	**3.2**	**1.4**		
Mauritius	5.4	5.8	5.6	4.7	4.9	6.1	3.6	4.6	4.3	3.2	4.6	5	2.4	1.3	4.0	54
Seychelles	4.7	5.2	5.4	5	5	5.9	2.7	3.9	4.3	4.3	4.4	5.4	2.6	1	3.9	62
Kenya	4.5	4.6	3.4	4.4	3.5	5.4	3	4.9	4.5	2.7	3.3	2.9	4.5	1.5	3.6	82
Tanzania	4	5.2	3	3.6	2.9	4.9	3.3	5.5	4.4	2.2	2.8	2.4	4.7	1.3	3.4	95
Rwanda	4.9	5.9	2.8	4.4	3.4	4.1	3.2	5.3	4.5	1.9	3.4	2.3	2.6	1.2	3.2	107
Uganda	4.2	4.7	2.5	4.1	3	4.3	3	5.7	4.2	1.7	2.5	2.3	3.7	1.5	3.2	112
Ethiopia	3.9	5.1	3.3	3.6	2.4	3.8	2.6	5.5	4.1	2.2	2.4	1.7	3	1.6	3.0	122
Malawi	4	5.4	2.7	4	2.2	3.6	2.5	5.6	4.1	1.5	2.1	2	3.1	1.5	2.9	125
Mozambique	3.8	4.7	1.7	3.5	2.1	4	3.1	5.6	4.3	1.8	2.2	2.8	2.8	1.2	2.9	127
Congo	3.6	4.4	2.6	3.8	1.7	1.9	1.5	4.8	3.9	1.6	2	1.9	4.1	1.2	2.7	136
Burundi	4	4.8	3.2	4.1	1.7	2.8	1.8	5.4	4.1	1.7	2.5	1.7	2.1	1.1	2.7	137
Eastern Africa Average	**4.3**	**5.1**	**3.3**	**4.1**	**3**	**4.2**	**2.7**	**5.2**	**4.2**	**2.3**	**2.9**	**2.8**	**3.2**	**1.3**		

Country	Enabling Environment				T&T Policy & Enabling Conditions			Infrastructure			Natural & Cultural Resources		Score	Ranking
	Business Environment	Safety & Security	Health & Hygiene	Human Resources & Labor Market	ICT Readiness	Prioritization of T&T	International Openness	Price Competitiveness	Environmental Sustainability	Air Transport Infrastructure	Ground & Port Infrastructure	Tourist Service Infrastructure	Natural Resources	Cultural Resources & Business Travel		
Cape Verde	4.5	5.2	4.7	4.2	4.2	4.7	3.2	5.7	4.5	3.5	3.1	4.2	2	1	3.5	88
Senegal	4.3	5.3	3.8	3.5	3.6	3.7	2.8	5	4.6	2.2	2.8	3.1	3.1	1.3	3.3	106
Gambia	4.3	5.7	3.9	4.1	3.4	5.1	2.3	5.3	4.4	2	3.3	2.6	2.3	1.1	3.2	11
Ghana	4.8	5.5	3	4.7	4.1	3.8	3	5	4.1	2	2.6	2.3	2.5	1.3	3.1	115
Cote d'Ivore	4.3	4.6	3.3	4	4	2.6	2.6	5.1	4.1	2.1	2.8	2.6	3.3	1.3	3.1	119
Benin	4.4	5.4	2.5	4.6	2.9	3.5	2.9	5.1	4.3	1.7	2.3	2.5	2.9	1.2	3.0	123
Guinea	4.2	4.6	2.6	4.1	3.2	2.7	1.8	5.7	4.5	1.9	2.3	2.4	3.1	1.1	2.9	126
Cameroon	4	4.7	2.8	4.4	2.8	3	1.8	5	4.4	1.7	2.5	2.2	3.2	1.2	2.9	128
Nigeria	4.2	3.1	2.9	3.5	2.9	3.4	1.9	5.5	4.3	2	2	2.5	2.3	1.8	2.8	129
Mali	4	4	2.6	3.2	3.3	3.7	1.7	4.8	4.3	2	2.1	2.5	2.3	1.6	2.8	130
Sierra Leone	4	5.1	2.3	4	3.1	3.4	2.8	4.4	4.2	1.7	2.7	1.9	2.1	1.1	2.8	131
Burkina Faso	4.3	4.8	2.4	3.4	2.9	3.2	1.6	5.5	4.2	1.6	2.2	2.3	2.6	1.2	2.8	132
Mauritania	3.4	5.6	3.8	2.5	3	2.8	2.9	5.3	3.9	1.6	1.8	2	2	1.1	2.7	135
