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ARTICLES

Configurations of entrepreneurial ecosystems: an analysis based on GEM data

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ABSTRACT

Entrepreneurial ecosystems (EEs) are receiving greater attention both in the academic world and in the field of government action. Recently, many studies have used a configuration perspective in the analysis of EEs. However, many of these studies have not specifically addressed whether different EE configurations can produce similar outputs; that is, they do not properly explore the concept of equifinality. Our main purpose was to fill this theoretical and empirical gap by exploring and demonstrating the patterns of performance of EEs (e.g., configurations) along a bundle of entrepreneurial outcome indicators. Using the Entrepreneurship Framework Conditions (EFCs) indicators provided by the Global Entrepreneurship Monitor (GEM) from 60 countries and applying exploratory factor analysis and cluster analysis, we identified and developed five distinctive EE configurations. Later, by applying analysis of variance (ANOVA) to compare these EE configurations across the entrepreneurial outcome indicators, we were able to show distinctive (dis)similarities with respect to the outcome indicators investigated. The results contribute to the understanding that there is not only one type of successful EE. In other words, the equifinality of EEs was empirically evidenced by our analysis. This is a significant theoretical contribution to the field, emphasizing the need for a broader view of how EEs may be configured and denying the relevance of searching for an ideal EE.

KEYWORDS | Entrepreneurial ecosystem; Configurations; Equifinality; Cluster analysis

1. Introduction

The EE is a phenomenon that is receiving increasing attention both in the academic world and in the field of government action (SPIGEL, 2020; VELT; TORKKELI; LAINE, 2020; DE BRITO; LEITÃO, 2021). The past five years have witnessed surprising growth in studies that have applied the ecosystem approach to entrepreneurship research (ALVEDALEN; BOSCHMA, 2017; MALECKI, 2018; ROUNDY; BRADSHAW; BROCKMAN, 2018; WURTH; STAM; SPIGEL, 2022).

EEs have been defined as a structure capable of fostering entrepreneurial activities, based on a holistic and systemic perspective, with the entrepreneur at its center, having his/her actions regulated by the context (ACS; AUTIO; SZERB, 2014). In this sense, the definitions of EEs have stressed the combination and interaction of material, cultural and social dimensions that produce shared values that encourage ambitious entrepreneurship (STAM, 2015; SPIGEL, 2017; MALECKI, 2018; SPIGEL; KITAGAWA; MASON, 2020).

Recently, some studies have focused on EEs by applying a configuration perspective (SPIGEL, 2017; ALVES et al., 2019; VEDULA; FITZA, 2019; MUÑOZ et al., 2022; SCHRIJVERS; STAM; BOSMA, 2021; XIE et al.; 2021; KANTIS; FEDERICO; GARCÍA, 2020; TORRES; GODINHO, 2022). By focusing on how a set of attributes may configure archetypes or gestalts, configurational approaches consider the possibility of equifinality, i.e., different combinations of the same attributes may achieve similar performance in a given period (MEYER; TSUI; HININGS, 1993; FISS, 2007; MILLER, 2017). Another salient feature of the configurational approach is that although combinations of attributes may occur in a very large number of variations, there are only a few configurations that prove to be viable (MEYER; TSUI; HININGS, 1993).

However, previous studies adopting the configurational approach have not specifically addressed whether different configurations of EEs could produce similar outcomes. This is because these studies emphasized the identification of EE configurations, not deepening the understanding of the relationship between these configurations and their outcome variables.

To address this gap in the literature, we seek to answer the following research question: can different EE configurations produce similar outputs considering various potential and actual entrepreneurial activities? To answer this research question, first, we use principal component and cluster analyses to uncover configurations of EE, and second, we apply analysis of variance (ANOVA) to compare the performance of configurations of EE across entrepreneurial outcome variables.

We do so by examining a set of data from Global Entrepreneurship Monitor (GEM) surveys conducted in 79 countries prior to 2020. Based on the five clusters of countries extracted, we highlight the main distinguishing features of each group of countries. Then, we compare these clusters of countries on a set of performance indicators (perceived opportunities rate, entrepreneurial intentions rate, total early-stage entrepreneurial activity, motivational index, high job creation expectation rate, and innovation rate) originating from the same GEM surveys, aiming to discuss the theoretical and practical implications of equifinality and different combinations of EE attributes.

The paper is structured into four additional sections in addition to this introduction. The following section is devoted to presenting a brief review of the literature on EE, its elements and previous research on EE configurations. The research procedures are described in section 3, with a detailed description of the steps followed for the building configurations of the EEs. The results and discussion are the focus of section 4, which includes a description of the EE configurations that were revealed and their relationships with the chosen performance indicators. Finally, in conclusion, we comment on the contributions of the paper and present theoretical and practical implications and suggestions for future studies.

2. Foundations of the entrepreneurial ecosystem

2.1 Determinants and configurations

One of the first authors to refer to the idea of an EE was Cohen (2006). Cohen discussed how a community could evolve into a "sustainable valley"

in which a set of innovative and sustainable technologies could emerge in a geographic region through new ventures. Four years later, Isenberg (2010) suggested that a broader approach to EEs could help governments achieve economic growth if public efforts and policies focus on greater involvement of the private sector, modification of cultural norms, and removal of regulatory barriers, among other issues.

After Cohen's first use and conceptualization of EE in 2006, numerous simpler and more elaborate definitions can be found in the academic literature. In general, the idea of an EE is related to the articulation of actors, public and private organizations, and the government to create a favorable environment for entrepreneurship, especially one with a high economic and social impact (SPIGEL; KITAGAWA; MASON, 2020; STAM, 2015; ROUNDY; BRADSHAW; BROCKMAN, 2018).

Many authors have proposed descriptions of the components of EE (AHMAD; HOFFMAN, 2008; AHMAD; SEYMOUR, 2008; ISENBERG, 2010; STAM; SPIGEL, 2017; STAM; VAN DE VEN, 2021). For our study, we chose to apply the dimensions used in the Global Entrepreneurship Monitor (GEM) surveys. Although the term EE is not used in GEM's scope, one of the parts of the research is dedicated to the evaluation of conditions that affect, positively or negatively, entrepreneurship (entrepreneurial framework conditions – EFCs) in each country.

These conditions are assessed by experts from each country who participate annually in the National Expert Survey (NES) by answering a series of statements on a Likert scale with scores ranging from 0 to 10 (0 = completely false; 10 = completely true). The data are available online at Global Entrepreneurship Research Association (2020). Table 1 shows the 12 dimensions and their definitions as presented on the GEM international website.

The EFCs encompass the main variables identified and reported in some important and well-known theoretical models of EE, such as those resulting from Isenberg and OECD works (AHMAD; HOFFMAN, 2008; AHMAD; SEYMOUR, 2008; ISENBERG, 2010)

TABLE 1
Description of the Entrepreneurship Framework Conditions (EFCs) indicators

Code, Indicators and Description	
EF	*Entrepreneurial Finance*
	The availability of financial resources—equity and debt—for small and medium enterprises (SMEs) (including grants and subsidies).
GPSR	*Governmental Policies: Support and Relevance*
	The extent to which public policies support entrepreneurship - entrepreneurship as a relevant economic issue.
GPTB	*Government Policies: Taxes and Bureaucracy*
	The extent to which public policies support entrepreneurship - taxes or regulations are either size-neutral or encourage new and SMEs.
GEP	*Government Entrepreneurship Programs*
	The presence and quality of programs directly assisting SMEs at all levels of government (national, regional, municipal).
EESS	*Entrepreneurial Education at School Stage*
	The extent to which training in creating or managing SMEs is incorporated within the education and training system at primary and secondary levels.
EEPSS	*Entrepreneurial Education at Post School Stage*
	The extent to which training in creating or managing SMEs is incorporated within the education and training system in higher education such as vocational, college, business schools, etc.
RDT	*Research and Development Transfers*
	The extent to which national research and development will lead to new commercial opportunities and is available to SMEs.
CLI	*Commercial and Legal Infrastructure*
	The presence of property rights, commercial, accounting and other legal and assessment services and institutions that support or promote SMEs.
IMD	*Internal Market Dynamics*
	The level of change in markets from year to year.
IMBER	*Internal Market Burdens or Entry Regulation*
	The extent to which new firms are free to enter existing markets.
PI	*Physical Infrastructure*
	Ease of access to physical resources—communication, utilities, transportation, land or space—at a price that does not discriminate against SMEs.
CSN	*Cultural and Social Norms*
	The extent to which social and cultural norms encourage or allow actions leading to new business methods or activities that can potentially increase personal wealth and income.

