A Comparative Analysis of the Competitiveness of Central American Countries Based on the Global Competitiveness Index before the COVID-19 Pandemic

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Abstract: A country’s global competitiveness is a fundamental element that facilitates the understanding of why some countries generate more wealth than others, as well as better sources of income in a sustainable manner. With globalization and market integration, governments are reviewing the current values of economic, business, social, and environmental variables that define multidimensional competitiveness indices. Central American countries face difficult economic situations with challenging political and social ramifications. This study presents a comparative analysis of the competitiveness of Central American countries in a globalized environment before the COVID-19 pandemic. For this purpose, multivariate statistical analysis and Cluster analysis have been applied to data from the World Economic Forum (WEF) Global Competitiveness Index 2018, contrasting it with the publication of the same index for 2019. This methodology allows to rank countries with similar levels of competitiveness and shows the relative position of each country about countries belonging to the same group and countries belonging to other groups with different levels of competitiveness. The results show differences in competitiveness at the country level in 12 variables or composite indicators of the Global Competitiveness Index, the most important being Macroeconomic Stability, IT Adoption, and Infrastructure, with the most significant differences between countries. This result contributes to the current policy discussion on measures to achieve sustainable competitiveness of Central American economies.

Keywords: competitiveness; macroeconomic analyses of economic development; comparative studies of countries; Central American countries; classification methods; cluster analysis

1. Introduction

During the last decade, the Central American region has shown some economic and social advances that have been insufficient to reverse the global problems and social imbalances that have considerably hindered the development of the region’s countries since the end of the 20th century. Before the pandemic, most of the countries in the region presented economic and social situations characterized by certain inequalities in some micro- and macroeconomic indicators related to competitiveness, unbalanced distribution of resources, weak political and social structures, and insufficient promotion of human development, aggravated by some political setbacks, sustained social conflict and social violence that condition the levels of social welfare of their populations [1]. Therefore, this article seeks to incorporate competitiveness into the agendas of the countries of Central America to reduce these shortcomings and thus achieve better development standards.

In the 1990s, exports from the Central American region maintained steady growth with an average annual rate of 13.7%, with coffee and textile products being its main export items [2]. In contrast, between the period from 2006 to 2015, exports from the region to the
United States presented an average annual growth rate of 2.5%, where the competitiveness of Central American countries showed a positive evolution, driven by exports and the establishment of the Central American Common Market (CACM), which subsequently achieved the Central American and Dominican Republic Free Trade Agreement (CAFTA-DR) with the United States, Canada, and Mexico [3]. However, in recent years, all countries except Panama and Costa Rica have experienced stagnation in their competitiveness.

Between 2016 and 2019, before the pandemic, the Central American region presented a declining panorama in terms of economic performance, at the same time that some relevant sectors showed signs of exhaustion and deceleration processes, which directly impacted the labor opportunities of the population. This situation could be associated with the low tax burden in Central American countries, which is lower as a percentage of GDP than the average tax burden in Latin America, and the high budget deficit in all countries [1].

The region’s countries have advanced slowly and unevenly in transforming their productive and labor structures, with reduced margins for change explaining the fragility of their socio-economic systems and development. This can be seen by comparing the gaps between countries’ GDP per capita, where Panama has the highest GDP per capita in the region, followed by Costa Rica. The disparity is such that, in 2019, Panama’s GDP per capita was almost seven times the GDP per capita of Nicaragua, more than five times the GDP per capita of Honduras, and between three and four times the GDP per capita of El Salvador and Guatemala [1].

Based on the relevance of competitiveness as a driver of wealth for countries and the situation in the Central American region, this paper aims to analyze the competitiveness and development of Central American countries.

Competitiveness depends on the ability of countries to produce knowledge, education, and innovation, which function as indicators of growth and globalization [4]. Therefore, there is a need to reduce the gaps between the region’s countries by strengthening trade, competitiveness, and productivity in the region. A country’s competitiveness plays an essential role in the efforts of the state to achieve sustainable development that impacts the well-being of the population, so its measurement has been addressed in various studies. At the same time, it contributes to the creation of economic policies, both at the country and regional levels, which in turn impacts business, especially in developing strategies that improve nations’ micro- and macroeconomic levels [5].

The concept of competitiveness dates back to the Theory of Trade when Adam Smith established that profit maximization, as an absolute advantage, is how a country obtains more significant benefits and trade becomes the generator of world production growth [6]. Later, Heckscher-Ohlin postulated that the intensity or abundance of the factor of production is the variable that drives the difference in comparative advantage [6].

However, it was not until the 1990s that Michael E. Porter [7] presented the basis of the so-called Competitiveness Theory. From this, the definition of competitiveness of the World Economic Forum (WEF) emerges, which defines it as “the set of institutions, policies, and factors that determine the level of productivity of an economy, which in turn sets the level of prosperity that the economy can achieve” [8]. Likewise, and addressing the concept beyond the country level, competitiveness can be understood as the ability of companies, industries, regions, or geographic areas to generate relatively high levels of income and employment on a sustainable basis [9]. Therefore, if the main goal of a nation is to produce a high and sustained standard of living for its citizens, productivity becomes a lever to achieve this goal, being fundamental the ability to measure the state of competitiveness at the country level as a source of information that determines future allocations of public resources to improve it [10]. In addition, Baumann and Pintado [11] proposed the model known as competitive productivity, which seeks the concrete relationship between both concepts and relates attitudes and behaviors aimed at beating the competition.

In this sense, the Central American region and the countries that comprise it present notable inequalities in some micro- and macroeconomic indicators related to competitiveness [12]. Although it is worth noting that the countries of the region showed positive
changes in their competitiveness during the 1990s [13], in recent years, they have experienced stagnation on average, only surpassed by Panama [12]. In addition, it should be considered the work done regarding the region’s integration, where a process of continuous changes has been experienced concerning trade integration, at the same time on infrastructure and mobility, tourism, environment, and more [14].

Thus, and based on the relevance of the concept of competitiveness as a driver of wealth at the country level and the situation described in Central America, this work aims to perform a comparative analysis of the competitiveness of Central American countries (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama) in a globalized environment, to deepen the knowledge about their behavior in terms of competitiveness, in addition to visualizing whether these countries present similar traits of competitiveness because they are located in the same region or if there are other countries with similar characteristics.

To this end, this research responds to the problem posed by the fact that the Central American region has considerable difficulties in terms of development. Hence, the objective is, first, to identify significant differences in the competitiveness of Central American countries, and second, to determine the variables with the most important differentiating potential in the region. For this, secondary data from the World Economic Forum’s Global Competitiveness Indicator (GCI) for Central America published in 2018 [12] and 2019 [15] are used, this taking into account that the GCI was updated in 2018, incorporating the novelty of the evaluation of variables focused on the fourth revolution, which, at the same time, prevents comparison with previously published indicators but manages to cover current issues and multivariate statistical analysis, mainly cluster analysis by hierarchical clusters. Thus, first, the Central American countries are classified according to the 12 pillars that make up the GCI, considering 139 countries covered by this index, in order to subsequently study only the Central American countries.

