Entrepreneurship: Analysis by Country Through Machine Learning Techniques

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Abstract: This research aims to analyze entrepreneurship worldwide through the dimensions and pillars of the entrepreneurship ecosystem of each country, identifying the contribution and patterns of behavior and correlation within the entrepreneurship ecosystem. This analysis intends to show the main actions that countries have carried out in support of entrepreneurship and entrepreneurs. The tool used to analyze is machine learning, where various algorithms are applied. The evidence shows that the most relevant pillars in the entrepreneurial ecosystem are I. Opportunity Startup, II. Technology Absorption, III. Risk Acceptance, IV. Risk Capital and V. Process Innovation. The pillars that best correlate are I. Competition and Opportunity Startup, II. Opportunity Startup, and Risk Acceptance, III. Opportunity Startup and Technology Absorption, IV. Cultural Support and Opportunity Startup, and V. Opportunity Startup and Risk Capital. The present work aims to provide knowledge to decision-makers in both the public and private sectors to channel public policies that support entrepreneurs in this time of crisis and promote the generation and strengthening of entrepreneurial activity. Although there are still no reliable GEI data for the years 2020 to 2022, the economic crisis generated by the stagnation in the development of the countries has reduced support for entrepreneurs, which in many cases can be a key factor for the rescue of the most disadvantaged countries.

Keywords: entrepreneurship ecosystem, machine learning, patterns detection, innovation process, country clusters, technology absorption

1. Introduction

The crisis caused by the Covid-19 pandemic has generated global uncertainty in all countries and all sectors. The virus spread so fast that it provoked great pressure, leading each country to take extreme measures to prevent its spread through programs of confinement, social distancing, and closure of businesses and borders, among others. Which caused crises at a global level affecting all economic sectors and all economies.

Currently, COVID-19 has caused a global recession and its economic impact is multiple. Although global economic activity is growing again, business is not likely to normalize as usual in the immediate future. This economic slowdown has affected many companies generating that many micro, small, and medium enterprises have closed permanently (OECD, 2020, 2021).

Saavedra et al., (2021) mention that entrepreneurial activity is crucial in all countries, as it drives the growth and development of the economy. The creation of companies as the first step of business activity is based on the favorable conditions that entrepreneurs identify not only in the field of the market but also in the social one (Saavedra et al. 2021 and Santamaría et al 2021).

Entrepreneurship is relevant because it serves as a mechanism that helps process economic crises, by relocating resources in such a way that it promotes new activities (Parra Miranda, 2014). Entrepreneurship favors the creation of new job opportunities, the introduction of new products in the market, and generates competition. The creation of a new company allows access to new job opportunities and even offers the opportunity to receive salary gains higher than those of work as an employee (Constant & Zimmermann, 2006, Nicolás and Rubio 2020).

For Schmiemann, (2012) entrepreneurship is the mindset and process for creating and developing an economic activity in which risk-taking and creativity, and/or innovation are combined, within a new or existing organization. Entrepreneurship is a key factor in the innovation, growth, and development of companies and countries. For this reason, the development of entrepreneurs must be supported in the various modalities that are manifested.

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Entrepreneurship has long been studied from various approaches. The first to provide knowledge about them was Cantillon who mentioned that employees are those who obtain fixed income, while entrepreneurs establish themselves with capital to run their company, or own their work without capital, and can be considered actors who live on uncertainty (Cantillon, 1931). Later Say (1803) affirms that the entrepreneur is the person who starts a small business, and makes the change of resources from an area of low performance to one of high productivity and higher performance (Terán-Bustamante and Torres, 2020).

Schumpeter (1934) assigns the entrepreneur a creative role and promoter of innovation, where he appears like the individual who breaks patterns of routines and introduces the new. Penrose (1959) sees entrepreneurship as a function focused on innovation as a source of profit (Szirmai et al., 2011). Also noteworthy are the contributions of Knight (1942) who argues that for the entrepreneur to obtain a positive benefit, he must carry out three tasks: 1. Start changes or useful innovations; 2. Adapt to changes in the economic environment; and 3. Assume the consequences of uncertainty and risk related to the company.