Source: Global Entrepreneurship Monitor 2019/2020 Global Report (GLOBAL ENTREPRENEURSHIP RESEARCH ASSOCIATION, 2020).

and those that have received extensive attention from academics and NGOs led by Erik Stam and colleagues (STAM, 2015; STAM; SPIGEL, 2017; STAM; VAN DE VEN, 2021). In addition, some researchers have adopted assessments of these conditions in conducting studies of EEs (BRUNS et al., 2017; FARINHA et al., 2020; HECHAVARRÍA; INGRAM, 2014; HECHAVARRÍA; INGRAM, 2019; HERRINGTON; CODURAS, 2019; LEENDERTSE; SCHRIJVERS; STAM, 2022; MUÑOZ et al., 2022; OROBIA et al., 2020; RIETVELD; PATEL, 2023).

2.2 Soundness and relevance of EFCs in entrepreneurship research

As shown in Table 2, GEM's variables strongly correspond with Isenberg's and Stam's and coauthor's EE models, which are widely referenced in the EE literature. Additionally, the study by Corrente et al. (2019) clearly takes the EFC variables as factors of EE. Importantly, taken together, these variables can be considered representative of the dimensions of entrepreneurial efforts, as well as institutional and context variables.

In view of this, it is possible to analyze EEs as attributes or condition configurations since EEs essentially involve a combination of actors and factors that interact with each other (STAM, 2015; STAM; VAN DE VEN, 2021). Furthermore, in light of the notion of equifinality, it is assumed that different configurations of EEs can "achieve success" or be "equally efficient".

Although the configurational approach, as an analysis perspective, has been used more frequently for more than three decades in organizational studies (MEYER; TSUI; HININGS, 1993; DESS; NEWPORT; RASHEED, 1993; FISS, 2007; MILLER, 2017), recent studies about EEs have adopted this approach as an analytical framework. Table 3 lists some of these studies, detailing their proposals, methodologies and main results.

As shown in Table 3, comparative qualitative analysis, especially applying fuzzy-set qualitative comparative analysis (fsQCA), has been

TABLE 2
Relationship between the EFC variables and the variables and elements of Isenberg and Stam and coauthors EE models

EFC Indicators	Isenberg (2010)	Stam (2015), Stam and van de Ven (2021), and Leendertse, Schrijvers and Stam (2022)
EF Entrepreneurial Finance	*Finance (financial capital):* microloans; angel investors, friends and family; zero-stage venture capital; venture capital funds; private equity; public capital markets; debt.	*Finance:* venture capital; access to credit
GPSR Governmental Policies: Support and Relevance	*Policy (leadership):* unequivocal support; social legitimacy; open door for advocacy; entrepreneurship strategy; urgency, crisis and challenge.	*Formal institutions:* quality of government (corruption, accountability, and impartiality); ease of doing business.
GPTB Government Policies: Taxes and Bureaucracy	*Policy (government):* regulatory framework incentives (e.g. tax benefits); venture-friendly legislation.	
GEP Government Entrepreneurship Programs	*Policy (government):* institutions (e.g. investment, support); financial support (e.g. for R&D, jump start funds).	
EESS Entrepreneurial Education at School Stage EEPSS Entrepreneurial Education at Post School Stage	*Human capital (educational institutions):* general degrees (professional and academic); specific entrepreneurship training.	*Talent:* population with tertiary education; working population engaged in lifelong learning; population with an entrepreneurship education; population with e-skills.
RDT Research and Development Transfers	*Policy (government):* research institutes.	*New Knowledge:* R&D expenditure.
CLI Commercial and Legal Infrastructure	*Supports (support professions):* legal; accounting; investment bankers; technical experts, advisors. *Policy (government):* venture-friendly legislation (e.g., bankruptcy, contract enforcement, property rights and labor).	*Intermediate services:* employment in knowledge-intensive market services.
IMD Internal Market Dynamics	*Markets (early customers):* early adopters for proof-of-concept; expertise in productizing; reference customer; first reviews; distribution channels.	*Demand:* disposable income per capita; potential market size expressed in GRP and in population.
IMBER Internal Market Burdens or Entry Regulation	*Markets (networks):* entrepreneur's networks; diaspora networks; multinational corporations.	*Networks:* connectedness of businesses.
PI Physical Infrastructure	*Supports (infrastructure):* telecommunications; transportation & logistics; energy; zones, incubation centers, clusters.	*Physical infrastructure:* accessibility by road; accessibility by railway; number of passenger flights; digital infrastructure. *Intermediate services*: incubators/ accelerators.
CSN Cultural and Social Norms	*Culture (successes stories):* visible successes; wealth generation for founders; international reputation. *Culture (societal norms*): tolerance of risk, mistakes, failures; innovation, creativity, experimentation; social status of entrepreneur; wealth creation; ambition, drive, hunger.	*Entrepreneurship culture:* entrepreneurial motivation; cultural and social norms; importance to be innovative; trust in others. *Leadership:* actors that provides guidance for and direction of collective action.

Source: Elaborated by the authors.

TABLE 3
Studies that adopted the configurational approach to the analysis of EEs

Reference	Purpose	Methodology	Results
Spigel (2017)	Examination of the attributes constituting entrepreneurial ecosystems, the relationships between them, and how they influence the competitiveness of new ventures	Illustrative case studies	Identification of various categories of attributes that constitute an ecosystem, recognizing that there are numerous different ways these attributes can be configured
Vedula and Fitza (2019)	Examination of the relationship between the regional entrepreneurial ecosystem and the performance of U.S. venture capital-backed startups	Fuzzy-set qualitative comparative analysis (fsQCA)	Identification of specific configurations of regional factors that are associated with the growth of VC-backed startups
Muñoz et al. (2022)	Examination of how configurations of local entrepreneurial ecosystem attributes, as evaluated by local experts, support or hinder the emergence of new and innovative firms	Fuzzy-set qualitative comparative analysis (fsQCA)	Demonstration of what matters and when for the emergence of early and growth-oriented firm activity, and the absence thereof, and how that forms different ecosystem types
Schrijvers, Stam and Bosma (2021)	Examination of how do entrepreneurial ecosystem elements combine to enable productive entrepreneurship	Fuzzy-set qualitative comparative analysis (fsQCA)	Indication of that different configurations of successful entrepreneurial ecosystems exist
Xie et al. (2021)	Examination of the possible combinations of factors that generate high entrepreneurship at a regional scale	Fuzzy-set qualitative comparative analysis (fsQCA)	Indication of that both high-quantity and high-quality entrepreneurship are achieved through the interaction of several factors, rather than by any single factor
Alves et al. (2019)	Examination of a broad set of variables in order to identify the different fundamental patterns behind EEs	Fuzzy-set qualitative comparative analysis (fsQCA)	Evidence of distinct trajectories and different configurations, suggesting the existence of heterogeneous patterns in EEs
Kantis, Federico and García (2020)	Analysis the main differences in terms of the systemic conditions for dynamic entrepreneurship between developed and emerging countries as well as within the emerging countries themselves	Principal components factor analysis and cluster analysis	Cluster analyses reveal the existing diversity among the emerging world's entrepreneurial ecosystems
Torres and Godinho (2022)	Examination the levels of necessity of digital entrepreneurial ecosystem elements	Necessary condition analysis (NCA) and fuzzy-set qualitative comparative analysis (fsQCA)	Necessary conditions do not have the same degree of importance, and the necessity of a given condition does not automatically imply its highest level is required

Source: Elaborated by the authors.

widely used in the operationalization of the configurational approach in studies on EEs. Our research adds to these efforts to look at EEs through the lens of configurational literature, however, using an alternative methodology to those adopted by the previous research mentioned here.