Concerning the structure of this paper, after the introductory section, the conceptual framework of the research is presented, followed by a review of the data and the characteristics of the sample. Next, the methodology of analysis is presented, followed by an explanation of the results, ending with the discussion and conclusions.

2. Literature Review

The concept of competitiveness has evolved throughout the history of economic thought, adopting different approaches, from mercantilist theories, which introduced the idea of a rivalry between nations, to Porter’s well-known theory of the competitive advantage of nations [5]. Precisely, Smith established that absolute advantage was based on specialization to minimize absolute costs (profit maximization); this became the way for a country to obtain greater profits and trade was the generator of growth in world production. Subsequently, David Ricardo advanced in the theory defined by Smith, establishing that relative costs, and not absolute costs, are determinants for the establishment of the advantage between countries until the contribution of Heckscher-Ohlin appeared by proposing the abundance of production factors as a differentiating variable and generator of comparative advantage [6].

Another important idea in the development of the concept of competitiveness is that of Krugman [16], who mentioned that the competitiveness of countries should not be measured exclusively with macroeconomic factors, this is based on Ricardo’s idea, that all countries have a comparative advantage; added to the fact that states cannot go bankrupt, while companies can; also that competition is generated between companies and not between nations so that competitiveness is firmly rooted in the behavior of companies [5].

At the end of the 20th century, Michael Porter presented the Theory of Competitiveness, stating that “the prosperity of a nation depends on its competitiveness, which is based on the productivity with which it produces goods and services. At the same time, he states that macroeconomic policies and solid legal institutions, and stable policies are necessary but not sufficient conditions to ensure a prosperous economy. Competitiveness is grounded in a nation’s microeconomic fundamentals: the sophistication of a company’s operations and
strategies and the quality of the microeconomic business environment in which companies compete. Understanding the microeconomic foundations of competitiveness is vital for national economic policy” [7]. He also mentioned that the main goal of a nation is to produce a high and sustained standard of living for its citizens. In a globalized world, countries face a variety of challenges and opportunities. Figure 1 shows a timeline of the evolution of the concept described in this section.

Figure 1. Evolution of the concept of competitiveness.

The constant flow of products and services between nations has increased and become more volatile, with some countries benefiting and others not [5], explaining the growing interest in competitiveness at all levels shown by many governments and industries, which demonstrates the importance of measuring it through productivity [17]. Precisely, D’Alessio stated that the concept of productivity is the “relationship between the results obtained concerning the resources used and the time to achieve them” [18]. This concept was also taken by Porter [10], when he proposed a model that helps understand industries and competition, facilitating the formulation of global strategies.

Taking into account the above concepts, Mahmoo [19], clarified that “The notion of comparative advantage is based on the factor endowment position of a country where no participating firm within an industry has an advantage over another based on its factor endowment (public goods characteristics). Unlike comparative advantage, competitive advantage is created and appropriated by individual firms (private good characteristics). One should not choose between one of the two paradigms, as they are neither mutually exclusive nor explicitly separable. So, we can argue that it is inappropriate to present competitive advantage as an alternative (substitute) to comparative advantage. The two theories must properly be seen as complements rather than competitors in the formulation of trade and industrial policies”.

Another idea that emerges is the relationship between competitiveness and GDP, where wealth, prosperity, and economic growth are often referred to as the results of substantial and well-developed intellectual capital. However, GDP has become a questionable indicator of prosperity and economic development, given that national well-being lies beyond GDP, which in turn requires inclusive economies, productivity, and well-functioning markets [20].
From a business perspective, a company’s competitiveness is its capacity to supply goods and services that are equally or more effective and efficient than those of its competitors [21]. With the same idea, Labarca [22] mentioned that competitiveness is the determining factor in determining how easy it is for companies to take advantage of the opportunities offered by the international economy. There is evidence to suggest that international trade strongly influences certain sectors of a country to produce the same goods and services they already produce but at a lower cost, through the improvement of technology in their production processes, which becomes a differentiating factor between developed and developing countries [23].

In addition, Esser [24] mentioned that systemic competitiveness constitutes a frame of reference for both industrialized and developing countries. He said that competitiveness is the product of the interaction between a nation’s four economic and social levels. A first micro- or business-level simultaneously seeks efficiency, quality, flexibility, and speed of reaction of companies. A second meso-level, which corresponds to the state and social actors responsible for the development of specific support policies, encourages the formation of structures and articulates learning processes at the societal level. A macro-level, which exerts pressure on companies through performance requirements. In addition, there is a final target level, which is structured with solid basic patterns of legal, political, and economic organization, and the social capacity for organization and strategic integration [24].

Thus, and thanks to the increase in intraregional trade among the nations that make up a region, regional economic integration has positively impacted the national economies of the countries that make up the region as a whole [25].

In this concept, two elements differentiate it from others. A first element, such as the distinction of the four levels (meta, macro, meso, and micro), emphasizes the importance of the meta-level where the factors related to the capacity of society for integration and strategic action are examined, and a meso-level where the action of an environment capable of promoting and multiplying the company’s efforts is studied. In addition, a second difference is related to linking elements to industrial economics, innovation theory, and industrial sociology [24].

The adoption and evolution of concepts such as regional innovation systems, and the recognition of subnational regions as critical units in globalization, have given rise to increasing attention to regional competitiveness policies, a common factor strengthening the conditions for innovation. Designing effective competitiveness policies is a complicated, dynamic, innovative process [26].

In a complementary manner, the Economic Commission for Latin America and the Caribbean (CEPAL) considers that national competitiveness is the “capacity of a country to increase or maintain its participation in international markets, which in turn translates into an increase in the standard of living of the population” [27].

Along the same lines, Wienert [17] defined competitiveness as the ability of firms, industries, regions, or specific geographic areas to generate relatively high levels of income and employment on a sustainable basis. He also mentioned that the Organization for Economic Cooperation and Development (OECD) has four different classifications for competitiveness studies:

- Engineering, which defines a country’s competitiveness based on its companies, is understood as its capacity to maximize its productivity to obtain higher income.
- Environment/systemic, which considers competitiveness to be directly linked to the productivity of companies, but considering environmental factors such as incentives, quality of inputs, and infrastructure.
- Capital development, understanding competitiveness as the ability of firms to accumulate physical, human, and technological capital to modify long-term performance or, also, the ability of firms to obtain income from factor differentiation in international markets.
Eclectic/Academic considers competitiveness a complex concept composed of specific and selective factors and elements, such as the pillars of competitiveness that make up the World Economic Forum’s global competitiveness model.

Likewise, and considering the contribution of Porter [10], Baumann and Pintado [11] proposed the beginnings of the model known as competitive productivity (CP), which in essence relates attitudes and behaviors aimed at beating the competition. This approach considers that productivity can be separated from competitiveness. In contrast, a pure focus on competitiveness can overlook productivity, so a nation, company, or individual could be very productive but not necessarily competitive [28].

