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# How Can Cultural Values and Entrepreneurship Lead to the Consideration of Innovation-Oriented or Non-Innovation-Oriented Countries?

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**Abstract:** This study provides an analysis of the existing relationship between culture, entrepreneurship, and orientation towards innovation at the national level. Drawing on the creation of an Artificial Neural Network, and using a sample of 37 countries, this paper aims to catalogue each country as innovation-oriented or non-innovation-oriented considering the six cultural dimensions proposed by Hofstede's model and the country´s entrepreneurial activity. The results achieved suggest that three of the cultural dimensions—long-term orientation, individualism, and indulgence—are positively associated with the consideration of a country as innovation-oriented, but one of them—uncertainty avoidance—is associated with the consideration of a country as non-innovation-oriented. On the other hand, while power distance and masculinity do not seem to be significant variables in this analysis, the entrepreneurial activity rate is associated with countries classified as non-innovation-oriented. This study aims to shed light on the relationships between cultural values, entrepreneurship, and orientation towards innovation, providing valuable information for stakeholders, mainly those belonging to private sector and governments, when designing strategies aimed at creating favourable environments for the development of a country's technology, research, and innovation.

**Keywords:** sustainable development goals; innovation; cultural values; entrepreneurship; artificial neural network

## 1. Introduction

In recent years, societies have experienced a growing concern about how countries have to deal with major global challenges, such as economic development, climate change, food security, natural disasters, pandemics, or water management. To overcome these issues, it seems clear that governments must develop and promote an effective innovation activity [1]. In this context, concepts, such as sustainability or sustainable development, have emerged strongly, affecting the decision-making processes related to countries' development, entrepreneurship, and innovation [2,3]. Innovation has become a crucial variable for the economic growth, the industrial change, and the creation of competitive advantages in a country, contributing to improve the well-being of citizens [4,5]. Furthermore, it is considered a central mechanism for achieving sustainable development [6]. Although previous research has pointed out institutional determinants based on political, legal, educational, or business and markets factors as potential antecedents of innovation, knowledge about innovation at the country level is still very limited [7,8].

Cross-cultural studies have proven to be an interesting and useful tool for analyzing and distinguishing between different behavior related to economic, organizational, and social spheres of individuals and groups. In fact, previous research has highlighted the

significant role of the cultural traits on the innovation success at a country level [9–14]. Most of these studies have only considered some cultural dimensions and are mainly focused on innovation outcomes, rather than innovation inputs. In addition, entrepreneurial activity has revealed to be a relevant factor for achieving competitive advantages and innovation, which positively impact communities through individual and organizational actions [15]. Although knowledge about the possibilities of entrepreneurship for achieving sustainable development is currently limited and requires further research, several studies underline its multiple benefits for economies, including job creation, productivity growth, technology transfer, and innovation [2,16].

This study proposes a novel approach to innovation considering cultural values and entrepreneurial activity at a country level. In fact, to date no study has led to the consideration of a country as innovation-oriented or non-innovation-oriented based on their cultural values and entrepreneurial activity. The cultural values and entrepreneurial activity of 37 countries around the world and an Artificial Neural Network have been used with the aim of providing new insights about the impact of culture and entrepreneurship on the orientation toward innovation at a country level. The main contribution of this study lies in knowing whether entrepreneurial activity and cultural dimensions, identifying those which more or less influence, can justify considering a country as innovation-oriented. This study also seeks to contribute to the generation of knowledge oriented to help achieve the Sustainable Development Goals (SDGs), which have as objective to promote prosperity and sustainable development on the planet and have been set by the United Nations in the 2030 Agenda for Sustainable Development [17]. Namely, although the aim of this research is related to several SDGs, it is mainly focused on the ninth goal 'Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation', since it involves the joint analysis of variables of different nature that can drive innovation. The results arising from this research provide valuable information to stakeholders and decision-makers, mainly governments and entities belonging to the private sector, for designing plans and strategies oriented to create favourable environments for the promotion and development of technology, research, and innovation.