As will be clear in the discussion section later, we chose cluster analysis because it is best suited to our purpose – investigating equifinality – rather than just looking for successful configurations (those set as output 1 in the truth table in fsQCA), which makes these approaches myopic to other possible suboptimal configurations. Although it is evident that fsQCA is not "blind" to these configurations, they are never treated or discussed, for example, in the aforementioned articles.

Furthermore, our research considers a wider range of variables, countries and periods. The next section details the research methodology.

2.3 Outputs of EE in entrepreneurship research

Our research question, as presented in the introduction, is related to identifying different EE configurations and verifying whether different configurations can produce similar outputs or present equifinality. To assess the entrepreneurial outcomes of each cluster in our taxonomy, we selected a set of six indicators that we considered to be most appropriate as proxies for EEs' performance indicators. Their descriptions are presented in Table 4.

These indicators were chosen because they are closely related to the outputs and outcomes expected from EEs, i.e., potential and actual productive entrepreneurial activities and socioeconomic development (STAM, 2015; BROWN; MASON, 2017). Thus, perceived opportunities (PORs) and entrepreneurial intentions (EIRs) are indicators that signal the potential emergence of new entrepreneurial activities. Total early-stage entrepreneurial activity (TEAR) indicates the actual rate of entrepreneurs in a given country. In this sense, it reveals the stock of entrepreneurs who are present in an EE and who are able to take advantage of available resources and entrepreneurial culture. On the other hand,

TABLE 4
Entrepreneurial ecosystems' performance indicators

POR *Perceived Opportunities Rate*
Percentage of 18-64 population (individuals involved in any stage of entrepreneurial activity) who see good opportunities to start a firm in the area where they live.
EIR *Entrepreneurial Intentions Rate*
Percentage of 18-64 population (individuals involved in any stage of entrepreneurial activity) who are latent entrepreneurs and who intend to start a business within three years.
TEAR *Total early-stage Entrepreneurial Activity Rate*
Percentage of 18-64 population who are either a nascent entrepreneur or owner-manager of a new business.
MI *Motivational Index*
Percentage of those involved in TEA that are improvement-driven opportunity motivated, divided by the percentage of TEA that is necessity-motivated.
HJCER *High Job Creation Expectation Rate*
Percentage of those involved in TEA who expect to create 6 or more jobs in 5 years.
IR *Innovation Rate*
Percentage of those involved in TEA who indicate that their product or service is new to at least some customers and that few/no businesses offer the same product.

Source: Global Entrepreneurship Monitor 2019/2020 Global Report (GLOBAL ENTREPRENEURSHIP RESEARCH ASSOCIATION, 2020).

the motivational index (MI) points to the level of prevalence (or not) of productive entrepreneurship as opposed to necessity entrepreneurship, while the innovation rate (IR) is a clear indicator of innovation-based (productive) entrepreneurship. Both indicators point to relevant expected outputs from an EE. Finally, the high job creation expectation rate (HJCER) is an indicator of expected economic growth resulting from entrepreneurial activities in the ecosystem.

The performance indicators are also obtained from the GEM consortium database. These indicators are gathered via GEM's Adult Population Survey of GEM Surveys to describe entrepreneurial behavior and attitudes. The APS survey collected data from samples of 2,000 adults aged between 18 and 64 years in each country. These indicators have been used in previous studies as proxies for EEs' performance (ACS; AUTIO; SZERB, 2014; BOSMA; SCHUTJENS, 2011; MUÑOZ et al., 2022; YAN; GUAN, 2019).

3. Research procedures: roadmap for building configurations of entrepreneurial ecosystems

In this section, we explain all the methodological steps used to construct the EE taxonomy, which are compared with the performance indicators. The creation of taxonomies is the empirical arm of the configurational literature, given that, in comparison with the construction of typologies, the construction of taxonomies is based on facts, that is, on quantitative data (MILLER, 1999). While the typology approach aims to detect ideal types, the taxonomies approach seeks to identify real types (HARMS; KRAUS; SCHWARZ, 2009). Thus, "[…] *the merit of the taxonomy approach is that when it is well executed it discovers reliable and conceptually significant clusterings of attributes*" (MILLER, 1999, p. 30).

3.1 Step 1: Sample and variable selection

Our dataset comprises 79 countries that participated in the annual GEM APS survey. For most of the countries (55), available data covered the period between 2013 and 2019. Thus, we chose countries with at least five years of data and took the average for each EFC, considering the most recent five-year period per country. As our research interest focused on revealing patterns of EFC conditions among countries and since these patterns do not change abruptly in short periods, the mean of a five-year period could reveal a more stable picture of the ecosystems.

Since it is not possible to assess, from a practical point of view, the suitability of a given variable for later use in the creation of the taxonomy (HAIR et al., 2010), the ideal approach is to start with a reasonably large set of variables that, from a theoretical point of view, have been identified as important variables of EEs. Therefore, all 12 EFC indicators displayed in Table 1 are our starting point, as they can be considered relevant measures of EE and utilized in previous studies at the national level (ÁCS; AUTIO; SZERB, 2014; ALVEDALEN; BOSCHMA, 2017; CORRENTE et al., 2019; ROUNDY; BRADSHAW; BROCKMAN, 2018;

STAM; SPIGEL, 2017). Finally, to keep these steps within the page limit, we briefly report the results of the exploratory factor and cluster analysis in this section, but the details can be found in Appendix 1.

In relation to the output indicators displayed in Table 4, we use data from the last two years (2018 and 2019). We considered that performance at the systems level presents a time lag and an accumulative effect. The rationale for this procedure is related to the well-known and previous literature on technological change (DOSI, 1982; FREEMAN; SOETE, 2009; GRILICHES, 1979; NELSON; WINTER, 1977) and recent studies (MÉNDEZ-MORALES; MUÑOZ, 2019; SAVONA; STEINMUELLER, 2013). Many studies have pointed out that the innovation (here we can say entrepreneurial) process takes time, and the interaction of many current inputs normally considered in such processes (research and development, STEM under/graduate workforce, climate/cultural aspects of entrepreneurial action, and so on) may not have an effect on measured outputs that come from these processes until several years have elapsed. Thus, the average indicators for the last two years (2018 and 2019) were considered to best represent the outcomes of the EFCs over the last five years (2014 and 2019).

3.2 Step 2: Perform exploratory factor analysis (EFA)

Several studies aimed at creating taxonomies use EFA to reduce the number of dimensions and variables for cluster analysis (HOLLENSTEIN, 2003; DE JONG; MARSILI, 2006). EFA condenses information from multiple original variables into fewer statistical variables (factors) with minimal information loss, reducing the risk of a single variable dominating the cluster analysis. This step involves considering the nature of variables, sample size, necessary statistical assumptions, and relationships between variables (KLINE, 1994).