Entrepreneurship involves an innovation process that facilitates new production combinations, giving rise to new products, production methods, industrial organizations, business models, and even the creation of new markets. Innovative activities include not only strictly technological innovations but also new goods, new production methods, new markets, new sources of supply, and new forms of industrial organization.

According to the above, entrepreneurship is a complex concept that has long been studied by various disciplines. Schumpeter (1934) assigns the entrepreneur a creative role and driver of innovation, where he appears like the individual who breaks routine patterns and introduces the new.

The economic growth of nations has been associated with their innovative capacity. This depends on multiple variables and how they are combined. One of these variables is entrepreneurship, which is related to innovation and business generation. This results in a better quality of life for a country.

The training of entrepreneurs and new companies is a key factor to promote the economic and social development of countries, especially in times of crisis such as the current one, therefore, it is necessary to determine which are the most important factors that influence and contribute to this objective (ODCE, 2021).

Based on this, several proposals have emerged to determine entrepreneurship capacity at the country level. The objective of this research is to analyze, through machine learning (ML) techniques, the variables that make up the entrepreneurship Index (GEI) to identify those that have the greatest contribution. The results can be used to guide entrepreneurship policies that promote their effectiveness.

Based on the above, the questions that guide this research are, what are the most relevant pillars at the country level that decision-makers and public policymakers should support in an entrepreneurship ecosystem? What are the best correlations between the various pillars of the entrepreneurship ecosystem that decision-makers should consider in public policies?

In this research, ML techniques are used to make predictions. This allows us to identify patterns of behavior for countries concerning entrepreneurship.

The entrepreneur and Entrepreneurship: conceptualization

For Lederman et al. (2014), the entrepreneur is an individual who transforms ideas into profitable initiatives. In addition, that transformation requires a special talent such as the ability to innovate, introduce new products and explore other markets. At the same time directing other people, prioritizing tasks to increase production efficiency, and giving available resources the best possible use.

An entrepreneur is a person with the vision to see innovation and the ability to bring it to market. The opportunity to undertake is positively correlated with economic growth. Entrepreneurs envision scalable, high-growth businesses. They also possess the ability to realize those visions. They get things done. They go over, below, and around obstacles. Entrepreneurs are the bridge between invention and commercialization. Invention without entrepreneurship stays in the university laboratory or R&D facilities (Zoltán, et al., 2018). According to

the above, there is no entrepreneurship without an entrepreneur and an entrepreneur to remain through time needs an ecosystem well strengthened by all the institutions and actors that participate in the

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In each of these scenarios, entrepreneurship is usually seen as an individual-driven process (or by key people within companies), involving some sort of innovative behavior and/or taking risks that result in change. Most scholars agree that entrepreneurship is also driven by a desire to accrue earnings or other types of rewards, whether they are related to monetary gains, personal satisfaction, career-related status, a change in lifestyle, recognition, or other benefits. As such, entrepreneurship is a process that has the potential to lead to the creation and expansion of businesses.

Entrepreneurship and innovation

Innovation is a fundamental factor for entrepreneurship and economic growth. Innovation is the process that turns ideas into inventions (the practical applications of new knowledge and ideas resulting from experience, scientific research, technological research, and development) into products, services, and processes with value in terms of their commercial impact and social benefit (UNCTAD, 2017).

The entrepreneur innovates by introducing ideas or improving products and services, by incorporating new technologies, production processes, work practices, or ways of doing business. According to the Oslo Manual (OECD, 2018) innovation, as the implementation of a new and useful idea. It is the effective realization that achieves a change in the system, to improve and perfect some aspect of its structure, content, or operation. Consequently, innovation turns ideas into useful, practicable, and commercial products or services. (Adair, 2007).

The definition of an entrepreneur and the act he carries out adopted different approaches throughout the periods of analysis. Innovation emerged as a novelty in the definition of entrepreneurship. These approaches also include that of Say (1803), who believes that the entrepreneur is an intermediary between the scientific producer/producer of knowledge and the worker who applies this knowledge in the industry (Say, 1803). Later, Marshall put the innovative role of the entrepreneur at the forefront, highlighting that the actor within the company is the one who constantly looks for opportunities to reduce costs (Marshall, 1875).