The paper is structured as follows. Section 2 presents the theoretical background. Section 3 explains the study sample, the measurement instruments, and the methodology used. The main results are outlined in Section 4. Section 5 discusses the results obtained and includes the practical implications of the paper. Finally, the conclusions, and future research lines are presented in Section 6.

## 2. Theoretical Background

From a general point of view, values are not innate and are acquired mostly in the early stages of life, which explains their irrationality by determining the subjective perception of what is considered to be rational [18]. We are not aware of many of the values we possess, so it is common for different cultures to use the same words to describe common phenomena, although each of them experiences these phenomena differently [19]. While values belong to both individuals and collectivities, culture can only be interpreted in terms of collectivity; being defined as 'the collective programming of the mind that distinguishes the members of one group or category of people from others' [18,20] (p. 6). Hofstede states that values, which represent the deepest level and invisible part of a culture, can be define as 'broad tendencies to prefer certain states of affairs over others' [20] (p. 9). The practices, which encompass symbols, heroes, and rituals, are the most superficial levels and are exposed to change with greater ease and speed. The fact that a person belongs simultaneously to different groups or categories allows to identify different layers of mental programming that correspond to different levels of culture, such as national culture [20]. Although the most commonly used concept of culture is applied to a society more than to a nation, most research aimed to establish models for measuring cultural differences, is more focused on a national level analysis due to both the complexity of obtaining data

from homogeneous organic societies, and the convenience of making comparisons between the cultural factors of the different nations [20].

The consideration of culture as an explanatory or explained factor in relation to other variables dates back to the early 80s, when it is considered for the first time the classification of national cultures according to different dimensions, which has allowed doing comparative, quantitative studies between countries [20]. Several authors have tried to identify and measure the differences between cultures through the elaboration of surveys, to equated samples of population, at national level [19,21–23]. Among them, the model developed by Hofstede stands out, which is considered one of the most influential models in the study of cultural differences, revolutionizing the research on international culture and business [24,25]. However, his work has also been criticized for the definition and way of obtaining its original dimensions [26]. Smith et al. pointed out the controversy generated by the choice of Hofstede's original sample composed exclusively of employees of subsidiaries of the multinational company IBM. They criticized that the respondents of the Hofstede's model, although coming from different countries, shared a common corporate culture which made them different from other individuals even from those coming from their respective countries. Another major criticism made to Hofstede's model relates to the way of analyzing and interpreting the results obtained, since these ones depend in one way or another on the point of view and the influence of the own culture of the evaluator [27]. Despite criticism, Hofstede's model has proven to be a true reference in the field of intercultural research, backed by its high number of citations far superior to other similar studies, such as the GLOBE project [24,28]. In March 2021, Google Scholar has reported more than 199,000 citations to Hofstede, of which more than 91,000 are citations to the first edition of his book published in 1980. Despite the economic development and the changes undergone in societies in the four decades elapsed from Hofstede's first study, this model has not lost its validity, as changes in the Hosfstede's cultural values have occurred in absolute rather than relative terms. Thus, the country scores in each of the Hofstede's dimensions may have vary, but the relative positions between the countries have not changed. What seems proven is that the validity of the values provided by Hofstede in his model are still valid today, and that the criticisms that can be made to this model can be based on many reasons, but all of them different from its validity over time [28].

Hofstede identified four major areas common to all societies that correspond to the four cultural dimensions of his original model called: (i) power distance, (ii) individualism (iii) masculinity, and (iv) uncertainty avoidance [29]. This study was subsequently extended by proposing two new dimensions: (v) long-term orientation and (vi) indulgence [20]. Power distance focuses on the societal attitude towards the social inequality problem; individualism is related to the degree of interdependence between the members of a society and their integration into those considered as primary groups; masculinity is related to the division of emotional roles between genders (male and female) that determine the dominant values that motivate and drive a society; uncertainty avoidance focuses on the level of stress a society suffers and the extent to which its members feel threatened by an uncertain and unknown future; long-term orientation relates to the approach chosen by the members of a society to direct their efforts towards the future or towards the present and the past; finally, indulgence is related to the level of satisfaction or desire to live life as one wants [18,20].