The 12 original variables, presented in Table 1, were used in the EFA. With 79 observations (countries) and a ratio of 6.58 cases per variable, our sample size is considered adequate (HAIR et al., 2010). The assumptions of

normality, homoscedasticity, and linearity are less restrictive in EFA than in other multivariate techniques and were thus not considered (HAIR et al., 2010). To proceed with factor analysis, variables must exhibit sufficient correlation. Four methods were used to verify this, including checking the correlation matrix, partial correlation matrix, Kaiser's measure of sampling adequacy (MSA), and Bartlett test of sphericity.

In the first round (Table A1 in Appendix 1), the variable IMD did not meet the minimum MSA value (> .50), so it was excluded. The reduced set of variables showed 82% significant correlations (at the .01 level), which is adequate for EFA (Table A2 in Appendix 1). Only the variable EEPSS had MSA values between .70 and .80 (meddling), but overall, the eleven retained variables met the criteria to proceed.

The number of factors to retain involved Kaiser's latent root criterion, the percentage of variance criterion, and the scree test criterion, suggesting two or three factors (Table A3 and Figure A1 in Appendix 1). The three-factor solution was more parsimonious, avoiding high loads in multiple factors. For factor analysis, principal component analysis and orthogonal varimax rotation were used for clarity. The ideal solution grouped variables into three distinct factors (Table A4 in Appendix 1).

Factor 1 includes variables (CLI, IMBER, EF, RDT and PI) that are mainly related to availability and access to resources, the market and infrastructure, which leads to it being named *Market and Resources*. The second factor included variables (GPSR, GEP and GPTB) that focus on government regulation and support for entrepreneurial activities. Thus, it was named *Support and Regulation*. Finally, the third factor grouped variables (EEPSS, CSN and EESS) related to entrepreneurs' training at different levels of education and the prevalence of a favorable culture setting for entrepreneurship. This led to its nomination as *Qualification and Culture*.

3.3 Step 3: Performing cluster analysis

According to Hair et al. (2010), a key characteristic of this multivariate technique is the grouping of objects based on their shared features. In this

step, both hierarchical and nonhierarchical methods were employed to obtain the most parsimonious number of clusters possible. Three criteria guided the decision on the final number of clusters: (i) the statistical properties of the relationships within and between groups; (ii) the plausibility of the clusters representing distinct patterns of entrepreneurial ecosystems; and (iii) the number of economies per cluster.

We utilized the factor scores calculated for each of the five factors derived from the EFA discussed in the previous step. This approach avoids the issue of multicollinearity, as each factor represents a distinct dimension of the EFCs. We combined hierarchical and nonhierarchical methods. Initially, hierarchical analysis was conducted to construct a dendrogram (Figure A2 in Appendix 1), employing the Ward method and the squared Euclidean distance, which are known for producing clusters with approximately the same number of observations. The potential solutions range from 2 to 6 clusters.

To initially assess whether these clusters could be interpreted as distinct patterns of entrepreneurial ecosystems, a visual analysis of the potential solutions was performed in conjunction with analysis of variance (ANOVA) tests to evaluate the differences between the means obtained by the clusters for the three factors used in their creation. This inspection led us to discard solutions of 2 to 4 groups, as they exhibited large intragroup dissimilarities with few groups (see the dissimilarity value on the y-axis of Figure A2 in Appendix 1). Solutions with 5 and 6 groups were well characterized, with low intragroup dispersion and clear intergroup separation. However, we also decided to discard the solution with 6 or more groups because it resulted in groups with very few economies, making them highly peculiar. Therefore, the final solution chosen was the one with 5 clusters.

Subsequently, the nonhierarchical procedure (k-means) was executed with two precautions: (i) using the means obtained from the hierarchical analysis of the five groups on the three factors as the initial seeds and (ii) calculating the centroid mean only after the completion of the clustering process and not at each iteration, i.e., with

each new member inserted into the group. This makes the k-means method less sensitive to the order of elements in the database. Both methods converged to practically the same solution of membership of the economies in the respective clusters, except for Israel (IL) and the United States (US), which moved from cluster 1 to clusters 2 and 5, respectively (Figure A2 in Appendix 1).

To fine-tune and harmonize these two techniques, there are no automated procedures, and consequently, we analyzed the adjustment suggested by the k-means method. As seen in the boxplot (Figure A3 in Appendix 1), the results worsened, in the sense that more economies (IL and NL) emerged as outliers – evidencing greater intragroup dissimilarities – in addition to the three already existing countries: Singapore (SG), Lebanon (LB) and the Philippines (PH). Therefore, the final solution remained that provided by the hierarchical method and is highlighted with colored boxes (Figure A2 in Appendix 1).

For the last step, we assessed the statistical significance of the final solution with analysis of variance (ANOVA) (Table A5 in Appendix 1). All clusters had statistically significant differences in all three factor scores used in the clustering process.

Finally, our taxonomy of EEs was built, and the results indicated the formation of five clusters with varying numbers of countries. Cluster 2 is the largest, comprising 23 countries. The others averaged 14 countries each, with cluster 1 consisting of 14 countries, cluster 3 consisting of 12 countries, cluster 4 consisting of 14 countries, and cluster 5 consisting of 16 countries (Table A6 in Appendix 1).

4. Results and discussion

4.1 Configurations of entrepreneurial ecosystems

The five distinctive clusters of EE are now scrutinized to identify similarities and differences among them, and the means of the EFC

TABLE 5
EFCs indicators by cluster

EFCs	*n*	Cluster (mean values)					Significance[1,2]	
		1	2	3	4	5	F value	Post Hoc test: Scheffe
	79	*14*	*23*	*12*	*14*	*16*		
EF[3]	2.63	2.42	2.53	2.68	2.46	3.04	33.737***	1-5, 2-5, 4-5
GPSR[3]	2.62	2.39	2.36	2.40	2.86	3.13	31.949***	1-4, 1-5, 2-4, 2-5, 3-4, 3-5
GPTB	2.47	2.13	2.21	2.19	2.66	3.17	23.615***	1-4, 1-5, 2-4, 2-5, 3-4, 3-5, 4-5
GEP	2.65	2.38	2.41	2.58	2.74	3.21	13.797***	1-5, 2-5, 3-5, 4-5
EESS[3]	2.05	2.08	2.06	1.70	1.70	2.57	22.944***	1-3, 1-4, 1-5, 2-3, 2-4, 2-5, 3-5, 4-5
EEPSS	2.86	3.04	2.76	2.56	2.76	3.14	10.938***	1-3, 2-5, 3-5, 4-5
RDT	2.40	2.19	2.31	2.30	2.32	2.88	12.794***	1-5, 2-5, 3-5, 4-5
CLI	3.02	2.89	3.05	3.08	2.72	3.31	9.765***	1-5, 2-4, 3-4, 4-5
IMD[3]	3.06	2.89	3.05	3.05	3.15	3.14	33.143[+]	
IMBR	2.59	2.42	2.50	2.62	2.39	3.01	16.506***	1-5, 2-5, 3-5, 4-5
PI	3.78	3.34	3.63	3.96	3.87	4.17	10.517**	1-3, 1-4, 1-5, 2-5,
CSN	2.90	3.25	2.70	2.38	2.86	3.30	16.180***	1-2, 1-3, 2-5, 3-4, 3-5, 4-5

Source: Elaborated by the authors.
Notes: [1]Significance: p < .05 = *; p < .01 = **; p < .001 = ***, nonsignificant = [+]. [2]Only pairs significant at least p .05 was reported.
[3]Welch Anova was applied when the Levene test of homogeneity of variances was p <= .05.

conditions for each cluster were compared using ANOVA in addition to the Scheffe post hoc test, as shown in Table 5. The Scheffe post hoc test showed that the clusters had significant differences in each of the EFCs, except for internal market dynamics (IMD), where the averages were not significantly different, with all clusters averaging close to 3.0 in this EFC.