Later, Baumann, Cherry, and Chu [28] added a broader look to the concept of the competitive productivity model, adjusting the concepts of productivity and competitiveness at different levels. The first is at the national level (NCP), which considers the geography, political stability, culture, and institutions, as well as the economic policy of each country. A second level, at the enterprise or meso-level (FCP), considers variables related to talent management, resource management, corporate culture, and brand management. In addition, a third level, at the individual or micro-level (ICP), considers the individual’s genetics, personality, motivation, education, nature, and life experience.

The literature review on the definitions and concepts of competitiveness shows a diversity of nuances. However, they share the idea that competitiveness should have an impact on improving a country’s prosperity [29]. Complementarily, the different theoretical foundations of the concept of competitiveness have generated various forms and measurement instruments, such as, for example, the Global Competitiveness Index of the Institute for Management Development (IMD); the World Bank’s Doing Business Index, or the International Competitiveness Index of the Mexican Institute for Competitiveness (IMCO). However, Ordóñez [29] mentioned that, possibly, the best-known competitiveness evaluation reference is the Global Competitiveness Index, prepared and published annually and since 1979 by the World Economic Forum, which defines competitiveness as “the set of institutions, policies and factors that determine the level of productivity of a country” [20], and considers that the level of competitiveness has a direct relationship with the ability of countries to achieve sustained growth and long-term prosperity.

3. Data and Methodology

3.1. Data

This research was based on the concept of competitiveness of Porter [10], the World Economic Forum [12], and Baumann, Cherry, and Chu [28], previously commented, where the focus is on the influence of the state and companies to generate conditions for competitiveness, well-being, and human development. Thus, to perform the comparative analysis of the competitiveness of Central American countries, the Global Competitiveness Index (GCI) published by the organization mentioned above for 2019 was used [12]. This index is designed to measure micro- and macroeconomic variables associated with the competitiveness of each country, constituting one of the most widely used references for measuring competitiveness [30].

The Global Competitiveness Index published in 2018 [12] incorporates a new methodology by including concepts associated with the Fourth Industrial Revolution (4IR) and evaluates a set of variables that collectively determines the level of a country’s productivity, which nowadays influences the long-term improvements in living standards of millions of people around the world [12].

This version is a compilation of 98 indicators or observed variables that capture concepts that matter for productivity and long-term prosperity. These indicators are collected and grouped into 12 pillars or latent variables (Institutions, Infrastructure, ICT adoption, Macroeconomic stability, Health, Skills, Product market, Labor market, Financial system, Market size, Business dynamism, and Innovation capability). These 12 pillars are grouped into four categories or components (Enabling environment, Human capital,
Markets, and Innovation ecosystem) [12]. This structure of indicators, pillars, and categories or components is shown in Figure 2.

![Diagram of the Global Competitiveness Index](image)

**Figure 2.** Composite indicators comprise the Global Competitiveness Index. Source: Framework adopted from WEF, modified by authors.

The first category or component, Enabling Environment, ensures an environment conducive to economic activity in each country, reducing transaction costs and accelerating the exchange of information, thereby increasing business confidence and productivity. The second component, Human Capital, measures how the physical, mental, and productive capabilities of individuals, as well as interpersonal skills and the ability to think critically and creatively, influence the competitiveness of countries. The third component, Market, measures the characteristics that enable the arrival of new products to a market while attracting, incentivizing, and retaining talent while providing an efficient payment system. Finally, the Innovation Ecosystem component is responsible for creating innovative products and services, fostering collaboration, creativity, diversity, confrontation; and the ability to turn ideas into new goods and services [12].

In addition, the calculation of the Global Competitiveness Index is based on successive aggregations of scores, from the indicator level (the most disaggregated level) to the overall GCI score (the highest level), thus in each aggregation level, there are different variables, being the score of each aggregation the arithmetic average of the variables that compose it and the overall GCI score will be the average of its 12 pillars [12]. In addition, each variable individually, before aggregation, presents values ranging from 0 to 100, with 100 being the highest value, as well as the ideal state of each variable. This score coincides with the highest level (GCI).

In turn, the Global Competitiveness Index comes from different sources. Of the 103 indicators composing the GCI, part of these is based on statistics provided by reliable external sources suppliers that adequately capture the identified concepts, is derived from external statistics from reputable organizations that collect high-quality data that will be regularly updated in the future, and have wide geographical coverage and are available for at least 75% of the economies covered by the GCI. Another part of the indicators is sourced from the Executive Opinion Survey (EOS), which for almost 40 years has been fundamental in providing critical aspects of the indicator for variables that are impossible or extremely difficult to measure statistically. The goal of the survey is to capture reality as best as possible, and business leaders are arguably the best at assessing these aspects [12,13].

For the 2019 publication, the opinion of 16,936 business executives in 41 different languages was taken between January and April 2019. In turn, the EOS comprises 78 questions divided into 10 sections, where most of the questions are answered on a scale of 1 to 7, with
7 being the highest and therefore considered the best in the world on specific aspects of the business environment of the country where the respondent operates [15].

Thus, and as previously commented, this research uses the Global Competitiveness Index data published in 2019 by the World Economic Forum [15]. Specifically, 139 records were selected and utilized corresponding to countries that did not present missing data in any pillar, including most Latin American countries and countries in the Central American region. Although the analysis focuses on the Central American countries (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama), it was necessary to use the complete information of the countries mentioned to have a sufficient sample size to apply the analysis and classification methods to analyze the competitive differences and similarities between countries.

Table 1 presents the values of the descriptive statistics for the 12 composite indicators or pillars that make up the 2018 and 2019 GCI for the countries in the sample.