Liberia	4.1	5.3	3.1	3.4	2.1	2.7	2	4.8	4.3	1.8	2.3	1.7	1.8	1.1	2.6	138
Chad	2.8	4.2	2.8	3.2	2.2	3.2	1.7	4.8	4.2	1.5	1.9	1.8	2.7	1	2.5	139
Western Africa Average	**4.1**	**4.9**	**3.1**	**3.8**	**3.2**	**3.4**	**2.3**	**5.1**	**4.3**	**1.9**	**2.5**	**2.4**	**2.6**	**1.2**		
Sub-Saharan Average	**4.2**	**5**	**3.2**	**3.9**	**3.2**	**3.9**	**2.5**	**5.3**	**4.2**	**2.1**	**2.7**	**2.8**	**2.9**	**1.3**		

569 **Table A2**. Travel and tourism and competitive index based on
570 different aggregation operators

Country	TTCI Score	TTCI Ranking	WA Score	WA Ranking	OWA Score	OWA Ranking	IOWA Score	IOWA Ranking	HOWA Score	HOWA Ranking	IHOWA Score	IHOWA Ranking
Spain	5.43	1	5.48	3	5.77	2	5.54	3	6.35	2	6.09	3
France	5.40	2	5.44	4	5.69	5	5.51	4	6.26	5	6.06	4
Germany	5.39	3	5.56	1	5.81	1	5.57	1	6.39	1	6.13	1
Japan	5.37	4	5.49	2	5.76	3	5.54	2	6.34	3	6.09	2
United States	5.26	5	5.24	7	5.63	8	5.42	5	6.20	8	5.96	5
United Kingdom	5.19	6	5.17	14	5.56	10	5.31	9	6.12	10	5.84	9
Australia	5.15	7	5.21	8	5.56	11	5.31	8	6.11	11	5.84	8
Italy	5.08	8	5.11	19	5.40	21	5.19	15	5.94	21	5.71	15
Canada	5.05	9	5.19	11	5.55	12	5.25	11	6.11	12	5.78	11
Switzerland	5.02	10	5.37	6	5.75	4	5.37	6	6.33	4	5.91	6
Austria	4.95	11	5.40	5	5.69	6	5.35	7	6.26	6	5.89	7
Gambia	3.22	11	3.96	104	4.18	104	3.78	107	4.60	104	4.16	107
Portugal	4.89	12	5.18	12	5.46	18	5.22	13	6.01	18	5.74	13
China	4.88	13	5.01	24	5.27	26	4.94	25	5.79	26	5.44	25
Hong Kong	4.82	14	5.16	15	5.65	7	5.26	10	6.22	7	5.78	10
Netherlands	4.78	15	5.20	9	5.52	13	5.19	14	6.07	13	5.71	14
Korea	4.78	16	5.18	13	5.42	20	5.13	17	5.96	20	5.64	17
Singapore	4.75	17	5.16	16	5.60	9	5.25	12	6.16	9	5.77	12
New Zealand	4.74	18	5.11	18	5.47	16	5.14	16	6.02	16	5.65	16
Mexico	4.69	19	4.66	52	4.95	46	4.73	36	5.44	46	5.20	36
Norway	4.58	20	5.06	20	5.44	19	5.08	19	5.98	19	5.58	19
Denmark	4.57	21	5.03	22	5.36	22	5.07	20	5.90	22	5.57	20
Sweden	4.57	22	4.99	26	5.31	23	5.01	23	5.85	23	5.51	23
Luxembourg	4.55	23	5.19	10	5.48	14	5.05	21	6.03	14	5.55	21
Belgium	4.54	24	5.03	23	5.24	28	4.94	26	5.77	28	5.43	26
Greece	4.54	25	4.91	35	5.17	33	4.88	31	5.68	33	5.37	31
Ireland	4.54	26	4.98	27	5.25	27	4.98	24	5.78	27	5.48	24
Croatia	4.53	27	4.97	30	5.20	32	4.88	30	5.72	32	5.37	29
Finland	4.52	28	5.15	17	5.46	17	5.08	18	6.01	17	5.59	18
Malaysia	4.53	29	4.98	27	5.20	31	4.93	27	5.72	31	5.42	27