*Culture, Innovation, and Entrepreneurship*

The study of national cultures and their differences has been a recurring theme over the years, being relevant in the field of business and international business. The markets globalization highlights the importance of identifying and managing the differences between societies, assuming a challenge for managers who, influenced by their own national cultures, can provide different interpretations and answers to strategic issues [30,31]. Therefore, it is necessary to assume the difficulty of finding universal solutions that serve to guarantee the effective management of companies due, precisely, to the significant role that cultures play in their proper functioning [19].

Innovation has revealed as an essential pillar for national success and development, being a strong influencing factor in the productivity and competitiveness of firms. From an organizational perspective, innovation can be understood as a process by which companies turn ideas into new or improved processes, services, or products that allow them to compete and differentiate within the market in which they operate [32]. This global phenomenon is not only restricted to advanced economies or highly technological sectors, but also affects all sectors of the economy [33]. Previous research has deepened into the relationship between culture and innovation based on the cultural dimensions of a country. Shane evaluates the effect of the four dimensions of the initial Hofstede model on the innovation level of 33 countries, concluding that there is a positive relationship between high innovation rates and high individualism scores, and reduced uncertainty avoidance and power distance scores [9]. Gorodnichenko and Roland establish a link between the individualism dimension and innovation, demonstrating that individualistic societies are more innovative societies that reward personal achievements, such as innovation through social rewards, such as status [11]. They also defend the key position of culture as a stimulating element of innovation and decisive in long-term economic growth. Rinne et al. evaluate the influence of individualism, power distance and uncertainty avoidance in the national levels of innovation, obtaining results similar to those of Shane with respect to the first two dimensions, but not managing to establish any relationship with respect to the uncertainty avoidance dimension [9,10]. Prim et al. argue that cultural values can favour both the development of innovation and the increase in the level of competitiveness of nations and companies [12]. Therefore, they propose a similar analysis to the previous one, including the long-term orientation and indulgence dimensions, which allows them to classify national cultures into four types according to their degree of innovation. They conclude that long-term orientation, indulgence, and individualism are values associated with greater innovation, measured by knowledge and technology outputs, and creative outputs. The other three dimensions are also relevant factors for innovation, although statistically, in this study, are only relate to one of the two variables considered to measure innovation.

Like innovation, entrepreneurship has become a central variable of the economy and its growth. Entrepreneurship is considered the basis of competition and innovation, both at the company level and at the national level [34]. Previous literature suggests that entrepreneurship introduces innovation, change, and increases competition and the degree of rivalry in the market, all of which impacts on the economic results of a country [35]. Entrepreneurship is not equivalent to a small business; however small businesses have often enabled individuals' entrepreneurial desires to be channelled [36]. In this sense, small businesses have shown to play a very important role in the economy contributing to entrepreneurial and innovative activity [37]. The relationship between culture and entrepreneurship has also been previously studied. Pinillos and Reyes positively relate individualism to the entrepreneurial activity of a country when its Gross Domestic Product (GDP) per capita is high [38]. Wildeman et al. relate uncertainty avoidance to high rates of self-employment by stating that in general the countries with the highest number of entrepreneurs are those where people are less satisfied with their lives and with the type of society in which they live; that is, those that show a higher level of uncertainty avoidance [39]. Hofstede and his colleagues point out that tenacity and perseverance are crucial in the beginning of business activity, both values being shown as differentiators of societies with long-term orientation [20]. On the other hand, Bogatyreva et al. analyze how the national culture explains the conversion of the intention to undertake an entrepreneurship activity into specific actions that lead to the effective creation of a company [40]. In addition, a positive relationship between entrepreneurship and innovation can be established, since 'several economies show an encouraging trend of high entrepreneurial activity rates coupled with robust levels of innovation' [41] (p. 10).