Entrepreneurs are the bridge between invention and commercialization. Invention without entrepreneurship stays in the university laboratory, or only in R&D facilities.

The Entrepreneurial Ecosystem

The environment of an entrepreneur is dynamic and very complex and requires support along the way. Moore (1993) affirms that companies do not evolve in a vacuum and highlights the links and relationships these when interacting with various actors such as suppliers, customers, financial agents, the government, research centers, and universities among others.

According to the above, business ecosystems are complex socio-economic structures that come to life first through action at the individual level (GEI, 2018), and then through collaborative action where various actors participate. However, some of the knowledge relevant to business action is embedded in the various structures and actors of the ecosystem and requires collaborative actions to extract it.

An entrepreneurial ecosystem is an environment that facilitates the emergence of new businesses and where social, political, economic, and cultural elements are combined to create an adequate environment in which its different actors interact to strengthen the different types of entrepreneurship.

For Mason and Ross (2014) an entrepreneurial ecosystem is a set of interconnected entrepreneurial actors (both potential and existing), business organizations (e.g., companies, venture capitalists, private investors, banks), institutions (universities, public sector agencies, financial institutions), and business processes (e.g., the birth

rate of companies, the number of high-growth companies, the levels of 'highly successful entrepreneurship', the number of serial entrepreneurs, the degree of total selling) mindset within companies and levels of entrepreneurial ambition) that come together formally and informally to connect, mediate and govern performance within the local business environment.

In addition to entrepreneurs and new businesses, the entrepreneurial ecosystem brings together the following: Accelerators and incubators of startups, investments, private groups, public institutions or consolidated entrepreneurs, educational institutions, universities, business schools, and research centers.

The concept of ecosystem illustrates how different individuals, organizations, and resources necessary for the successful generation of new companies in each territory.

For Isenberg (2011a) having an entrepreneurship ecosystem is an indispensable factor to stimulate the economy and successfully detonate strategies de hubs, innovation systems, knowledge economy, and national competitiveness policies. To achieve the above, it identifies six dimensions within the business system: I. Favorable culture, II. Politics, III. Availability of adequate funding, IV. Talent, V. Favorable markets for products, and VI. A range of institutional supports. These dimensions in turn comprise various elements that interact in very complex ways. In addition to these dimensions, it also gives importance to the context, arguing that each ecosystem arises under a unique set of conditions and circumstances (Isenberg, 2011, a,b).

Measuring entrepreneurship at the country level.

There are several models at the country level to measure the performance and quality of support for entrepreneurship. Among them are the Global Entrepreneurship Index (GEI) and the Global Entrepreneurship Monitor (GEM). The GEM evaluates nine conditions of Entrepreneurial Activity, which in turn are subdivided into [1] financing; [2] government policies, tax payments, and bureaucracy; [3] government programs; [4] Education and training in entrepreneurship at the school and graduate-level; [5] transfer of research and development; [6] access to commercial and professional infrastructure; [7] internal market dynamics; [8] access to physical infrastructure and services, and [9] social and cultural norms of Entrepreneurship (Isenberg, 2011). The GEI is based on three dimensions [1] Attitude, [2] Ability, and [3] Aspiration (see table 1).

Table 1: Dimensions, pillars, and variables in GEI

Dimension	Pillars	Concept	Variables
Attitude (5 pillars, 10 variables)	Opportunity perception	Refers to the entrepreneurial opportunity perception potential of the population and weights this against the freedom of the country and property rights	Opportunity recognition
			Freedom (economic freedom property rights)
	Start-up skills	Captures the perception of start-up skills in the population and weights this aspect with the quality of education	Skill perception
			Education (tertiary education quality of education)
	Risk acceptance	Captures the inhibiting effect of fear of failure of the population on entrepreneurial action combined with a measure of the country's risk.	Risk perception
			Country risk
	Networking	This pillar combines two aspects of Networking: (1) a proxy of the ability of potential and active entrepreneurs to access and mobilize opportunities and resources and (2) the ease of access to reach each other.	Know entrepreneurs
			Agglomeration (urbanization infrastructure)
	Cultural support	The Cultural Support pillar combines how positively a given country's inhabitants view entrepreneurs in terms of status and career choice and how the level of corruption in that country affects this view	Career status
			Corruption
Ability (4 pillars, 8 variables)	Opportunity start-up	The Opportunity Startup pillar captures the prevalence of individuals who pursue	Opportunity motivation