As indicated by the data in Table 4, cluster 5 is the most distinct, presenting five EFCs that are significantly different from those of the other clusters. Thus, the distinguishing features of cluster 5 are a greater evaluation of existing government policies in terms of taxes and bureaucracy (GPTB) and government entrepreneurship programs (GEPs). This configuration is also strong in terms of entrepreneurial education at the school stage (EESS) and research and development transfers (RDT) and possesses less internal market burdens or entry regulation (IMBR) than the other configurations. Furthermore, cluster 5 is also highly evaluated in the other five EFCs, being better

evaluated than three of the other clusters in terms of entrepreneur financing (EF), support and relevance of governmental policies (GPSR), entrepreneurial education at the postschool stage (EEPSS), commercial and legal infrastructure (CLI), and cultural and social norms (CSN). This overall evaluation led to this cluster being nominated as **highly developed EEs**.

In contrast, cluster 1 had a high score in entrepreneurial education at the postschool stage (EEPSS) and cultural and social norms (CSN), very close to cluster 5. The other EFCs for this cluster presented lower evaluations in comparison to the other clusters. Both cluster 1 strengths are related to qualifications and culture factors. Thus, cluster 1 was identified as **emerging cultural supportive EEs**.

In cluster 2, the best results were obtained for physical infrastructure (PI) and commercial and legal infrastructure (CLI). The remaining EFCs were evaluated with lower scores. Since both strengths of these clusters are related to the market and resources factor, cluster 2 was labeled **the emerging structurally rich EEs**.

Cluster 3 presented high results for commercial and legal infrastructure (CLI) and physical infrastructure (PI), features shared with clusters 5 and 1. Entrepreneurial finance (EF) is its distinguishing feature, positioning the cluster in the second-highest average result compared to all other clusters. The remaining EFCs for this cluster were evaluated with lower scores. Thus, this cluster was **considered an emerging financially favorable EE**.

Finally, the configuration represented by cluster 4 also presented five high averages in terms of the level of support and relevance of government policies (GPSR), physical infrastructure (PI), government policies relating to taxes and bureaucracy (GPTB), government entrepreneurship programs (GEP) and cultural and social norms (CSN). However, most of them are the second-highest. This combination of EFCs is spread over the three factors (market and resources; support and regulation; qualification and culture) and indicates an EE that is approaching a fully developed EE. Thus, cluster 4 was referred to as the **maturing EEs**.

4.2 Configurations of EE vs. its performance

In this section, the equifinality issue is investigated by presenting the results of the clusters' performances for each configuration. As noted in section 2, a set of six indicators from the GEM variables was selected for this analysis. The results are shown in Table 6.

As expected, the five clusters presented similar and differing outcomes depending on the chosen performance indicator. For instance, there were no significant differences among clusters regarding the perceived opportunities rate (POR), high job creation expectation rate (HJCER) or innovation rate (IR). This result is very consistent with the configurations approach since one of its main tenets is the idea of different configurations being capable of producing similar outputs or presenting equal performance. Thus, the empirical evidence of our study is, to the best of our knowledge, the first example of EE equifinality in three performance indicators that are associated with productive entrepreneurship (SPIGEL; KITAGAWA; MASON, 2020; WURTH; STAM; SPIGEL, 2022).

On the other hand, there were also significant differences in some of the chosen performance indicators. For instance, cluster 1 presented the highest value for the total early-stage entrepreneurial activity rate (TEAR), 21.6, which is significantly different from all other clusters that presented results for this indicator averaging 13.0. Another significant difference is in the entrepreneurial intentions rate (EIR). Clusters 1 and 4 had relatively high average values that were not significantly different (38.5 and 28.2, respectively), but the results for cluster 1 were significantly different from those for clusters 2, 3 and 5. These results indicate that while there is equifinality in some performance indicators for all clusters, an emerging cultural supportive EE that is strong in entrepreneurial education at the postschool stage (EEPSS) and cultural and social norms (CSN) seems to be more inclined to stimulate potential and nascent entrepreneurs than other types of EEs, either emerging or more developed ones.

TABLE 6
Performance indicators by cluster, selected countries

Performance indicators	*n*	Cluster (mean values)					Significance[1,2]	
		1	2	3	4	5		
		Emerging Cultural Supportive EEs	Emerging Structurally Rich EEs	Emerging Financially Favorable EEs	Maturing EEs	Highly Developed EEs	F value	Post Hoc test: Scheffe
	79	*14*	*23*	*12*	*14*	*16*		
POR	47.1	55.6	44.1	43.2	45.4	48.5	1.790^{+}	
EIR	23.3	38.5	17.8	19.1	28.2	16.9	7.847***	1-2, 1-3, 1-5
TEAR[3]	13.0	21.6	11.0	8.0	14.6	10.5	9.817***	1-2, 1-3, 1-4, 1-5
HJCER	22.0	16.1	22.7	19.9	24.3	25.7	1.756^{+}	
MI[3]	2.9	2.2	2.8	2.2	2.3	4.7	2.651*	1-5, 3-5, 4-5
IR	25.0	24.8	22.3	23.8	26.3	28.7	1.144^{+}	

Source: Elaborated by the authors.
Notes: [1]Significance: p < .05 = *; p < .01 = **; p < .001 = ***, nonsignificant = $^{+}$. [2]Only pairs significant at least p .05 was reported. [3]Welch Anova was applied when the Levene test of homogeneity of variances was p <= .05.

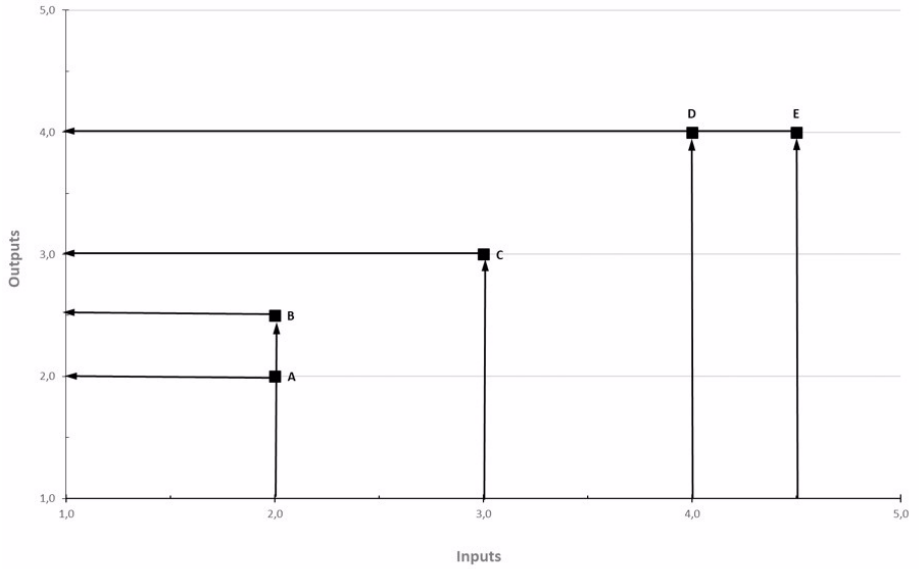
Furthermore, clusters 1, 3 and 4 presented similar results in terms of the motivation index (MI), but cluster 5 was significantly different from all the other clusters. This is a very interesting result since the MI is a ratio between opportunity-driven and necessity-driven entrepreneurship rates. Higher values for this index indicate that there is more opportunity-driven entrepreneurship at an EE and less necessity-driven entrepreneurship. Thus, **fully developed EEs** are the most appropriate economies for innovative or productive entrepreneurship, as suggested by Stam (2015), Schrijvers, Stam and Bosma (2021) and Xie et al. (2021).

To synthesize and schematically illustrate the results concerning equifinality, consider Figure 1. Our analysis revealed the presence of equifinality. Figure 1a illustrates this concept with hypothetical data. Points D and E demonstrate one type of equifinality, where different levels of EFCs result in similar EE performance levels. Conversely, points A and B illustrate how the same levels of EFCs can lead to different EE performance levels.