The possible relationship between culture, entrepreneurship, and innovation has not been previously analyzed in depth, and even less if, instead of innovation, the orientation towards innovation is considered. In general, the few studies in this regard place culture as an

essential element in explaining entrepreneurial and innovative activity, what Lounsbury et al. call cultural entrepreneurship [42]. To date, we hardly find studies that include the six-dimensional cultural model of Hofstede and that consider entrepreneurship and innovation (or orientation towards innovation) at the same time. In addition, the study of the relationship between culture and innovation usually focuses on the results achieved with innovation (e.g., knowledge and technology outputs), and it is not so usual to take into account the investment necessary to carry it out. Precisely, the expenditure made in R&D can be a good proxy when the variable under study is innovation orientation as it happens in this study. Considering the previous findings and using an Artificial Neural Network, this paper aims to analyze whether the six cultural dimensions proposed by Hofstede together with the entrepreneurial activity of a country can influence its consideration as innovation-oriented or non-innovation-oriented. Therefore, the following hypotheses are proposed:

**Hypothesis 1 (H1).** *The six cultural dimensions of the Hofstede model influence the consideration of a country as innovation-oriented or non-innovation-oriented.*

**Hypothesis 2 (H2).** *The level of entrepreneurship influences the consideration of a country as innovation-oriented or non-innovation-oriented.*

## 3. Method

### 3.1. Sample

Based on the list of countries and geographic regions of the United Nations Statistics Division—UNSD, a database has been created that includes a total of 37 countries belonging to 12 different regions (Table 1) [43]. Eleven of these regions correspond directly to subregions established by UNSD, and the remainder is the result of the merger of two subregions, South-eastern Asia and Southern Asia. The choice of the countries that make up the study universe of this research responds to the objective of considering the largest possible number of regions to include very different countries with the aim of providing a comprehensive and diverse overview. Besides, for a country to be part of the sample, it is necessary that the study of the six-dimensional model proposed by Hofstede has been done in that region and, therefore, have a score for all the dimensions of the model. In addition, country data on national indicators Total Early-stage Entrepreneurial Activity (TEA) rate and Gross Domestic Expenditure on Research and Development (GERD) are also required. The initial intention was to include the same number of countries within each region, but this has not been possible due to the aforementioned requirements.

**Table 1.** Regions and countries included in the study sample.

| Australia and New Zealand | Eastern Asia | Eastern Europe |
|---|---|---|
| Australia<br>New Zealand | China<br>Japan<br>Republic of Korea | Hungary<br>Poland<br>Romania<br>Russian Federation |
| **Latin American and the Caribbean** | **Northern Africa** | **Northern America** |
| Argentina<br>Chile<br>Colombia<br>Mexico | Egypt<br>Morocco | Canada<br>United States of America |
| **Northern Europe** | **South-Eastern and Southern Asia** | **Southern Europe** |
| Finland<br>Norway<br>Sweden<br>United Kingdom | India<br>Iran<br>Malaysia<br>Singapore<br>Thailand | Greece<br>Italy<br>Portugal<br>Spain |
| **Sub-Saharan Africa** | **Western Asia** | **Western Europe** |
| Burkina Faso<br>South Africa | Turkey | Belgium<br>France<br>Germany<br>Netherlands |

*3.2. Measures*

The country scores for each of the cultural dimensions have been extracted from the study of Hofstede et al. [20]. Specifically, the power distance index (PDI) scores are between '0' in small-power-distance countries and '100' in large-power-distance countries; for individualism index (IDV) the score '0' represents a collectivist country, while '100' represents an individualist country; masculinity index (MAS) scores are between '0' for countries considered female and '100' for countries considered male; for uncertainty avoidance index (UAI), the score '0' represents countries with a low degree of uncertainty avoidance and '100' to countries with a high degree of uncertainty avoidance; Long-term orientation index (LTO) scores are between '0' for short-term orientation societies and '100' for long-term orientation societies; finally, for indulgence index (IVR), the score '0' represents restrained societies and '100' indulgent societies. It is important to note that these scores represent relative, not absolute, values of the countries, and that the score of a country in one dimension does not depend on the score obtained in the other dimensions, although there may be a relationship between them.