Dimension	Pillars	Concept	Variables
		potentially better-quality opportunity-driven start-ups (as opposed to necessity-driven start-ups) weighted with the combined effect of taxation and government quality of services.	Governance (taxation good governance)
	Technology absorption	The Technology Absorption pillar reflects the technology intensity of a country's start-up activity combined with a country's capacity for firm-level technology absorption.	Technology level
			Technology absorption
	Human capital	The Human Capital pillar captures the quality of entrepreneurs by weighing the percentage of start-ups founded by individuals with higher than secondary education with a qualitative measure of the propensity of firms in a given country to train their staff combined with the freedom of the labor market.	Educational level
			Labor market (staff training labor freedom)
	Competition	The Competition pillar measures the level of the product or market uniqueness of start-ups combined with the market power of existing businesses and business groups as well as with the effectiveness of competitive regulation.	Competitors
			Competitiveness (market dominance regulation)
Aspiration (5 pillars, 10 variables)	Product innovation	The Product Innovation pillar captures the tendency of entrepreneurial firms to create new products weighted by the technology transfer capacity of a country.	New product
			Tech transfer
	Process innovation	The Process Innovation pillar captures the use of new technologies by start-ups combined with the Gross Domestic Expenditure on Research and Development (GERD) and the potential of a country to conduct applied research.	New technology
			Science (GERD ((average quality of scientifical institutions +availability of scientists and engineers))
	High growth	The High Growth pillar is a combined measure of (1) the percentage of high-growth businesses that intend to employ at least ten people and plan to grow more than 50 percent in five years (2) the availability of venture capital and (3) business strategy sophistication	Gazelle
			Finance and strategy (venture capital*business sophistication
	Internationalization	The Internationalization pillar captures the degree to which a country's entrepreneurs are internationalized, as measured by businesses' exporting potential weighted by the level of economic complexity of the country	Export
			Economic complexity
	Risk capital	The Risk Capital pillar combines two measures of finance: informal investment in start-ups and a measure of the depth of the capital market. The availability of risk capital is to fulfill growth aspirations.	Informal investment
			Depth of capital market

Source: Own elaboration based on Szerb and Acs Zoltan (2011); J Ács, et.al (2018a, b); Global Entrepreneurship Index methodology in detail (2019) and Bonyadi (2021).

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favorable culture, II. Politics, III. Availability of adequate funding, IV. Talent, V. Favorable markets for products, and VI. A range of institutional supports. These dimensions in turn comprise various elements that interact in very complex ways. In addition to these dimensions, it also gives importance to the context, arguing that each ecosystem arises under a unique set of conditions and circumstances (Isenberg, 2011, a,b).

In this work, the GEI was chosen for including the pillars that the authors have considered most explicit for the adequate impulse for entrepreneurship (table1).

Methodological Strategy

This research is quantitative. The analysis of the information was carried out through Machine Learning techniques. The three dimensions and the 14 pillars of support that make up the Global Entrepreneurship Index (GEI) are analyzed, to identify those that have the greatest contribution to the performance of the entrepreneurship ecosystem of each country, that is, quality and depth of support for entrepreneurship. The questions that this research aims to answer are: What are the most important dimensions within the entrepreneurship ecosystem?

Based on the information available, it is possible to consider a hypothesis that successful entrepreneurship requires training and support from various sectors that cause the necessary synergy for it to flourish. Support alone will not give entrepreneurs the necessary boost. The combination of them is what will make entrepreneurship successful.

The key elements for the realization of this study are 1) The Global Entrepreneurship Index database containing the 14 variables for the year 2019 was used. 2) 137 countries were considered. 3) Python software version 3.6.1 was used to create models based on machine learning techniques (Table 1).

Tasnim et al., (2018). Faghih and Bonyadi (2020); Junior et al. (2021) have developed models to analyze entrepreneurship at the country level and agree on considering systemic efficiency more thoroughly and the limitation of resources.

The methodology followed for the analysis of the data is integrated into three steps.