| GCI Composite Indicators       | Year | Average | Median | Std. Deviation | Min. | Max. | Skewness Coef. | Kurtosis Coef. |
|--------------------------------|------|---------|--------|----------------|------|------|----------------|----------------|
| 1. Institutions (INST) *       | 2018 | 55.399  | 53.561 | 11.495         | 29.466| 81.554| 0.436          | −0.426         |
|                                | 2019 | 55.074  | 53.893 | 11.957         | 25.721| 81.216| 0.241          | −0.451         |
| 2. Infrastructures (INFRA)     | 2018 | 65.359  | 66.987 | 16.049         | 28.574| 95.704| −0.309         | −0.607         |
|                                | 2019 | 65.397  | 67.839 | 16.702         | 26.878| 95.448| −0.350         | −0.617         |
| 3. ICT Adoption (ADOP_ICT)     | 2018 | 52.049  | 54.029 | 19.813         | 12.772| 81.255| −0.129         | −0.975         |
|                                | 2019 | 55.330  | 55.394 | 19.381         | 10.769| 92.836| −0.185         | −0.840         |
| 4. Macroeconomic Stability (MAC_STAB) * | 2018 | 79.967  | 74.648 | 16.155         | 31.063| 100.000| −0.287         | −0.546         |
|                                | 2019 | 80.083  | 75.000 | 17.625         | 0.000 | 100.000| −1.019         | 2.373           |
| 5. Health (HEALTH) *          | 2018 | 75.224  | 79.985 | 19.667         | 11.933| 100.000| −0.815         | −0.180         |
|                                | 2019 | 75.406  | 80.545 | 18.138         | 21.728| 100.000| −0.716         | −0.360         |
| 6. Skills (SKILLS)            | 2018 | 60.613  | 61.698 | 14.924         | 28.248| 87.878| −0.289         | −0.743         |
|                                | 2019 | 61.262  | 63.161 | 14.513         | 29.039| 86.721| −0.353         | −0.681         |
| 7. Product market (PRO_MAR)    | 2018 | 56.561  | 55.700 | 8.183          | 37.517| 81.230| 0.242          | 0.307           |
|                                | 2019 | 55.262  | 54.632 | 8.595          | 35.433| 81.613| 0.206          | 0.377           |
| 8. Labour market (LAB_MAR)     | 2018 | 59.384  | 59.176 | 9.166          | 37.607| 81.885| 0.245          | −0.219         |
|                                | 2019 | 59.980  | 59.822 | 8.753          | 40.905| 81.229| 0.180          | −0.374         |
| 9. Financial system (FIN_SYS) * | 2018 | 61.469  | 58.797 | 13.726         | 37.170| 92.117| 0.577          | −0.583         |
|                                | 2019 | 62.441  | 59.791 | 14.185         | 29.035| 91.411| 0.351          | −0.615         |
| 10. Market size (MAR_SIZE)     | 2018 | 53.987  | 52.229 | 17.740         | 15.992| 100.000| 0.213          | −0.467         |
|                                | 2019 | 54.504  | 53.500 | 17.428         | 17.125| 100.000| 0.235          | −0.418         |
| 11. Business dynamism (BUS_DYN) | 2018 | 59.499  | 58.330 | 11.285         | 14.897| 86.489| −0.322         | 1.170           |
|                                | 2019 | 59.955  | 59.795 | 11.411         | 14.071| 84.210| −0.589         | 1.398           |
| 12. Innovation capability (INNO_CAP) * | 2018 | 42.433  | 36.408 | 17.588         | 16.782| 87.522| 0.998          | −0.118         |
|                                | 2019 | 42.981  | 37.984 | 17.066         | 17.967| 86.829| 0.961          | −0.134         |
| Global Competitiveness Index   | 2018 | 60.162  | 59.861 | 12.604         | 35.520| 85.641| 0.106          | −0.751         |
|                                | 2019 | 60.639  | 60.929 | 12.427         | 35.085| 84.784| 0.058          | −0.741         |

Note: * Non-normal distributions according to the Kolmogorov–Smirnov test. Source: Authors’ calculation.

The descriptive statistical values of the Global Competitiveness Index 2019 of the 139 countries have the following descriptive statistical values: Average = 60.639, Median = 60.929, Standard Deviation = 12.427, Skewness coefficient = 0.058, Kurtosis coefficient = −0.741. The average 2019 GCI indicates a medium level of competitiveness.

From this brief characterization, it became evident that the latent variable with the highest average value corresponds to the Macroeconomic stability pillar (80.083), followed...
by Health (75.406), Infrastructure (65.397), and Financial system (62.441) pillars, with performance levels at the international level above the average value of the 2019 GCI (60.639).

While the pillars ICT adoption (55.330), Product market (55.262), Institutions (55.074), Market size (54.504), and Innovation capability (42.981) present not only values below the average value of the 2019 GCI but are the pillars with low performance in terms of competitiveness for the set of countries analyzed.

3.2. Multivariate Analysis

A cluster analysis [31] was performed to group countries with similar values and behaviors in terms of competitiveness and in order to differentiate from other countries with different values and behaviors [32]. A clustering proposal was made, and as previously mentioned, using the 12 pillars or latent variables of the 2018 GCI as evaluation variables, applying the inter-group linkage method through the squared Euclidean distance, different analyses were obtained (grouping in 4, 5, 6, and 7 clusters, respectively). The analysis with grouping in 5 clusters was selected because it shows better values of intragroup linkage and intergroup differences, at the same time that the natural association observed with the dendrogram shows that using 5 clusters will allow a positive interpretation of the results [33]. The dendrogram, or tree diagram, is a graphical representation of the clustering procedure, where the nodes represent the clusters. The stem lengths represent the distances at which the clusters are joined [34]. In addition, this number of clusters allows associating the countries in such a way that in each group, some observations statistically can be worked with other methodologies used later.

The ANOVA statistical technique and the Bonferroni and Games–Howell tests were applied to evaluate the existence of statistically significant differences between the five groups of countries. The ANOVA technique is a method for analyzing the equality of means of variables with normal distributions between different populations through the analysis of sample variances [35], determining the influence of some variables on others and their significance [36]. The Kruskal–Wallis non-parametric test [37] was used to analyze differences in the means of variables with non-normal distributions. Complementarily, the Bonferroni and Games–Howell tests were applied to determine, more concretely, the differences between the four groups [38].

Finally, the non-parametric Mann–Whitney–Wilcoxon test was applied to the subsample of data from the Central American countries to compare the cluster analysis results and determine whether differences exist [39]. The influence of the variables on the grouping of the countries was also evaluated, based on the geometric means of each variable, which is the average of the rate of change of a variable [40], averaging percentages, indices, or relative figures. From the results of the Mann–Whitney–Wilcoxon test, the variables with the greatest differences were identified.

The statistical analysis described was conducted using IBM SPSS Statistics (v. 26) and Microsoft Excel (v. 2019) software. Figure 3 summarizes the statistical analysis performed throughout the paper.

Thanks to the identification of significant differences in the competitiveness of Central American countries, groups with similar characteristics to the countries of the region are identified and the variables with the most significant potential for differentiation among the countries are identified, which in turn can have an impact on support when making decisions on public policy issues.
Descriptive statistics
Statistical method Specific objective
ANOVA y Kruskal-Wallis Analyze the differences in the means of the variables that measure competitiveness.
Hierarchical cluster analysis Identify groups of countries with similar behavior in terms of competitiveness.
Bonferroni and Games-Howell tests Identifies the existence of differences for each group of countries by indicator pillar.
Mann-Whitney-Wilcoxon test Prioritizes the variables with the greatest potential to differentiate between countries.

Figure 3. Summary statistical analysis.

4. Results

The hierarchical cluster analysis performed on the 139 countries in the sample, considering the values of the 12 composite indicators of the 2019 GCI, formed five groups or clusters (Table 2).