To split the sample by differentiating between a group of countries considered as innovation-oriented and a group of countries considered as non-innovation-oriented, an external criterion has been used, using the average of the GERD obtained from the World Bank for 2018, the latest updated data [44]. In the absence of data for that year for any of the countries, the most recent published data has been chosen. According to the UNESCO Institute for Statistics, this indicator represents the expenditure on research and development made by a country within its borders in a given period of time and is expressed as a percentage of its GDP. So, those countries that have a percentage equal to or greater than this average have been initially considered as innovation-oriented and those that have a lower percentage as non-innovation-oriented.

As a measure of entrepreneurship, the Total Early-stage Entrepreneurial Activity (TEA) rate for the year 2018 has been chosen, which measures the percentage of the adult population (18 to 64 years) that are engaged in starting a new business or are already running a new one [45]. As in the case of GERD, in the absence of data for that year for any of the countries, the latest published data close to this date has been chosen. The consideration of the variable entrepreneurship is justified because, as already mentioned, it can be as important as the cultural dimensions to explain the orientation of a country towards innovation.

*3.3. Methodology*

Data mining has been used to build an Artificial Neural Network using WEKA (Waikato Environment for Knowledge Analysis) 3.8.2 version, an open-source software that includes machine learning algorithms for data mining tasks. A neural network is formed by a network of artificial neurons, also called nodes, connected to each other, and distributed in different layers [46]. It is commonly used for classification or estimation, being able to have multiple purposes as descriptive and predictive data mining [47]. The most commonly used neural network model for predictive data mining is the algorithm Multi-Layer Perceptron, which is trained using the Back Propagation algorithm [47,48].

**4. Results**

The classification model that identifies a country as innovation-oriented or non-innovation-oriented has used Hofstede dimension scores and the TEA rate indicator values for each of the 37 countries considered. The results can be seen in Table 2. The model shows a good fit, since true positives rate and the precision are above 90%, 35 being the number of terms correctly classified. Kappa statistic is used to 'measure the agreement between predicted and observed categorizations of a dataset, while correcting for agreement that occurs by chance' [49]. Its maximum value is 1. In this case, Kappa statistic is 0.8918 which means that there is a high concordance between the predicted and the observed.

**Table 2.** Artificial Neural Network results.

| | |
|---|---|
| Correctly Classified Instances | 35 |
| Kappa statistic | 0.8918 |
| Mean absolute error | 0.1060 |
| Root mean squared error | 0.2404 |
| TP Rate | 94.60% |
| Precision | 94.60% |

The neural network of the model is divided into three parts that correspond to each of the layers (Figure 1). The input layer consists of the attributes PDI, IDV, MAS, UAI, LTO, IVR, and TEA. The intermediate zone corresponds to the hidden layer that contains the unobservable nodes [50]. The output layer contains the two possible responses: non-innovation-oriented (node 0) and innovation-oriented (node 1). Node 0 has the threshold closest to the zero value which indicates a better fit, so it was the one selected.
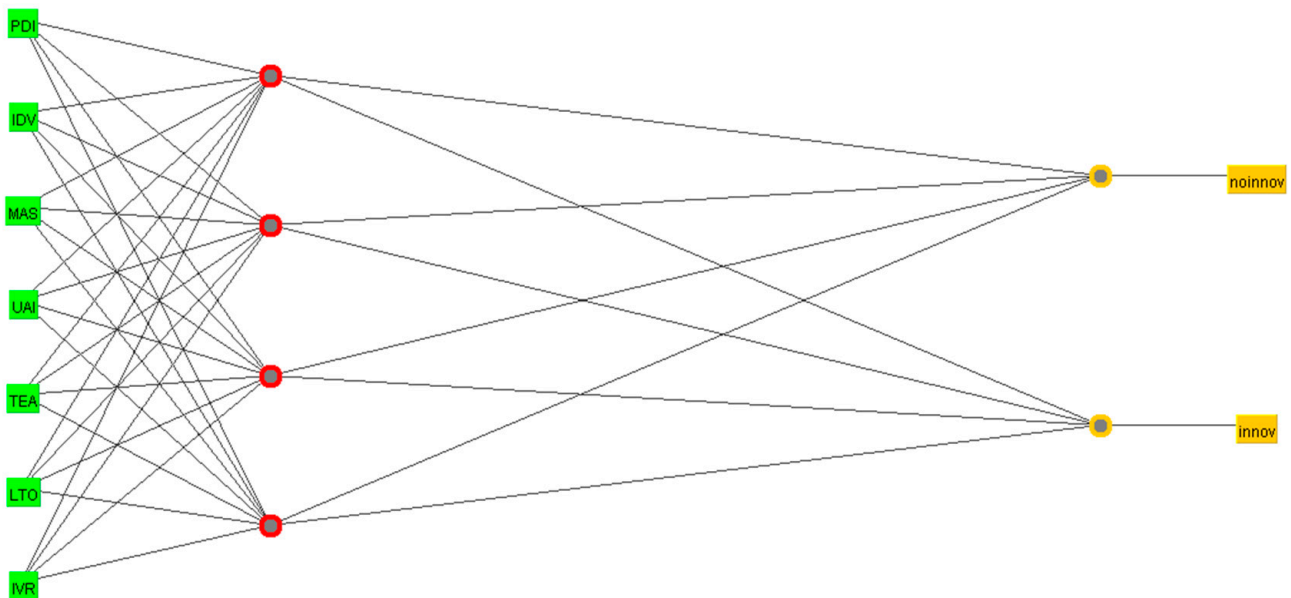