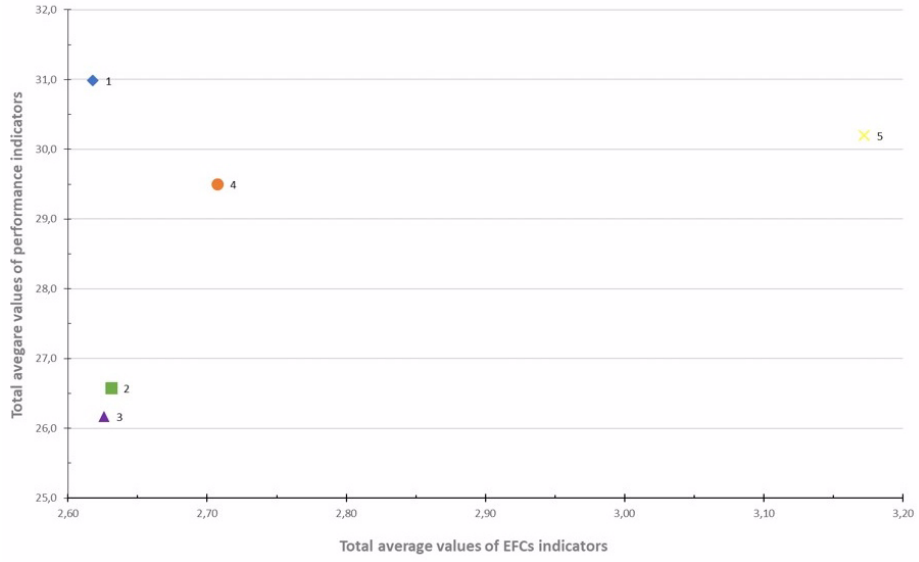
Our choice to employ factor and cluster analyses for deriving these configurations, as opposed to methods such as fuzzy-set qualitative comparative analysis (fsQCA), stems from the sensitivity of these multivariate techniques to nuanced relationships between variables that characterize equifinality. Specifically, fsQCA would be insensitive to the patterns observed in hypothetical cases A and B, potentially obscuring important insights.

In the context of our research, Figure 1b reveals a pattern similar to that of the hypothetical example. Clusters 1, 2, and 3 exemplify the pattern observed with points A and B, where similar average EFC levels result in significantly different performance outputs. Moreover, clusters 4 and 5 reflect the pattern observed in D and E, with different EFC levels yielding similar performance levels. This finding suggests that the relationship between EFC conditions and performance indicators is not linear, implying that other factors may influence the results.

FIGURE 1
Scatter plot



a) Hypothetical



b) Total average EFCs x Total average Performance indicators

Source: Global Entrepreneurship Monitor (GEM) from 2014 to 2019 (GLOBAL ENTREPRENEURSHIP RESEARCH ASSOCIATION, 2020).
Elaborated by the authors.

5. Conclusion

The most surprising result that our study has shown is the lack of significant differences among clusters in three outcome indicators that may be considered most relevant by EE scholars who consider the main purpose of EEs to be the generation of productive or innovative entrepreneurship, e.g., Spigel, Kitagawa and Mason (2020), Stam (2015), and Stam and Van De Ven (2021). The perceived opportunity rate, high job creation expectation rate and innovation rate are indicators that are mostly related to what other researchers have called productive or high impact entrepreneurship (CORRENTE et al., 2019; NICOTRA et al., 2018). It would be expected that EEs with lower evaluations in EFCs would present lower results for these three indicators. However, as our results have shown, this was not the case. Despite differing EFC evaluations, the five clusters' configurations present a global overall state of conditions that seem to balance strengths and weaknesses, leading to similar levels of productive entrepreneurship. A similar result was obtained by Schrijvers, Stam and Bosma (2021), who compared clusters of European EEs at the regional level and their outcomes in terms of the number of innovative startups.

On the other hand, as the results have shown, the clusters have had different outcomes in three performance indicators: entrepreneurial intentions rate, total early-stage entrepreneurial activity rate, and motivation index. Thus, when looking through a configurational approach lens, different configurations of EEs may produce similar and different outcomes. These results have both theoretical and practical implications.

First, we believe that our study contributes to the understanding that there is not only one type of successful EE. In other words, the equifinality of EEs was empirically evidenced by our analysis. This is a significant theoretical contribution to the field that emphasizes the need to have a broader view of how EEs may configure and deny the relevance of searching for an ideal EE. Thus, from a practical point of view, for instance, public policy agents in the field of entrepreneurship

should avoid attempting to emulate successful EEs as a standard to be achieved in the long term.

Second, the lack of differences in the three performance indicators more adherent to productive or innovative entrepreneurship may indicate that, perhaps, there are other EE conditions that have not been addressed in GEM surveys. This suggests that further studies should focus on what type of elements in an EE are more inclined to generate favorable conditions for the emergence of productive entrepreneurship. This knowledge would further support the formulation of public policies focused mainly on productive entrepreneurship.

For instance, one can expect that the governance mode of EEs may be inclined toward innovation-based entrepreneurship or toward more traditional entrepreneurship. According to Colombo et al. (2019), efficient governance structures in EEs address the provision, allocation and distribution of resources and critical incentives. They have suggested two distinct governance modes: the bottom-up approach and the top-down approach. The latter is more hierarchical and presents a formalized structure, while the former is more self-regulated or relational (COLOMBELLI; PAOLUCCI; UGHETTO, 2019). This condition is not present in the GEM's EFC, and we think that a relational governance mode may be more favorable for productive entrepreneurship. In a relational governance mode, flows of knowledge and information are more intense, leading to a denser network of various stakeholders that might be amenable to innovation-based entrepreneurship. Future studies could explore the presence of distinct modes of governance, as part of EE configurations, and their influence on EE outputs.

Another possible dimension that may be more clearly included in configurational studies is related to Spigel and Harrison's (2018) argument that both the resources available in an EE and the strength of the networks through which these resources flow are fundamental to understanding its functionality. Thus, the munificence of resources (financial, entrepreneurial knowledge, skilled workers, and experienced mentors) combined with strong network ties among an EE's actors may also be related to more innovative entrepreneurial activities. Hence,

exploring EE configurations combined with resource munificence and network dynamics can lead to novel knowledge.

Finally, further studies applying the configurational perspective are encouraged. They could replicate this study with more countries and include other EE conditions not covered by GEM surveys. Other types of EE performance indicators might also be tested. For instance, at the country level, the Global Competitiveness Index may be a suitable candidate for EE configuration comparisons. However, from a macro perspective, the average income level of each country may be used. Thus, richer and more complex sets of data could help in understanding the interplay between EE configurations and outputs and outcomes.

However, we must acknowledge that our sample is limited by the fact that we examined EEs at the country level. Thus, our results did not consider potential differences in EEs that might be related to other geographical settings in a country. Other configurational studies could investigate EEs in smaller geographic areas by applying GEM results.