Table 2. Distribution of countries by the group.

| Cluster | Countries |
|---------|-----------|
| 1 (26 countries) | ANGOLA, BENIN, BURKINA FASO, BURUNDI, CAMEROON, CHAD, CONGO, CÔTE D’IVOIRE, ETHIOPIA, GUINEA, HAITI, LESOTHO, LIBERIA, MALAWI, MALL, MAURITANIA, MOZAMBIQUE, NIGERIA, PAKISTAN, SIERRA LEONE, SWAZILAND, TANZANIA, UGANDA, YEMEN, ZAMBIA, ZIMBABWE. |
| 2 (55 countries) | ALBANIA, ALGERIA, ARGENTINA, ARMENIA, AZERBAIJAN, BANGLADESH, BAREIN, BOLIVIA, BOSNIA AND HERZEGOVINA, BOTSWANA, BRAZIL, BRUNEI, CAMBODIA, CAPE VERDE, COSTA RICA, CROATIA, CYPRUS, DOMINICAN REPUBLIC, ECUADOR, EGYPT, EL SALVADOR, GAMBIA, GEORGIA, GHANA, GREECE, GUATEMALA, HONDURAS, IRAN, JORDAN, KENYA, KYRGYZSTAN, LAOS, LEBANON, MACEDONIA, MALDIVES, MAURITIUS, MONGOLIA, MONTENEGRO, NAMIBIA, NEPAL, NICARAGUA, PARAGUAY, RUANDA, SENEGAL, SERBIA, SEYCHELLES, SRI LANKA, TAJIKISTAN, TRINIDAD AND TOBAGO, TUNISIA, TURKEY, UKRAINE, URUGUAY, VIETNAM. |
| 3 (31 countries) | BULGARIA, CHILE, CHINA, COLOMBIA, CZECH REPUBLIC, ESTONIA, HUNGARY, INDONESIA, ITALY, KAZAKHSTAN, KUWAIT, LATVIA, LITHUANIA, MALAYSIA, MALAYSIA, MALTA, MEXICO, MOROCCO, OMAN, PANAMA, PERU, PHILIPPINES, POLAND, PORTUGAL, QATAR, ROMANIA, SAUDI ARABIA, SLOVAK REPUBLIC, SLOVENIA, THAILAND, UNITED ARAB EMIRATES. |
| 4 (25 countries) | AUSTRALIA, AUSTRIA, BELGIUM, CANADA, DENMARK, FINLAND, FRANCE, GERMANY, HONG KONG, ICELAND, IRELAND, ISRAEL, JAPAN, LUXEMBOURG, NETHERLANDS, NEW ZEALAND, NORWAY, SINGAPORE, SOUTH KOREA, SPAIN, SWEDEN, SWITZERLAND, TAIWAN, UNITED KINGDOM, UNITED STATES OF AMERICA. |
| 5 (2 countries) | INDIA, SOUTH AFRICA. |
Cluster 1 is mainly made up of countries from the African region. Precisely 23 of the 26 countries belong to the region mentioned above, while only 2 Asian countries (Yemen and Pakistan) and one from the Central America and Caribbean region (Haiti) are included in the group. It is also important to note that the performance of the countries belonging to this cluster is lower than the others concerning the GCI. The cluster shows an average score of 42.48 points in the GCI, a value below the world average. Therefore, this cluster is made up of the countries with the lowest competitive levels. Slightly improving cluster 1, in terms of competitive levels, is cluster 2, comprising 16 Asian countries, 13 African countries, 10 from the rest of Europe, eight from Central America and the Caribbean, six from South America, and two belonging to the European Union. This country has an average GCI score of 56.03, slightly below the world average.

Cluster 3 shows a better picture than the two previous clusters, with an average score of 66.63 in the GCI. This cluster is made up of 13 countries from the European Union, 11 Asian countries, three from South America, and one from Africa, North America, Central America and the Caribbean, and the rest of Europe.

On the other hand, cluster 4 has the highest average score in the study, with 79.49 ICG points. This cluster is mainly made up of countries belonging to the European Union (12 countries), followed by 6 Asian countries, three from the rest of Europe, and two from North America and Oceania.

Finally, cluster 5 is made up of only two countries, South Africa and India, with an average score of 61.39 in the GCI. This cluster presents a particular behavior. It can be inferred that these countries are characterized by trade, having on average a good debt management (79.08) and a relatively low inflation rate (4.92).

With the above, it is corroborated that the behavior of the countries in terms of competitiveness presents different nuances, visualized in various groupings, which show better standards than others in terms of competitiveness. Thus, according to this analysis, the Central American region presents differences in the behavior of its countries, since they were classified into two groups or clusters. Panama belonged to one group (cluster 3) along with 30 other countries, which presented similar characteristics in terms of competitiveness. On the other hand, Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua presented similar characteristics, belonging to the same cluster (cluster 2) that they shared with 50 other countries.

Table 3 provides the average values of the composite indicators of the global competitiveness of the five clusters.

| GCI Composite Indicators          | Cluster 1 | Cluster 2 | Cluster 3 | Cluster 4 | Cluster 5 |
|----------------------------------|-----------|-----------|-----------|-----------|-----------|
| 1. Institutions (INST)           | 42.658    | 51.427    | 58.164    | 73.929    | 55.833    |
| 2. Infrastructures (INFRA)       | 40.946    | 62.550    | 74.050    | 85.889    | 68.651    |
| 3. ICT Adoption (ADOP_ICT)       | 23.781    | 48.593    | 63.512    | 76.039    | 37.032    |
| 4. Macroeconomic Stability (MAC_STAB) | 62.804 | 69.741    | 91.307    | 97.680    | 88.251    |
| 5. Health (HEALTH)               | 43.270    | 76.479    | 84.104    | 95.970    | 51.118    |
| 6. Skills (SKILLS)               | 38.570    | 58.646    | 67.057    | 80.212    | 56.444    |
| 7. Product market (PRO_MAR)      | 47.425    | 54.295    | 59.457    | 67.737    | 53.062    |
| 8. Labour market (LAB_MAR)       | 50.294    | 56.901    | 60.756    | 72.581    | 59.638    |
| 9. Financial system (FIN_SYS)    | 45.756    | 56.508    | 65.175    | 82.984    | 75.818    |
| 10. Market size (MAR_SIZE)       | 40.511    | 46.775    | 62.904    | 69.207    | 80.524    |
| 11. Business dynamism (BUS_DYN)  | 47.654    | 55.431    | 63.583    | 75.563    | 61.279    |
| 12. Innovation capability (INNO_CAP) | 25.924 | 33.882    | 45.409    | 74.199    | 49.042    |

Source: Authors' calculation.

The performance of cluster 4 stands out in 11 out of 12 pillars, concerning the other clusters, thus being the cluster made up of the most competitive countries analyzed. Cluster 2 (Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua) shows a medium level in
the variables that make up the GCI; however, its competitive performance is surpassed by cluster 3 (Panama) in all the latent variables or pillars of the GCI.

Figure 4 shows, graphically, the comparison of the values of the composite indicators of the five groups, where the differences mentioned above can be observed.