**Figure 1.** Artificial Neural Network output.

In this node, the node that stands out for having a greater weight (5.45) is node 2 (Table 3). Its positive sign states that node 2 has a positive influence on node 0. Table 4 shows the weight of each of the attributes within node 2. In this study, power distance and masculinity are not representative since both have a weight less than 1. In relation to the rest of the attributes, the results indicate that the countries centered on the 'I', and therefore individualistic, are shown as innovation-oriented. The tendency to avoid uncertain environments and unknown situations can lead a country to be considered non-innovation-oriented. In addition, saving, persevering and future-oriented countries tend to be considered as innovation-oriented, being this attribute the one that has a greater weight within node 2. Greater control of one's life and greater happiness, characteristics of the indulgent countries, reveal them as innovation-oriented. Finally, the relationship between entrepreneurship and innovation is inverse, that is, greater business creation is related to the consideration of a country as non-innovation-oriented. Therefore, H1 is partially supported, since four of Hofstede's six cultural dimensions are representative; and H2 is full supported. The results obtained suggest placing culture and entrepreneurship as explanatory factors for the consideration of a country as innovation-oriented or non-innovation-oriented.

**Table 3.** Node 0 weights.

| Sigmoid Node 0 | |
| --- | --- |
| **Inputs** | **Weights** |
| Threshold | 0.33866922 |
| Node 2 | 5.45923728 |
| Node 3 | −3.17240013 |
| Node 4 | −3.62673980 |
| Node 5 | 0.33648906 |

**Table 4.** Node 2 weights.

| Sigmoid Node 2 | |
| --- | --- |
| **Inputs** | **Weights** |
| Threshold | 1.26541096 |
| Attrib PDI | 0.52917929 |
| Attrib IDV | −2.91186161 |
| Attrib MAS | −0.11166167 |
| Attrib UAI | 3.03000064 |
| Attrib LTO | −4.87872368 |
| Attrib IVR | −2.75653172 |
| Attrib TEA | 4.86769913 |

## 5. Discussion and Practical Implications

The absence of a significant relationship between the innovation orientation and the power distance and masculinity indices indicates that a country will not be conditioned on its consideration as innovation-oriented or non-innovation-oriented depending on the existence or not of inequality in the distribution of power, nor based on the predominance of values associated with male or female roles. This means that the existence of political polarization, or large differences in the income of the inhabitants or in the distribution of power do not condition the consideration of a country as innovation-oriented. Conversely, other studies found that low power distance values are associated with greater orientation towards innovation [9,10,12]. The separation of roles between men and women, the emphasis on economic growth, ambition or strength, or on the contrary, concern for the environment, the quality of life or the protection of the weakest, does not determine the orientation towards innovation of a country. Thus, while some authors state that masculinity leads to less orientation towards innovation, other studies, as this one, state that this dimension lacks explanatory power over innovation orientation [9,12].