Iceland	4.50	30	4.95	32	5.47	15	5.05	22	6.02	15	5.55	22
Thailand	4.48	31	4.67	49	5.00	42	4.72	37	5.51	42	5.19	37
Brazil	4.45	32	4.54	60	4.79	60	4.49	54	5.27	60	4.94	54
United Arab Emirates	4.44	33	4.94	33	5.30	25	4.88	29	5.83	25	5.37	29
India	4.42	34	4.51	64	4.74	65	4.49	53	5.21	65	4.94	53
Malta	4.36	35	4.96	31	5.31	24	4.91	28	5.84	24	5.40	28
Slovenia	4.35	36	4.98	29	5.14	35	4.79	34	5.65	35	5.27	34
Taiwan	4.34	37	4.92	34	5.11	36	4.79	33	5.62	36	5.27	33
Czech Republic	4.32	38	5.05	21	5.22	29	4.83	32	5.74	29	5.31	32
Russian Federation	4.29	39	4.77	42	4.97	43	4.66	42	5.47	43	5.12	42
Indonesia	4.27	40	4.60	59	4.89	51	4.59	45	5.38	51	5.05	45
Costa Rica	4.29	41	4.69	47	4.96	45	4.56	46	5.45	45	5.02	46
Poland	4.24	42	4.83	39	4.97	44	4.61	43	5.46	44	5.07	43
Turkey	4.22	43	4.49	66	4.73	66	4.50	52	5.20	66	4.95	52
Cyprus	4.22	44	4.74	43	5.14	34	4.78	35	5.66	34	5.26	35
Bulgaria	4.22	45	4.85	38	5.06	38	4.68	39	5.57	38	5.15	39
Estonia	4.20	46	5.00	25	5.22	30	4.71	38	5.74	30	5.18	38
Panama	4.20	47	4.61	55	4.79	62	4.50	50	5.26	62	4.95	50
Hungary	4.20	48	4.87	36	5.03	41	4.67	40	5.53	41	5.14	40

Country	TTCI Score	TTCI Ranking	WA Score	WA Ranking	OWA Score	OWA Ranking	IOWA Score	IOWA Ranking	HOWA Score	HOWA Ranking	IHOWA Score	IHOWA Ranking
Peru	4.16	49	4.46	71	4.60	73	4.32	68	5.06	73	4.76	68
Argentina	4.16	50	4.52	62	4.68	68	4.37	63	5.15	68	4.81	63
Qatar	4.12	51	4.82	41	5.09	37	4.67	41	5.60	37	5.14	41
Chile	4.10	52	4.66	51	4.83	58	4.50	51	5.32	58	4.95	51
Latvia	4.05	53	4.82	40	5.04	40	4.60	44	5.54	40	5.07	44
Mauritius	4.01	54	4.60	58	4.95	47	4.51	48	5.44	47	4.96	48
Colombia	4.01	55	4.34	77	4.51	80	4.25	73	4.96	80	4.68	73
Romania	3.99	56	4.71	45	4.84	57	4.45	56	5.32	57	4.90	57
Israel	3.97	57	4.48	68	4.90	50	4.47	55	5.39	50	4.91	55
Oman	3.98	58	4.71	44	4.90	49	4.51	49	5.39	49	4.96	49
Lithuania	3.97	59	4.85	37	5.06	39	4.53	47	5.56	39	4.98	47
Slovak Republic	3.97	60	4.69	46	4.86	54	4.44	58	5.35	54	4.88	58
South Africa	3.97	61	4.10	96	4.36	92	4.12	80	4.79	92	4.54	80
Seychelles	3.94	62	4.36	75	4.79	61	4.34	65	5.27	61	4.77	66
Vietnam	3.90	63	4.44	73	4.57	74	4.26	72	5.02	74	4.69	72
Bahrain	3.90	64	4.62	54	4.92	48	4.45	56	5.41	48	4.90	56
Egypt	3.91	65	4.47	70	4.62	72	4.30	70	5.08	72	4.74	70
Morocco	3.91	66	4.49	65	4.67	69	4.34	64	5.14	69	4.77	64