Table 3. Average values of the composite indicators of 2019 GCI in each cluster.

| GCI Composite Indicators | 1 | 2 | 3 | 4 | 5 |
|--------------------------|---|---|---|---|---|
| 1. INST                   | C2,C3,C4 | 51.427 | C1,C3,C4 | 58.164 | 73.929 | C1,C2,C3 | 55.833 |
| 2. INFRA                  | C2,C3,C4,C5 | 62.550 | C1,C3,C4 | 74.050 | 85.889 | C1,C2,C3 | 68.651 | C1,C4 |
| 3. ADOP_ICT               | C2,C3,C4 | 48.593 | C1,C3,C4 | 63.512 | 76.039 | C1,C2,C3 | 37.032 |
| 4. MAC_STAB               | C2,C3,C4,C5 | 69.741 | C1,C3,C4,C5 | 91.307 | 97.680 | C1,C2 | 88.251 | C1,C2 |
| 5. HEALTH                 | C2,C3,C4 | 76.479 | C1,C3,C4 | 84.104 | 95.970 | C1,C2,C3 | 51.118 |
| 6. SKILLS                 | C2,C3,C4 | 58.646 | C1,C3,C4 | 67.057 | 80.212 | C1,C2,C3 | 56.444 | C4 |
| 7. PRO_MAR                | C2,C3,C4 | 54.295 | C1,C3,C4 | 59.457 | 67.737 | C1,C2,C3 | 53.062 |
| 8. LAB_MAR                | C2,C3,C4 | 56.901 | C1,C3,C4 | 60.756 | 72.581 | C1,C2,C3,C5 | 59.638 | C4 |
| 9. FIN_SYS                | C2,C3,C4 | 56.508 | C1,C3,C4 | 65.175 | 82.984 | C1,C2,C3 | 75.818 |
| 10. MAR_SIZE              | C2,C3,C4 | 55.431 | C1,C3,C4 | 62.904 | 69.207 | C1,C2 | 80.524 |
| 11. BUS_DYN               | C2,C3,C4 | 53.882 | C1,C3,C4 | 63.583 | 75.563 | C1,C2,C3,C5 | 61.279 | C4 |
| 12. INNO_CAP              | C2,C3,C4 | 53.882 | C1,C3,C4 | 45.409 | 74.199 | C1,C2,C3 | 49.042 |

Note: Ci: Significant differences at 5% according to Bonferroni and Games–Howell tests with clusters 1 to 5. Source: Authors’ calculation.

In turn, the Bonferroni and Games–Howell tests [39] show the significant differences of each composite indicator of the 2019 GCI and determine the pillars that present the highest degree of heterogeneity among the defined groups. The values obtained are presented in Table 4.

Table 4. Bonferroni and Games–Howell test the composite indicators for the groups or clusters.

Thus, differences are observed between cluster 1 and cluster 2 in 11 of 12 pillars, being Market size the only one that does not show significant differences. In comparison, cluster 1 and cluster 3 have different behavior in the 12 pillars, as well as with cluster 4. Comparing cluster 1 with cluster 5, significant differences are observed in the macroeconomic stability and infrastructure pillars.
When doing the same analysis with cluster 2, significant differences are found in the 12 pillars, both with clusters 3 and 4, and significant differences are observed in the Macroeconomic Stability pillar with cluster 5.

While cluster 3 and cluster 4 present significant differences in the pillars of Macroeconomic Stability and Market Size. In addition, cluster 4 compared to cluster 5 presented significant differences in 4 pillars, Infrastructure, Skills, Labor market, and Business dynamism.

This result confirmed the division in competitive terms among the Central American countries. In addition, the same is visually ratified in Figure 5, where a comparison between clusters 2 and 3 is presented.

The descriptive statistical values of the Global Competitiveness Index 2019 for the two groups, including the seven Central American countries, have the following descriptive statistical values:

- Panama (PAN *, Panama spot values), belonging to cluster 2. Average = 61.639, Median = 58.608, Standard Deviation = 16.226, Skewness coefficient = 0.837, Kurtosis coefficient = 0.396.
- Costa Rica (CRI), El Salvador (SLV), Guatemala (GTM), Honduras (HND), Nicaragua (NIC) belong to cluster 3. Average = 54.448, Median = 52.626, Standard Deviation = 14.585, Skewness coefficient = 2.084, Kurtosis coefficient = 4.475.

To carry out a comparative analysis exclusively among the Central American countries, Table 5 provides the average values of the composite indicators of the global competitiveness of the Central American countries.

The purpose of this is to find the variables with the greatest potential for differentiation in the region, without considering the other countries in each respective cluster, and to better approximate the study problem.

Table 6 presents the geometric means and the Mann–Whitney–Wilcoxon test for each set of countries’ pillars or latent variables, where the largest statistically significant differences are found. This is to compare the cluster analysis results and evaluate the importance of the variables that most influence the grouping of countries in a given way since this test allows the binary comparison of two independent samples to determine the existence of differences between the populations.
Table 5. Average values of the composite indicators of 2018 and 2019 GCI in each Central American country.

| GCI Composite Indicators                  | Central American Countries                                                                 |
|-------------------------------------------|--------------------------------------------------------------------------------------------|
|                                           | Year | Costa Rica (CRI) | El Salvador (SLV) | Guatemala (GTM) | Honduras (HND) | Nicaragua (NIC) | Panama (PAN)    |
| 1. Institutions (INST)                    | 2018  | 59.0590          | 40.6698           | 43.5226        | 44.6730        | 43.9360         | 50.8569         |
|                                           | 2019  | 57.1262          | 39.8444           | 42.4459        | 43.7889        | 41.8889         | 51.4129         |
| 2. Infrastructures (INFRA)                | 2018  | 65.0822          | 59.7500           | 58.3029        | 58.0190        | 55.2416         | 68.3043         |
|                                           | 2019  | 68.7386          | 61.0201           | 55.8500        | 57.3979        | 55.9594         | 69.4727         |
| 3. ICT Adoption (ADOP_ICT)                | 2018  | 59.6071          | 39.4859           | 31.0734        | 28.1220        | 31.9802         | 47.5176         |
|                                           | 2019  | 59.9677          | 40.6399           | 37.7340        | 30.1710        | 35.8776         | 50.0603         |
| 4. Macroeconomic Stability (MAC_STAB)     | 2018  | 72.9971          | 74.8716           | 74.3768        | 74.1620        | 74.0424         | 89.8051         |
|                                           | 2019  | 74.3482          | 69.7430           | 74.8058        | 74.6734        | 73.5053         | 90.0000         |
| 5. Health (HEALTH)                        | 2018  | 97.3820          | 82.7442           | 74.5727        | 75.3893        | 90.3676         | 91.8050         |
|                                           | 2019  | 93.2328          | 78.1180           | 73.9648        | 77.8311        | 90.0059         | 92.0125         |
| 6. Skills (SKILLS)                        | 2018  | 69.0822          | 48.2658           | 52.5752        | 48.2499        | 45.5488         | 58.1668         |
|                                           | 2019  | 68.9541          | 48.4393           | 51.3830        | 49.5189        | 46.7982         | 58.4650         |
| 7. Product market (PRO_MAR)               | 2018  | 60.4175          | 54.0008           | 61.1210        | 56.9334        | 53.7589         | 57.9514         |
|                                           | 2019  | 59.3794          | 53.9390           | 58.9903        | 55.3169        | 51.3914         | 59.2315         |
| 8. Labour market (LAB_MAR)                | 2018  | 59.7191          | 52.2354           | 51.3272        | 56.3724        | 52.7885         | 56.4554         |
|                                           | 2019  | 59.0925          | 53.4133           | 50.9283        | 55.9451        | 53.2354         | 56.2813         |
| 9. Financial system (FIN_SYS)             | 2018  | 59.7935          | 60.0994           | 57.3572        | 59.7968        | 54.0079         | 66.8837         |
|                                           | 2019  | 60.0613          | 62.2506           | 57.5215        | 59.7914        | 53.1308         | 67.6324         |
| 10. Market size (MAR_SIZE)                | 2018  | 46.1955          | 43.1644           | 50.8351        | 41.9480        | 39.6580         | 48.8838         |
|                                           | 2019  | 46.5381          | 42.8516           | 51.2039        | 42.4852        | 39.1523         | 49.0378         |
| 11. Business dynamism (BUS_DYN)           | 2018  | 55.8959          | 51.6279           | 54.5500        | 53.9064        | 49.6468         | 58.2861         |
|                                           | 2019  | 56.3278          | 52.6886           | 55.8112        | 53.9574        | 49.8266         | 58.7510         |
| 12. Innovation capability (INNO_CAP)      | 2018  | 40.4334          | 26.9207           | 30.7385        | 31.5131        | 27.0373         | 37.4883         |
|                                           | 2019  | 40.3006          | 27.9165           | 31.5489        | 30.6355        | 27.8485         | 37.3077         |