The orientation towards non-innovation becomes visible in countries with high values in uncertainty avoidance and entrepreneurial activity. Societies with strong uncertainty avoidance show fear of change, of the unknown, and have difficulty accepting the introduction of new products and technologies, being the innovation process somewhat novel and even disruptive. Once innovations are accepted, these societies show a greater facility to develop and implement them than societies with weak uncertainty avoidance where basic innovations predominate. The results obtained are in line with previous research that states that societies that feel comfortable in unfamiliar situations tend to show higher orientation towards innovation [9,12]. On the other hand, Rinne and her colleagues found no relationship between this dimension and innovation [10]. It is noteworthy that countries, such as Japan and the Republic of Korea, have a high score in the UAI index (92 and 85, respectively) and despite this, they are the countries which shows the greatest research and development expenditures along the study sample. The reason may be that both countries show a strong control of uncertainty, so they do not like to invent or enter new innovations. However, they are more disciplined and rigorous in developing these innovations and turning them into new products or services, which in turn may require more investment. Therefore, the degree of acceptance of uncertainty in a society can condition the orientation

of its efforts towards innovation or the implementation of the innovation process, and therefore its level of research and development expenditure. On the other hand, cultures with strong uncertainty avoidance tend to show higher percentages of unhappiness among their inhabitants and a greater number of self-employed workers, which can justify the results achieved in relation to the variable entrepreneurship [20]. The Global Entrepreneurship Monitor classifies the countries according to the level of economic development by placing them in three possible groups, the factor-driven group, the efficiency-driven group, and the innovation-driven group. Given that increases in the level of economic development tend to decrease the entrepreneurial activity rate, it could be assumed that the level of economic development determines the level of entrepreneurship and consequently the orientation towards innovation of a country. Therefore, economies included in the first two groups and which have a high entrepreneurial activity rate (Burkina Faso, Chile, or Colombia) show lower research and development expenditure than economies with a lower entrepreneurial activity rate driven by innovation (Finland or Sweden). It is possible that high entrepreneurship rates in less developed economies respond to the need to create local businesses that satisfy their markets, since the geographical location, the level of bureaucracy, the level of openness to the market or the ease of access to resources can also influence business behavior [41].

The three remaining cultural dimensions (indulgence, individualism, and long-term orientation) have shown that they positively influence the consideration of a country as innovation-oriented, as long as they have high scores in these specific dimensions. Indulgent or hedonistic societies promote individual freedom and a more positive attitude towards life. In fact, while unhappiness is explained through uncertainty avoidance, happiness is explained through indulgence. Happier societies are societies with a greater capacity to face new experiences, which could explain the decision to invest in new and different ideas and projects. This result is in line with previous research that affirms that the most permissive societies have a greater ability to produce innovations related to goods, services, knowledge, and technology [12]. Proof of this are countries, such as Sweden, Australia, or the USA, which are among the most hedonistic countries of the sample (78, 71, and 68, respectively) and at the same time have high percentages of GERD (occupying the third, sixth, and ninth position, respectively). Individualistic countries also show a greater orientation towards innovation. These societies are characterized by having a higher per capita income. National wealth and its strong relationship with this cultural dimension help explain again the predisposition of the most economically developed countries to make a greater effort in innovation. Since individualism is oriented to the achievement of individual interests, research and development activities can be a way to differentiate and progress in this type of societies. Besides, wealthy societies demand more new and different consumer goods, which drives the need for innovations in a country [9]. We highlight again countries, like the USA or Australia, that hold the first two positions in the sample in terms of individualism. They also have a high GDP per capita and are among the top thirteen positions in research and development expenditure. Previous research also highlights the importance of individualism to justify a country's innovation, since it is one of the dimensions of Hofstede that better explain innovation [9–12]. In line with previous research, the long-term orientation dimension has proven to be the most representative when considering a country as innovation-oriented or non-innovation-oriented [12]. The long-term orientation focuses the attention on knowledge, education, and effort as key variables to achieve success. These three variables are directly related to innovative activity, since effort and tenacity are necessary to persevere in the process of creation and development; the educational level can cause huge changes in the economy by creating skilled jobs that favour analytical thinking and innovation; and finally, the generation of knowledge is itself an output and an input of the innovative activity. In addition, long-term oriented societies have a greater talent for applied sciences, useful to connect knowledge of different disciplines and generate new ideas, products, processes, or services. The countries indicated above for having strong uncertainty avoidance, Japan and Republic of Korea, are the