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APPENDIX 1
Exploratory factor analysis

TABLE A1
Assessing Assumptions in Factor Analysis: Correlations, Measures of sampling adequacy (MSA), Partial correlations

Code	Variable description	EF	GPSR	GPTB	GEP	EESS	EEPSS	RDT	CLI	IMD	IMBER	PI	CSN	Number of significant correlations[a]
EF	Entrepreneurial Finance	.868[b]	**.527**	**.478**	**.552**	**.573**	**.260**	**.676**	**.558**	**.377**	**.655**	**.467**	**.440**	11
GPSR	Governmental Policies: Support and Relevance	.004	.780[b]	**.626**	**.745**	**.431**	**.368**	**.633**	**.310**	**.368**	**.492**	**.384**	**.367**	11
GPTB	Government Policies: Taxes and Bureaucracy	.025	-.305	.895[b]	**.685**	**.440**	**.376**	**.567**	**.468**	.049	**.589**	**.547**	**.453**	10
GEP	Government Entrepreneurship Programs	-.072	-.582	-.138	.840[b]	**.444**	**.494**	**.774**	**.545**	.003	**.702**	**.538**	**.338**	10
EESS	Entrepreneurial Education at School Stage	-.197	-.089	-.055	.148	.902[b]	**.549**	**.563**	**.536**	.175	**.579**	.253	**.535**	9
EEPSS	Entrepreneurial Education at Post School Stage	.319	.001	.047	-.109	-.276	.799[b]	**.551**	**.423**	-.082	**.468**	.174	**.481**	9
RDT	Research and Development Transfers	-.263	-.111	.112	-.254	-.051	-.334	.896[b]	**.586**	.164	**.775**	**.562**	**.365**	10
CLI	Commercial and Legal Infrastructure	-.257	.135	-.066	-.085	-.201	-.101	-.005	.913[b]	-.075	**.656**	**.432**	**.305**	10
IMD	Internal Market Dynamics	-.316	-.486	.166	.388	-.046	.102	-.063	.186	.406[b]	.077	.127	.179	2
IMBER	Internal Market Burdens or Entry Regulation	-.139	.172	-.119	-.198	-.149	.006	-.306	-.192	-.011	.931[b]	**.550**	**.397**	10
PI	Physical Infrastructure	-.012	.160	-.304	-.121	.137	.160	-.215	-.093	-.142	-.099	.880[b]	.216	7
CSN	Cultural and Social Norms	-.222	-.006	-.246	.060	-.198	-.344	.156	.091	-.072	-.033	.003	.840[b]	9

Source: Global Entrepreneurship Monitor (GEM) from 2014 to 2019 (GLOBAL ENTREPRENEURSHIP RESEARCH ASSOCIATION, 2020).
Notes: [a] Bold value are correlations with least at the .01 significance level.
[b] On the diagonal are the Measure of sampling adequacy (MSA); Off diagonal and above are Correlations among variables; Off diagonal and below are Partial correlations among variables; Overall Measure of sampling adequacy (MSA) = .856; Bartlett Test of Sphericity = 589.784, significance = .000.

TABLE A2
Assessing Assumptions in Factor Analysis: Correlations, Measures of sampling adequacy (MSA), Partial correlations after exclusion of IMD variable

Code	Variable description	EF	GPSR	GPTB	GEP	EESS	EEPSS	RDT	CLI	IMBER	PI	CSN	Number of significant correlations[a]
EF	Entrepreneurial Finance	.860[b]	**.527**	**.478**	**.552**	**.573**	**.260**	**.676**	**.558**	**.655**	**.467**	**.440**	11
GPSR	Governmental Policies: Support and Relevance	-.180	.836[b]	**.626**	**.745**	**.431**	**.368**	**.633**	**.310**	**.492**	**.384**	**.367**	11
GPTB	Government Policies: Taxes and Bureaucracy	.083	-.260	.902[b]	**.685**	**.440**	**.376**	**.567**	**.468**	**.589**	**.547**	**.453**	10
GEP	Government Entrepreneurship Programs	.057	-.488	-.222	.877[b]	**.444**	**.494**	**.774**	**.545**	**.702**	**.538**	**.338**	10
EESS	Entrepreneurial Education at School Stage	-.223	-.128	-.048	.180	.894[b]	**.549**	**.563**	**.536**	**.579**	.253	**.535**	9
EEPSS	Entrepreneurial Education at Post School Stage	.373	.059	.030	-.162	-.273	.783[b]	**.551**	**.423**	**.468**	.174	**.481**	9
RDT	Research and Development Transfers	-.298	-.163	.124	-.250	-.054	-.330	.889[b]	**.586**	**.775**	**.562**	**.365**	10
CLI	Commercial and Legal Infrastructure	-.213	.263	-.099	-.174	-.196	-.123	.007	.903[b]	**.656**	**.432**	**.305**	10
IMBER	Internal Market Burdens or Entry Regulation	-.150	.191	-.118	-.210	-.149	.007	-.307	-.193	.926[b]	**.550**	**.397**	10
PI	Physical Infrastructure	-.061	.105	-.288	-.072	.132	.177	-.227	-.068	-.102	.897[b]	.216	7
CSN	Cultural and Social Norms	-.258	-.047	-.238	.096	-.202	-.339	.152	.106	-.034	-.007	.830[b]	9

Source: Global Entrepreneurship Monitor (GEM) from 2014 to 2019 (GLOBAL ENTREPRENEURSHIP RESEARCH ASSOCIATION, 2020).
Notes: [a] Bold value are correlations with least at the .01 significance level.
[b] On the diagonal are the Measure of sampling adequacy (MSA); Off diagonal and above are Correlations among variables; Off diagonal and below are Partial correlations among variables; Overall Measure of sampling adequacy (MSA) = .876; Bartlett Test of Sphericity = 544.957, significance = .000.

TABLE A3
Eigenvalues

Component	Eigenvalues[1]		
	Total	**% of variance**	**% cumulative**
1	6.083	55,301	55.301
2	1.151	10.460	65.761
3	.852	7.748	73.509
4	.704	6.398	79.907
5	.600	5.455	85.362
6	.434	3.950	89.312
7	.350	3.179	92.491
8	.291	2.642	95.133
9	.225	2.047	97.179
10	.158	1.435	98.614
11	.152	1.386	100.000

Source: Global Entrepreneurship Monitor (GEM) from 2014 to 2019 (GLOBAL ENTREPRENEURSHIP RESEARCH ASSOCIATION, 2020).
Notes: Elaborated by authors. [1]Eigenvalue is é a medida de quanto da variância total das variáveis é explicada pelo fator. Ele é obtido pela soma dos quadrados das cargas fatoriais de todas as variáveis no respectivo fator. Indica a importância relativa de cada fator, na explicação da variância associada ao conjunto de variáveis analisado (PEREIRA, 1999, p. 123-124).

TABLE A4
Final solution of factor matrix to be used in Cluster analysis

Indicators[1]	Factor loading[2]			Commu-nality
	1	**2**	**3**	
CLI - Commercial and Legal Infrastructure	**.820**			.764
IMBER - Internal Market Burdens or Entry Regulation	**.732**	.403	.304	.791
EF - Entrepreneurial Finance	**.674**	.345		.647
RDT - Research and Development Transfers	**.617**	.550	.322	.786
PI - Physical Infrastructure	**.598**	.541		.677
GPSR - Governmental Policies: Support and Relevance	.117	**.847**		.817
GEP - Government Entrepreneurship Programs	.424	**.763**		.822
GPTB - Government Policies: Taxes and Bureaucracy	.303	**.737**		.705
EEPSS - Entrepreneurial Education at Post School Stage			**.766**	.671
CSN - Cultural and Social Norms			**.766**	.655
EESS- Entrepreneurial Education at School Stage	.483		**.708**	.749
Explained variance				
Eigenvalues	2.966	2.849	2.270	
Percentual of trace	26.968	25.902	20.639	73.509

Source: Elaborated by the authors.
Notes: Extraction method = Principal components; Rotation = Varimax; n= 79. [1]Indicators were arranged in descending order of factor loading in each factor. [2]Factor loadings less than ± 0,30 were omitted.