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|                                           | 2018  | 62.1387          | 52.8196           | 53.3627        | 52.4613        | 51.5012         | 61.0337         |
|                                           | 2019  | 62.0056          | 52.5720           | 53.5156        | 52.6261        | 51.5213         | 61.6388         |

Source: Authors’ calculation.

Table 6. Prioritization of the 2019 GCI composite indicators for the two groups containing Central American countries.

| GCI Composite Indicators                  | Cluster 2 (PAN) ** | Cluster 3 (CRI, SLV, GTM, HND, NIC) | Difference in Averages | Sig. Mann–Whitney–Wilcoxon *** |
|-------------------------------------------|--------------------|------------------------------------|------------------------|-----------------------------|
| 1. INST *                                   | 51.4129            | 45.019                             | 6.394                  | 0.000                       |
| 2. INFRA                                    | 69.4727            | 59.720                             | 9.752                  | 0.000                       |
| 3. ADOP_ICT *                               | 50.0603            | 40.878                             | 9.182                  | 0.000                       |
| 4. MAC_STAB                                 | 90.0000            | 73.415                             | 16.585                 | 0.000                       |
| 5. HEALTH                                  | 92.0125            | 82.631                             | 9.382                  | 0.002                       |
| 6. SKILLS *                                 | 58.4650            | 53.019                             | 5.446                  | 0.000                       |
| 7. PRO_MAR                                  | 59.2315            | 55.803                             | 3.428                  | 0.000                       |
| 8. LAB_MAR *                                | 56.2813            | 54.523                             | 1.758                  | 0.009                       |
| 9. FIN_SYS                                  | 67.6324            | 58.551                             | 9.081                  | 0.000                       |
| 10. MAR_SIZE                                | 49.0378            | 44.446                             | 4.592                  | 0.000                       |
| 11. BUS_DYN *                               | 58.7510            | 53.722                             | 5.029                  | 0.000                       |
| 12. INNO_CAP                                | 37.3077            | 31.600                             | 5.658                  | 0.000                       |

Note: * Variables prioritized according to ANOVA, Mann–Whitney–Wilcoxon, and Kruskal–Wallis tests in the complete groups. ** Panama point values for the 12 pillars of the 2019 GCI. *** Test conducted with all countries belonging to clusters 2 and 3. Source: Authors’ calculation.
From the above, it is observed that there are statistically significant differences between the means of the two groups of Central American countries in the 12 composite indicators of the 2019 GCI, with higher mean values for all indicators associated with Cluster 2, and therefore with Panama, compared to the mean values for Cluster 3, to which Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua are associated.

In addition, it is possible to prioritize certain pillars of the 2019 GCI according to the Mann–Whitney–Wilcoxon test and the difference between the geometric means of the Central American countries, whereby the pillars with the largest significant differences are Macroeconomic stability (16.585), Infrastructure (9.752), Health (9.382), IT Adoption (9.182), and Financial system (9.081). Therefore, these can be considered key factors determining Panama’s best performance in terms of competitiveness.

5. Discussion

This research confirms the existence of different patterns of association in the Central American region in terms of the drivers that characterize competitiveness so that the existence of competitive differences can be affirmed. This can be associated with a difference in the level of economic development, which seems to be corroborated by the United Nations/ECLAC [41], when it mentions that Latin America and the Caribbean are not the poorest regions in the world but the most unequal. This organization also comments on the difficulties of this region to develop as such, which is caused by gaps in different areas such as low productivity, poor infrastructure, segregation, and problems in the quality of services such as health and education, in addition to persistent gender gaps and territorial inequalities, adding to environmental problems and the significant risks of climate change. The region has experienced a complicated situation recently, with economic recessions in Argentina and Brazil. Venezuela has been experiencing critical social and economic conditions for several years, which can easily be replicated in other countries in the region [25]. The Central American area is an example of a region that presents problems of inequality, with competitiveness being a fundamental factor that has been measured in the region for years.

The result of this research confirms the existence of a significant gap in competitiveness between two groups of Central American countries. Thus, Panama presents a better competitive performance at the country level than Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua in the 12 composite indicators analyzed from the Global Competitiveness Index published in 2018 and 2019. The result coincides with the region’s GDP growth rate, where Panama maintained an average growth rate of over 5% between 2015 and 2017, decreasing in 2018, compared to El Salvador, which held growth rates below 3% over the same period [42]. As well as a GDP per capita higher than the rest of the countries in the region, where Panama reaches values of US $15,545 million, followed only by Costa Rica with US $12,485.4 million for the year 2018, against Guatemala, El Salvador, Honduras, and Nicaragua whose value of GDP per capita does not exceed US $5000 million in the same year [43]. At the same time, Panama presents the lowest inflation rate value for 2018, slightly reaching the value of 0.8%, contrasting with countries such as Guatemala, Honduras, and Nicaragua, whose inflation is around or above 4% [44].

Another relevant factor is exports, where Panama has the highest merchandise exportation levels, reaching US $11.48 million in 2018, followed by Costa Rica with US $11.34 million for the same year [45]. This behavior is repeated with imports, where Panama reached values of 23.01 million dollars for 2018, followed by Guatemala with 19.7 million dollars for the same year [46]. Another influential factor is maritime container traffic, where Panama shows itself to be enormously superior in the region, presenting values of 7,014,700 TEUs (20-foot equivalent units) in 2018, followed by Guatemala with 1,530,596 TEUs [47].