most long-term oriented countries in the sample. This is explained because future-oriented societies have values, such as responsibility or self-discipline, in the work environment, which suggests greater possibility of success developing innovations.

According to Shane, it is possible that a country fails to increase its innovation rates by acting solely on economic variables (e.g., increasing the investment in research and development or industrial infrastructure) [9]. Conversely, it may be necessary exerts some effort oriented towards its cultural values to promote innovative activity. This means that a country considered non-innovation-oriented could improve its results and become more innovation-oriented in the long run through social changes that affect its cultural values. In this research the cultural values that justify a country being considered as innovation-oriented are the same as those proposed by Prim et al. (except for PDI and MAS), although these authors consider innovation in terms of outputs, not inputs [12]. This helps to confirm the initial hypothesis that cultural values in general can condition both research and development expenditure and the innovative activity of a country.

Therefore, knowledge about how cultural values and entrepreneurship can influence a country's orientation towards innovation offers new perspectives for the design and implementation of strategies and plans aimed at promoting innovation. Specifically, governments, companies, and policymakers must make decisions aimed at fostering scientific research, improving the technological capacity of industrial sectors, and promoting sustainable performance. Thus, achieving successful results in the development of technology, research, and innovation is a way to achieve the objectives of 'build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation'.

## 6. Conclusions and Future Research

In this paper, we analyzed the relationship between the six cultural dimensions of Hofstede and the entrepreneurial activity of 37 countries, as well as their consideration as innovation-oriented or non-innovation-oriented. The results suggest that some cultural values and entrepreneurial activity influence the consideration of a country as innovation-oriented or non-innovation-oriented. In this study, power distance and masculinity dimensions lack explanatory power, as there is no significant relationship between them and the orientation towards innovation. On the other hand, the presence of a strong uncertainty avoidance or a high entrepreneurial activity suggests a non-innovation orientation at a country level. Despite this, it is important to indicate the advantageous situation of countries with high uncertainty avoidance when implementing new processes and converting innovations into products or services [20]. It is also worth considering the potential positive influence that entrepreneurship can have on innovation orientation, provided that this entrepreneurship is more innovative and less imitative [51]. Conversely, indulgent, individualistic, or long-term oriented societies have proven to be suitable for the promotion and consideration of a country as innovation-oriented. Considering the importance of the 17 SDGs to overcoming the main challenges of the world, and specifically the ninth of these goals, this study provides new knowledge about how the cultural values and the entrepreneurial activity of a country can influence its expenditure in R&D, which, in turn, can influence its levels of technological development, research, and innovation. This study presents some limitations that provide guidance for future research. The number and the disparity between countries that make up the study sample constitutes two main limitations of the study. The selection of countries has depended, in cases, on the existence of data from all the indicators considered, without forgetting the objective of covering countries from multiple regions with which to offer a global and plural vision. Future research could cover a broader sample to deepen the distinction between innovation-oriented or non-innovation-oriented countries. In this sense, to gain a better understanding of the innovative orientation of countries, it can be interesting to consider specific country's classifications (e.g., emerging countries, developed countries, etc.) capable of concluding results for a group of countries that share a set of common characteristics. It could also be interesting to analyze the particular influence of only some of the cultural

variables -the most relevant ones- on the innovative capacity of a country. Future research could also include other explanatory variables (from the political—democracy level—or social—population density—spheres) and even other outcomes directly related (patent applications, scientific publications ... ) or indirectly related (start-ups entrepreneurship) to innovation to compare and corroborate the results obtained in this research.

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