Montenegro	3.88	67	4.60	56	4.83	59	4.39	62	5.31	59	4.82	62
Georgia	3.87	68	4.67	48	4.87	52	4.44	59	5.36	52	4.88	59
Saudi Arabia	3.87	69	4.60	57	4.84	56	4.34	65	5.33	56	4.77	65
Ecuador	3.86	70	4.39	74	4.50	83	4.18	76	4.95	83	4.60	76
Azerbaijan	3.82	71	4.66	50	4.86	55	4.42	61	5.34	55	4.86	61
Brunei	3.79	72	4.64	53	4.87	53	4.43	60	5.36	53	4.88	60
Dominican Republic	3.77	73	4.23	85	4.52	79	4.17	77	4.97	79	4.59	77
Uruguay	3.77	74	4.48	69	4.74	64	4.33	67	5.21	64	4.76	67
Philippines	3.75	75	4.14	92	4.44	87	4.11	81	4.88	87	4.52	81
Jamaica	3.75	76	4.08	98	4.54	75	4.14	78	5.00	75	4.56	78
Sri Lanka	3.73	77	4.32	81	4.50	82	4.10	83	4.95	82	4.51	83
Ukraine	3.70	78	4.45	72	4.63	71	4.24	74	5.09	71	4.67	74
Armenia	3.69	79	4.52	63	4.71	67	4.26	71	5.18	67	4.69	71
Kazakhstan	3.67	80	4.54	61	4.75	63	4.31	69	5.22	63	4.75	69
Namibia	3.69	81	4.15	91	4.42	88	4.06	87	4.86	88	4.47	87
Kenya	3.62	82	3.94	106	4.24	100	3.94	94	4.66	100	4.33	94
Serbia	3.64	83	4.48	67	4.65	70	4.21	75	5.11	70	4.63	75
Jordan	3.57	84	4.33	79	4.53	77	4.12	79	4.98	77	4.54	79
Tunisia	3.58	85	4.32	80	4.49	84	4.08	85	4.94	84	4.48	85
Albania	3.59	86	4.35	76	4.53	76	4.11	82	4.98	76	4.52	82
Trinidad and Tobago	3.58	87	4.17	89	4.45	85	4.09	84	4.90	85	4.50	84
Cape Verde	3.55	88	4.22	86	4.41	89	4.06	88	4.85	89	4.46	88
Iran	3.54	89	4.30	82	4.40	90	4.03	89	4.84	90	4.43	89
Bolivia	3.48	90	4.07	99	4.16	107	3.80	104	4.58	107	4.18	104
Nicaragua	3.49	91	4.18	88	4.34	94	3.96	93	4.77	94	4.36	93
Botswana	3.47	92	4.06	100	4.34	93	3.90	97	4.78	93	4.29	97
Mongolia	3.49	93	4.33	78	4.50	81	4.07	86	4.95	81	4.48	86
Honduras	3.45	94	3.94	107	4.20	102	3.89	98	4.62	102	4.28	98
Tanzania	3.43	95	3.87	110	4.16	106	3.79	106	4.58	106	4.17	106
Kuwait	3.42	96	4.29	83	4.52	78	3.99	90	4.97	78	4.39	90
Lao	3.41	97	4.10	97	4.30	97	3.93	95	4.73	97	4.32	95
Cambodia	3.39	98	3.95	105	4.17	105	3.80	103	4.59	105	4.18	103
Guatemala	3.38	99	3.93	108	4.10	111	3.72	110	4.51	111	4.10	110
Lebanon	3.40	100	4.12	94	4.32	95	3.91	96	4.75	95	4.30	96

Country	TTCI Score	TTCI Ranking	WA Score	WA Ranking	OWA Score	OWA Ranking	IOWA Score	IOWA Ranking	HOWA Score	HOWA Ranking	IHOWA Score	IHOWA Ranking
North Macedonia	3.37	101	4.19	87	4.39	91	3.97	91	4.82	91	4.36	91
Nepal	3.34	102	3.97	103	4.21	101	3.81	102	4.63	101	4.19	102
Moldova	3.29	103	4.29	84	4.44	86	3.96	92	4.89	86	4.36	92