- 1. The pillars that have the greatest influence on the GEI were identified, based on the importance of each of the 14 variables for the classification. The GEI published for the year 2019 was taken as a class. This was done employing univariate regression for the GEI variable, to approximate the dependency relationship between the GEI variable and the variables that make up the database under study.
- 2. Correlations between the variables were established, based on Pearson's correlation coefficient. This coefficient is efficient for measuring correlations between continuous variables. It measures the statistical relationship between continuous variables. This coefficient takes values in the range of +1 to -1. Where a value less than zero indicates a negative correlation, that is, the variables will be associated in the opposite direction. A value greater than zero indicates a positive correlation. The Pearson correlation coefficient is calculated by random dates (X, Y) through the covariance between the variables divided by the standard deviations of both variables (Eq.1).

$$\rho_{X,Y} = \sigma_{XY} / \sigma_X \sigma_Y \quad \ldots\ldots\ldots\ldots \textit{Eq.1}$$

- 3. Unsupervised learning was applied through the machine learning clustering tool by applying the K-means algorithm. This is a grouping method, which aims to partition a set of n observations into k groups in which each observation belongs to the group whose mean value is closest. Given a set of observations (x_1, x_2, ..., x_n), where each observation is a real vector of d dimensions, k-means construct a partition of the observations into k sets ($k \leq n$) to minimize the sum of the squares within each group.

We utilized K=4; random initialization, where clusters are assigned randomly at first and then updated with further iterations; and 99 iterations as maximum, as the maximum number of iterations within each algorithm run.

2. Results and discussion

To elucidate the factors that most influence entrepreneurship, first, the index is reviewed in 137 countries, and the countries with the highest GEI in 2019 are located (Table 2).

Table 2: Countries best evaluated through GEI

Country	GEI	Country	GEI
United States	86.800	Ireland	71.300
Switzerland	82.200	Sweden	70.200
Canada	80.400	Finland	70.200
Denmark	79.300	Hong Kong	67.900
United Kingdom	77.500	Israel	67.900
Australia	73.100	France	67.100
Iceland	73.000	Germany	66.700
Netherlands	72.300		

Source: Own elaboration

Features relevance

According to the analysis of the data, the variables that are most relevant for the classification considering that GEI has been chosen as the target variable have been determined employing univariate regression. In this way, each of them was rated according to their correlation with the GEI (Table 3) to consider only the most influential variables.

Table 3: Feature Selection for GEI

Feature	Univar. Regression
Opportunity Startup	667.5
Technology Absorption	440.4
Risk Acceptance	365.3
Risk Capital	355.0
Competition	344.0
Process Innovation	281.7
Internationalization	268.7
Cultural Support	256.0
Human Capital	184.3
Product Innovation	183.3
High Growth	164.6
Startup Skills	115.3
Networking	106.3

Source: Own elaboration

The pillars that best correlate are Competition, Opportunity Startup, Risk Acceptance, Technology Absorption, and Cultural Support (Table 4). So, these variables provide information in the same proportion.

Table 4: Pearson correlations

Correlation	Feature 1	Feature 2
0.820	Competition	Opportunity Startup
0.817	Opportunity Startup	Risk Acceptance
0.802	Opportunity Startup	Technology Absorption
0.788	Cultural Support	Opportunity Startup
0.777	Opportunity Startup	Risk Capital
0.772	Internationalization	Technology Absorption
0.771	High Growth	Risk Capital
0.757	Risk Capital	Technology Absorption
0.751	High Growth	Human Capital
0.751	Competition	Cultural Support
0.747	Internationalization	Opportunity Startup
0.746	Competition	Risk Acceptance
0.746	Process Innovation	Technology Absorption
0.740	Opportunity Startup	Process Innovation
0.734	Human Capital	Risk Capital
0.732	Risk Acceptance	Technology Absorption
0.729	Competition	Process Innovation
0.724	Competition	Technology Absorption

Source: Own elaboration

To understand the behavior of the countries under study in terms of entrepreneurship performance, clustering of the countries was carried out using the k-means algorithm. In this way, the clusters to which each country belongs to the group whose average value is closest were obtained (Fig.1).