The importance of these competitiveness indicators is corroborated by works such as those of Von Krogh, Nonaka, and Rechsteiner [48], which state that companies must generate and acquire new knowledge in a continuous and sustained manner, in addition...
to improving their technological readiness to achieve and maintain satisfactory competitiveness values and sustainable growth levels. Precisely this relationship points to an important challenge for Central American countries.

Thus, one aspect that has the potential to influence both competitiveness and development is infrastructure. The IDB [49] states that “infrastructure is essential for economic growth and productivity. Especially in developing countries, infrastructure contributes to (i) expanding markets, (ii) raising private investment, and (iii) lowering production costs”. Therefore, investment in infrastructure is a facilitating element for the growth of countries that has positive effects and increases private investment, promotes the expansion and sophistication of markets, and favors the efficiency of the productive sector, so that the growth in quantity and quality of infrastructure in Central American countries has an impact on higher levels of development and competitiveness of their economies.

On the other hand, UNESCO [50] explains the link between education, competitiveness, and development by pointing out that “the educational progress of countries is but one component of the process of improving the living conditions of societies, that is, of their development, and has a reciprocal relationship of influence with the latter: while more and better education is expected to contribute to general progress, the very absence of progress is, in turn, an obstacle to the expansion of educational opportunities”. The close relationship between development and education is an important challenge for the Central American region.

The achievements and efforts in education in the region occur too late, responding when opportunities have passed or have been replaced by other realities with greater demands. This has generated a secular delay that places the region at a disadvantage against other countries worldwide.

This is shown graphically in Figure 6, which shows per capita public social spending on education, where Costa Rica stands out in the region [51].

![Figure 6. Public social spending on education in Central American countries.](image)

Furthermore, the importance of science, technology, and innovation in the sustainable growth of the Central American region has been emphasized. Precisely, Casalet [52], mentions that the greatest challenge for the region consists of “increasing the macro and micro-complexities of their respective productive and innovation systems to continuously boost the development of capabilities that promote changes in productive and institutional processes aimed at greater complementarity”. To this, it is essential to add that the constant and rapid technological changes, such as cloud computing, the internet of things, and the generation of computer applications, considerably affect economic science since it is one of the social sciences most sensitive to changes in the environment. Therefore, policymakers should consider technological evolution as a relevant factor when creating policies that affect the development of nations [4].
Innovation is a relevant and necessary factor in facing the challenges generated by the COVID-19 pandemic, where new solutions must be implemented to respond to the current problems. Thus, governments must be faster and more transparent while at the same time cooperating with other social actors to develop new technologies and tools that generate and increase collective benefits [53].

This can be seen graphically in Figure 7, which shows the public spending, as a percentage of GDP, on research and development in the countries of the Central American region, in which a notable difference between Costa Rica and the other countries of the region between 2007 and 2017 can be seen.

Figure 7. Research and development spending (measured as a percentage of GDP) year 2007 to 2017.

In a complementary manner, UNDP [54] points out that the successful management of the development processes of some nations is closely linked to aspects related to the institutional and governance framework. Evans [55] clarifies that the understanding of development requires an institutional approach and points out that the differences in the levels of investment and technological progress of countries are key differentiating factors and cannot be understood without the institutional context. Furthermore, although the context is open and globalized, development processes are constrained by specific local conditions, with the institutional aspect being a fundamental part of the social fabric determining development [56].

In addition, and according to Martínez [14], regional integration will allow achieving more significant benefits in terms of competitiveness than those obtained by each country separately. Therefore, the importance of the participation of the Central American Integration System (SICA) in the development of the region is fundamental, since, according to Martínez [14], it faces the challenge of creating instruments for collaboration in the region, in addition to the creation of regional agreements that guarantee thresholds of well-being and development, this promoting the participation of all actors, as well as equality, security, and social support networks. The integration of markets can achieve a higher degree of productive specialization, generating competitive advantages in international markets [57]. In the particular case of Central America, regional integration presents an additional advantage that could contribute to solving some challenges, facilitating the decoupling of economic growth and the increase of negative externalities and consolidating a structural change with high rates of equality, as proposed by the Goals of the 2030 Agenda for Sustainable Development [58].

In the Central American region, significant progress has been made concerning the integration plan [57]. However, the region faces enormous challenges due to high poverty levels originating from income inequality and lack of social inclusion. Therefore, it is necessary to stimulate growth and competitiveness in the region’s countries in an economic
and social context threatened by frequent episodes of social violence, the action and effects of organized crime, and increasing vulnerability to threats arising from climate change [55].

6. Conclusions

This research demonstrates the existence of significant differences in the competitiveness of Central American countries, five different groups of countries have been identified, and each grouping presents particular characteristics. The Central American region is characterized by having a low competitive level, except for Panama, which is incorporated into a different group where it shows a better competitive outlook.

At the same time, this research identifies the variables with the most significant differentiating potential in the Central American region, where, as previously mentioned, Panama shows a better competitive outlook. The pillars with the most remarkable significant differences, and therefore the pillars where it is necessary to prioritize state intervention through public policies, are macroeconomic stability, infrastructure, health, adoption of information technologies, and the financial system. Therefore, these can be considered key factors that determine Panama’s better performance in terms of competitiveness with other countries in the region.

Without wishing to enter into controversy about the leading roles that governments should assume in favoring and defining the political, social, and economic conditions that favor competitiveness and development, it seems reasonable to specify the status of governments as depositaries of this responsibility in the exercise of the same, given the influence they have in determining and ensuring the conditions necessary for the country’s companies and economies to be competitive [16], being able to affect productive conditions directly or indirectly through the formulation of economic and industrial policies [59]. However, it is crucial to consider that the design and implementation of competitiveness policies are highly complex, being a constantly evolving and innovative process in itself. This complexity offers learning opportunities throughout the process, so the participation of various agents in the territory is necessary [60].

The factors of competitiveness that favor and facilitate the economic and social development of countries can be used as evaluation instruments to guide the definition of political measures and laws that serve governments to stabilize markets and promote the growth and development of countries. In other words, this research presents findings that revolve around the fact that the reduction of the gaps between the elements that differentiate Central American countries in terms of competitiveness is transcendental for the region’s development. For this reason, they should not be seen as separate elements of political or governmental action but as related elements that, if properly implemented, can facilitate and promote the improvement of a country’s productivity, competitiveness, and prosperity on a sustainable basis.

The limitation of this study lies in the performance of a single comparative analysis through the cluster methodology, which is an exploratory technique, finding the need to extend the research beyond the analysis of the Global Competitiveness Index. At the same time, it is necessary to perform a comparative analysis with more years of study. Still, it is required to clarify that having a new methodology since the 2018 publication and due to the influence of the pandemic generated by COVID-19, it is necessary to wait for recent publications of the World Economic Forum. Finally, it is required, in the first place, to perform an in-depth statistical analysis to visualize the influence of time on the behavior of the competitiveness of the countries in the region, taking this role as the study’s hypothesis. In addition, it is necessary to perform a separate analysis of the competitive behavior of the countries under study where the influence of the pandemic is a variable.

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