Tajikistan	3.30	104	4.14	93	4.30	96	3.85	100	4.73	96	4.23	100
Bosnia and Herzegovina	3.29	105	4.15	90	4.27	99	3.84	101	4.70	99	4.23	101
Senegal	3.26	106	3.87	111	4.01	115	3.67	112	4.41	115	4.04	112
Rwanda	3.25	107	3.92	109	4.19	103	3.80	105	4.61	103	4.18	105
El Salvador	3.24	108	3.79	115	4.10	112	3.72	111	4.51	112	4.09	111
Paraguay	3.24	109	3.97	102	4.16	108	3.75	108	4.58	108	4.13	108
Kyrgyz Republic	3.23	110	4.11	95	4.28	98	3.86	99	4.71	98	4.25	99
Uganda	3.19	112	3.68	119	3.92	117	3.60	116	4.32	117	3.96	116
Zambia	3.15	113	3.69	118	3.93	116	3.58	117	4.32	116	3.93	117
Zimbabwe	3.17	114	3.72	117	3.90	118	3.55	119	4.29	118	3.90	119
Ghana	3.15	115	3.79	116	4.06	114	3.67	113	4.47	114	4.04	113
Algeria	3.12	116	4.02	101	4.15	109	3.73	109	4.57	109	4.11	109
Venezuela	3.14	117	3.58	125	3.74	126	3.45	125	4.11	126	3.79	125
Eswatini	3.12	118	3.81	113	4.07	113	3.65	114	4.48	113	4.02	114
Cote d'Ivore	3.11	119	3.64	122	3.82	121	3.52	121	4.20	121	3.88	121
Bangladesh	3.09	120	3.79	114	3.90	119	3.54	120	4.29	119	3.89	120
Pakistan	3.09	121	3.66	120	3.79	122	3.47	122	4.17	122	3.82	122
Ethiopia	3.01	122	3.64	122	3.78	124	3.47	123	4.16	124	3.82	123
Benin	3.03	123	3.65	121	3.90	120	3.57	118	4.29	120	3.93	118
Lesotho	3.02	124	3.82	112	4.10	110	3.61	115	4.51	110	3.97	115
Malawi	2.94	125	3.61	124	3.78	123	3.47	124	4.16	123	3.81	124
Guinea	2.93	126	3.54	126	3.77	125	3.40	126	4.15	125	3.74	126
Mozambique	2.92	127	3.42	131	3.71	127	3.34	127	4.08	127	3.67	127
Cameroon	2.91	128	3.48	129	3.69	128	3.32	128	4.06	128	3.66	128
Nigeria	2.83	129	3.30	136	3.54	135	3.23	133	3.89	135	3.55	133
Mali	2.80	130	3.28	137	3.49	137	3.20	135	3.84	137	3.51	135
Sierra Leone	2.77	131	3.36	135	3.59	132	3.27	130	3.95	132	3.59	130
Burkina Faso	2.78	132	3.41	132	3.64	129	3.22	134	4.00	129	3.54	134
Haiti	2.77	133	3.49	128	3.62	130	3.28	129	3.98	130	3.61	129
Angola	2.72	134	3.43	130	3.55	134	3.19	136	3.90	134	3.51	136
Mauritania	2.68	135	3.52	127	3.61	131	3.26	131	3.98	131	3.59	131
Congo	2.68	136	3.17	138	3.36	138	3.03	138	3.69	138	3.33	138
Burundi	2.66	137	3.41	133	3.56	133	3.23	132	3.92	133	3.55	132
Liberia	2.61	138	3.37	134	3.53	136	3.15	137	3.88	136	3.46	137
Chad	2.52	139	3.11	140	3.25	140	2.92	139	3.58	140	3.21	139
Yemen	2.42	140	3.16	139	3.27	139	2.90	140	3.59	139	3.19	140

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