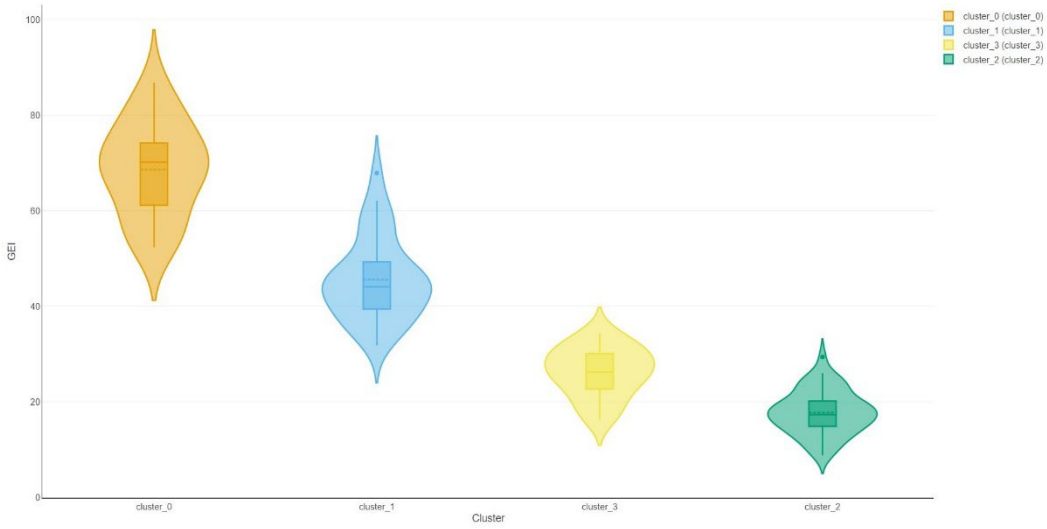

Figure 1: Violin chart by cluster

Countries are grouped by their similarities in the values corresponding to the pillars. This means that it is necessary to consider that the grouping does not depend on the overall value obtained from GEI, but on the quality and depth of the support to the venture. Thus, the countries were grouped into four groups with similar entrepreneurship ecosystems according to the 14 pillars of the GEI. Then, the countries that make up cluster zero are characterized by having the highest values for the most relevant variables. These values decrease as the cluster identifier number increases. The smallest cluster is cluster 0, which also includes the countries with the highest GEI (Table 5).

Table 5: Clusters composition

Cluster	Number of countries by cluster
Cluster 0	9
Cluster 1	20
Cluster 2	3
Cluster 3	10

Source: Own elaboration

Most relevant features by cluster

The values found for the most relevant variables for the countries of cluster 0 and cluster 3 are listed to compare them (Table 6). Where the United States stands out with the highest values and Botswana with the lowest values of all countries. Mexico occupies 16th place in cluster 3 (lowest values).

3. Conclusions

The crisis caused by this great confinement and this recession worldwide shows, as in other previous crises, the fundamental role that entrepreneurs have to face this situation and generate economic recovery. It is a fact that it is possible to perceive innovative opportunities in periods of crisis, however, it should not be thought that everything that entails an economic crisis makes entrepreneurship easier.

Consequently, entrepreneurs need to have the support of their institutions in each country to be able to create or continue with their activity in the face of this crisis caused by COVID-19, since they have to face important challenges. Among which stand out digitalization – which has become a priority -, lack of financing, lack of human talent with digital skills, and administrative facilities among others. Entrepreneurship is dynamic and generates a high impact to the extent that new entrants to the economy generate changes in productivity and sustainability

in economic sectors. In the analysis presented, the countries have been grouped based on the values of the 14 pillars that characterize them.

Table 6: Most relevant features of Cluster 0 and Cluster 3

Country	*Opportunity Startup*	*Technology Absorption*	*Risk Acceptance*
Cluster 0			
United States	**1**	**0.95**	**0.93**
Switzerland	0.71	0.82	0.9
Canada	0.91	0.9	0.66
Denmark	1	1	0.76
United Kingdom	0.75	1	0.88
Australia	0.8	1	0.74
Iceland	0.68	1	0.92
Netherlands	0.81	0.99	0.95
Ireland	0.77	0.89	0.82
Sweden	0.95	1	0.69
Finland	0.6	0.82	0.78
Israel	0.73	1	0.48
France	0.36	0.84	0.81
Germany	0.49	0.82	0.72
Austria	0.64	0.92	0.65
Belgium	0.52	0.83	0.56
Luxembourg	0.55	0.97	0.54
Slovenia	0.42	1	0.92
Norway	0.79	0.73	1
Japan	0.18	0.74	0.69
Singapore	0.5	0.73	0.81