TABLE A5
Assessing significance of final cluster solution by ANOVA analysis

	Total	Cluster[1]					Significance[2,3]	
		1	2	3	4	5	F-value	Post Hoc test: Scheffe
Total (n)	*79*	*14*	*23*	*12*	*14*	*16*		
Fator 1	.000	-.787	.184	.709	-1.036	.800	20,261***	[1-4; 2-4, 2-5, 3-5]$^{+}$
Fator 2	.000	-.752	-.698	-.269	1.048	.946	34,412***	[1-2; 1-3, 2-3, 4-5]$^{+}$
Fator 3	.000	1.065	-.167	-1.384	-.500	.783	38,730***	[1-5; 2-4]$^{+}$

Source: Global Entrepreneurship Monitor (GEM) from 2014 to 2019 (GLOBAL ENTREPRENEURSHIP RESEARCH ASSOCIATION, 2020).
Notes:[1]Our sample comprises only countries with five or more years of data. [2]For Levene test of homogeneity of varianceis significant was used Welch Anova. [3]Significance: p < .05 = *; p < .01 = **; p < .001 = ***, non-significant = $^{+}$. Pairs not mentioned post-hoc test means it has significance at least p < 0.05. Elaborated by the authors.

TABLE A6
List of economies by cluster

1		2		3		4		5	
Economy	**Code**	**Economy**	**Code**	**Economy**	**Code**	**Economy**	**Code**	**Economy**	**Code**
Angola	AO	Australia	AU	Austria	AT	Saudi Arabia	AS	United Arab Emirates	AE
Argentina	AR	Bosnia and Herzegovina	BA	Belgium	BE	Burkina Faso	BF	Canada	CA
Botswana	BW	Barbados	BB	Bulgaria	BG	Chile	CL	Switzerland	CH
Colombia	CO	Brazil	BR	Germany	DE	China	CN	Denmark	DK
Ecuador	EC	Cyprus	CY	Egypt	EG	France	FR	Estonia	EE
Guatemala	GT	Spain	ES	Croatia	HR	Iran	IR	Finland	FI
Israel	IL	United Kingdom	GB	Hungary	HU	Japan	JP	Hong Kong	HK
Jamaica	JM	Greece	GR	Jordan	JO	South Korea	KR	Indonesia	ID
Lebanon	LB	Italy	IT	Morocco	MA	Kazakhstan	KZ	Ireland	IE
Madagascar	MG	Lithuania	LT	Poland	PL	Mexico	MX	India	IN
Peru	PE	Latvia	LV	Slovenia	SI	Panama	PA	Luxembourg	LU
Philippines	PH	North Macedonia	MK	Slovakia	SK	Tunisia	TN	Malaysia	MY
Uganda	UG	Norway	NO			Uruguay	UY	Netherlands	NL
United States	US	Pakistan	PK			Vietnam	VN	Qatar	QA
		Portugal	PT					Singapore	SG
		Romania	RO					Taiwan	TW
		Russia	RU						
		Sweden	SE						
		Thailand	TH						
		Turkey	TR						
		Trinidad and Tobago	TT						
		Venezuela	VE						
		South Africa	ZA						

Source: Global Entrepreneurship Monitor (GEM) from 2014 to 2019 (GLOBAL ENTREPRENEURSHIP RESEARCH ASSOCIATION, 2020).
Notes: Elaborated by the authors.

FIGURE A1
Scree test and Latent root criterions for factors to retain.

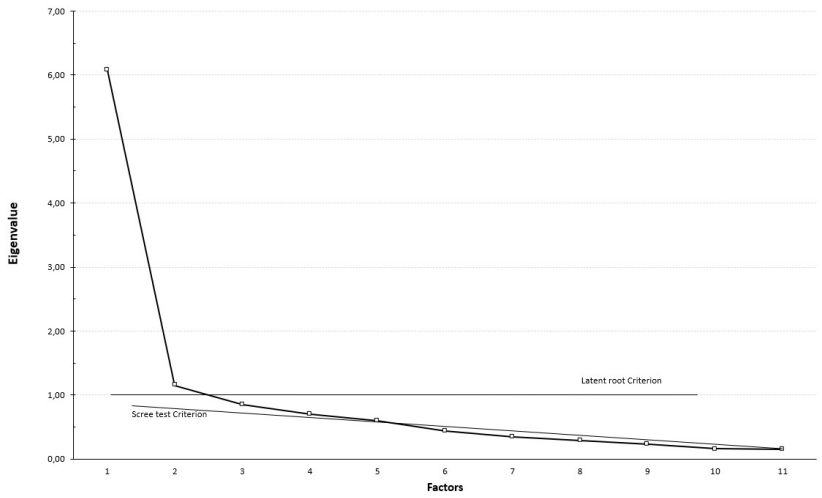
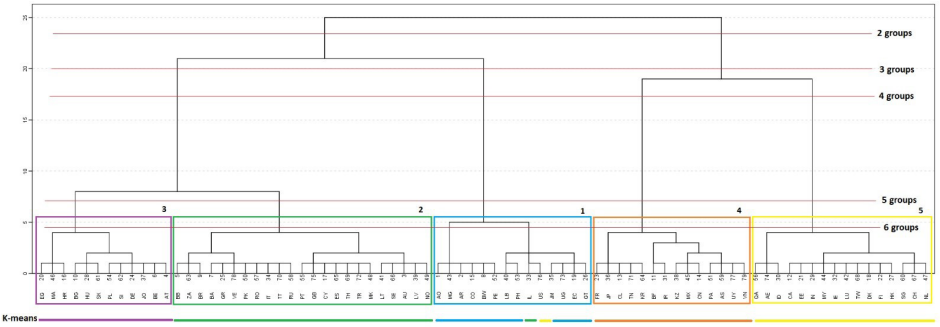
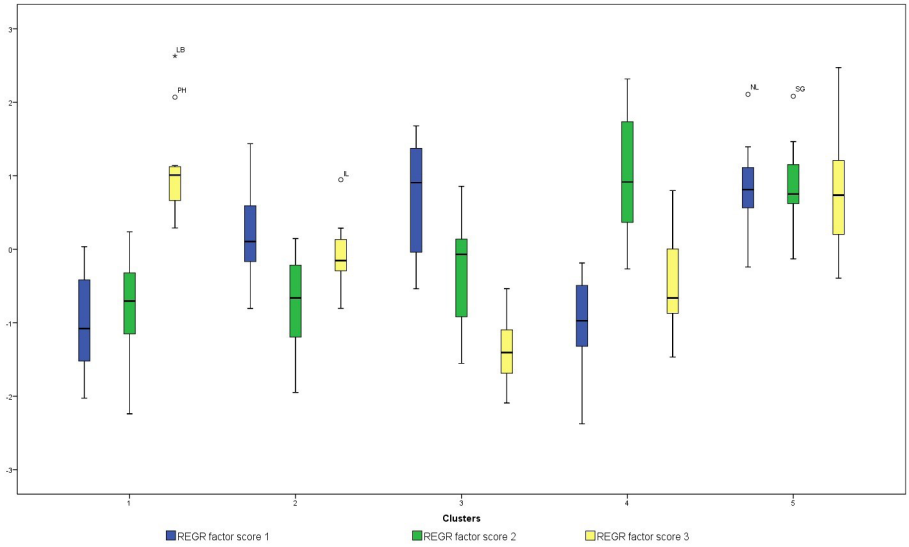


FIGURE A2
Dendrogram from hierarchical and K-means cluster analysis.



Source: Global Entrepreneurship Monitor (GEM) from 2014 to 2019 (GLOBAL ENTREPRENEURSHIP RESEARCH ASSOCIATION, 2020).
Notes: Legend of axis x: numbers are the order of registries (economies) in the spreadsheet. Two letters are the ISO 3166-1 alpha-2 code of countries. The coloured boxes are the pertinence of the economies to the groups coming from the cluster analysis by the hierarchical and k-means methods. Elaborated by the authors.

FIGURE A3
Boxplot of cluster analysis from [no]-hierarchical after reassigned of IL and US.



Note: Elaborated by authors.