Country	*Opportunity Startup*	*Technology Absorption*	*Risk Acceptance*
Cluster 3			
Botswana	0.58	0.22	0.76
Colombia	0.63	0.36	0.31
Thailand	0.37	0.2	0.16
Barbados	0.44	0.28	0.2
Azerbaijan	0.44	0.28	0.14
South Africa	0.46	0.24	0.24
Kazakhstan	0.62	0.14	0.09
Uruguay	0.43	0.56	0.36
Bulgaria	0.28	0.31	0.29
Namibia	0.83	0.13	0.26
Jordan	0.33	0.44	0.12
Costa Rica	0.34	0.07	0.34
Lebanon	0.33	0.17	0.02
Serbia	0.3	0.14	0.17
Morocco	0.27	0.35	0.27
Mexico	**0.4**	**0.21**	**0.44**
Belize	0.38	0.26	0.02
Georgia	0.46	0.31	0.07
Vietnam	0.43	0.15	0.08
Indonesia	0.35	0.41	0.24
Panama	0.37	0.11	0.5
India	0.33	0.05	0.38
Jamaica	0.71	0.22	0.08
Egypt	0.27	0.26	0.07
Philippines	0.39	0.01	0.34
Peru	0.55	0.25	0.42
Trinidad & Tobago	0.64	0.11	0.54
Ghana	0.53	0.13	0.09
Senegal	0.37	0.12	0.24
Bosnia & Herzegovina	0.15	0.4	0.02
Suriname	0.41	0.02	0.1
Ethiopia	0.33	0.08	0.02
Zambia	0.45	0.03	0.1
Guyana	**0.37**	**0**	**0.11**

Source: Own elaboration

Therefore, it is convenient to analyze the level of entrepreneurship by separating it from the GEI to indicate the key factors to improve in each case since each country will have its unique characteristics and by region as well. It should be noted the difference between the values for the most relevant variables between the countries that make up the ends of cluster 0 and cluster 3. At the highest point of cluster 0 is the United States with values of 1, 0.95, and 0.93 for the variables Opportunity Startup, Technology Absorption, and Risk

Acceptance, respectively. At the lower end of cluster 3 is Guyana with values of 0.37, 0, and 0.11 for the same variables. This allows us to contrast the great differences in the support that entrepreneurs receive in these countries. In the case of Mexico, located in cluster 3, the values obtained in the same pillars are 0.4, 0.21, and 0.44. While they are not at the lower end of cluster 3, they also show that action is needed in favor of entrepreneurs.

The countries that have a high performance in the variables detected as the most relevant are only 9, these makeup cluster 0. While those that do not reach an optimal performance are the 33 countries belonging to clusters 1, 2, and 3.

The country clusters clearly show that it is necessary to improve the values in the pillars of Opportunity Startup, Technology Absorption, Risk Acceptance, Risk Capital, Competition, Process Innovation, Internationalization, and Cultural Support. This indicates that it is essential to support entrepreneurs from countries belonging to clusters other than cluster 0 in the aforementioned areas since these can be triggers for the economies of those regions. These differences have been marked with greater force after two years of the covid19 pandemic has begun. Although there is still no reliable data on GEI for the years 2020 to 2022, the economic crisis generated by the stagnation in the development of countries has decreased support for entrepreneurs, which in many cases can be a key factor for the rescue of countries with less favored economies.

Future work on the entrepreneurial ecosystem should focus on going from the general to particular, that is, from the best practices in the world, the best practices and correlations in the entrepreneurial ecosystem of each country within the cluster of similarities, to the individual analysis of each case individually country by country. This exercise will allow the generation of unique models for each country that will allow them to make better public policies and actively involve all the actors. Remember that the way of absorbing knowledge is different for each country and its implemented strategies. In other words, what can be successful for a country is not necessarily so for its different resources.

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