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DETERMINATION AND CLASSIFICATION OF ENTREPRENEURIAL EFFICIENCY OF COUNTRIES: DATA ENVELOPMENT ANALYSIS AND HIERARCHICAL CLUSTERING ANALYSIS

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Abstract
Entrepreneurship initiatives have undeniable effects on national economies. States and governments produce various strategies and policies to increase the contribution of entrepreneurship to the country's economy. Entrepreneurship levels of countries are determined by various organizations. Country entrepreneurship scores and rankings are regularly published by the "Global entrepreneurship monitor (GEM)". Countries, on the other hand, understand their current level of entrepreneurship according to these reports. In this research, it is aimed to determine the entrepreneurial activity efficiency levels (EAE) of the countries with the data obtained from the GEM 2021 reports and to cluster them according to their activity levels. In this context, forty-two country data of five indicators presented in the 2021 GEM report were used. The research was carried out in two stages. In the first stage, four output-oriented data envelopment (DEA) models were created and the EAE were determined. In the second stage, the clustering of countries according to their EAEs was carried out by hierarchical clustering analysis. According to the research findings, 21 countries were at full efficiency in the DEA-1 model, 22 countries were at full efficiency in the DEA-2 model, and 18 countries were at full efficiency in the DEA-3 and DEA-4 models. In the hierarchical clustering analysis, the countries are clustered in three groups. Twenty-two countries were included in Cluster-1, seven countries in Cluster-2, and thirteen countries in Cluster-3. Cluster-1, Cluster-2 and Cluster-3 were characterized as high, middle, and low efficiency levels, respectively. As a result of the research, suggestions were made to countries to improve their entrepreneurial activities.

Keywords ***:*** *National Entrepreneurship, Country Entrepreneurship Efficiency, Data Envelopment Analysis, Hierarchical Cluster Analysis*
JEL Classification *: C30, L26, M10*

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ÜLKELERİN GİRİŞİMCİLİK ETKİNLİKLERİNİN BELİRLENMESİ VE SINIFLANDIRILMASI: VERİ ZARFLAMA ANALİZİ VE HİYERARŞİK KÜMELEME ANALİZİ

Öz

Girişimcilik teşebbüslerinin ülke ekonomileri üzerindeki yadsınamaz etkileri bulunmaktadır. Devletler ve hükümetler girişimciliğin ülke ekonomisine katkılarını artırmak adına çeşitli stratejiler ve politikalar üretmektedirler. Çeşitli kuruluşlar tarafından da ülkelerin girişimcilik düzeyleri tespit edilmektedir. "Global Entrepreneurship Monitör (GEM)" tarafından düzenli olarak ülke girişimcilik skorları ve sıralamaları yayınlanmaktadır. Ülkeler ise bu raporlara göre mevcut girişimcilik düzeylerini tespit etmektedirler. Bu araştırmada GEM 2021 raporlarından elde edilen verilerle ülkelerin girişimcilik aktivite etkinlik düzeylerinin tespit edilmesi ve etkinlik düzeylerine göre kümelenmesi amaçlanmıştır. Bu kapsamda 2021 GEM raporunda kırk iki ülkeye ait sunulan beş indikatör kullanılmıştır. Araştırma iki aşamada gerçekleştirilmiştir. Birinci aşamada dört adet çıktı odaklı veri zarflama (DEA) modeli oluşturularak ülkelerin girişimcilik aktiviteleri etkinlik düzeyleri tespit edilmiştir. İkinci aşamada ülkelerin etkinlik düzeylerine göre kümelemesi hiyerarşik kümeleme analiziyle gerçekleştirilmiştir. Araştırma bulgularına göre DEA-1 modelinde 21 ülke tam etkinlik düzeyinde, DEA-2 modelinde 22 ülke tam etkinlik düzeyinde, DEA-3 ve DEA-4 modellerinde 18 ülke tam etkinlik düzeyinde olarak tespit edilmiştir. Hiyerarşik kümeleme analizi bulgularına göre ülkeler üç grupta kümelenmiştir. Küme-1'de yirmi iki ülke, Küme-2'de yedi ülke, Küme-3'te on üç ülke yer almıştır. Küme-1, Küme-2 ve Küme-3 sırasıyla etkinlik düzeyi yüksek, orta ve düşük olarak nitelendirilmiştir. Araştırma sonucunda ülkelere girişimcilik etkinliklerini geliştirmelerine yönelik öneriler sunulmuştur.

Anahtar Kelimeler **:** *Ulusal Girişimcilik, Ülke Girişimcilik Etkinliği, Veri Zarflama Analizi, Hiyerarşik Kümeleme Analizi*

JEL Sınıflandırması **:** *C30, L26, M10*

INTRODUCTION

Entrepreneurship basically covers the actions of establishing a new business and ensuring its continuity. The entrepreneur, represents the cognitive and rational person who aims, initiates, and continues the entrepreneurial action in risky environmental and economic conditions. At the micro level, entrepreneurship attempts are seen as a new competitive struggle of the individual, but at the macro level, they are seen as the forces that contribute to the economies of the countries. The effects of micro-level entrepreneurship actions at the macro level reveal the necessity of addressing entrepreneurship at the macro level, that is, at the national level. States and governments take steps to encourage entrepreneurship with various strategies and policies. In addition, international organizations are established and continue their activities to determine the entrepreneurship competitiveness of countries. These organizations report the entrepreneurship scores of countries with various methodological approaches. Researchers, on the other hand, deal with entrepreneurship at the macro level by conducting studies based on the entrepreneurship scores of the countries (Rocha and Sternberg, 2005; Wennekers et al., 2005; Koellinger, 2008; Thompson

et al., 2009; Arafat and Saleem, 2017; Tokatlıoğlu and Yalçın, 2019; Sarreal, 2019; Vodă et al., 2020; Velilla et al., 2020; Velilla, 2021; Moterased et al., 2021).

There are many studies that uses Global Entrepreneurship Monitor (GEM) reports in the literature to determine country entrepreneurship scores. these research brings the entrepreneurship scores of countries to the literature regularly. Four basic indicators are used at GEM reports. These are attitudes and perceptions towards entrepreneurship, impact of entrepreneurship, the motivation of entrepreneurship, and entrepreneurial activities. However, the COVID-19 outbreak and its effects on entrepreneurship have been added as the fifth indicator in recent reports. GEM reports are based on surveys that determine the entrepreneurship perceptions of the adult citizens of the countries. In addition, entrepreneurship scores are determined based on expert opinions.

In this research, it is aimed to determine the entrepreneurial activity efficiency (EAE) of the countries by using the 2021 GEM report data and to cluster the countries according to their efficiencies. For this purpose, it is aimed to raise awareness in terms of entrepreneurship by positioning the countries considering the entrepreneurship activities. In this context, data envelopment analysis (DEA) was applied to determine the EAE of the countries, Hierarchical clustering analysis was applied to cluster the countries according to their efficiencies. In this direction, five research questions are formed. The research questions are as follows:

- *Research Question 1:* Can the EAE of countries based on their perceptions and attitudes be determined by the DEA model?
- *Research Question 2*: Can the EAE of the countries based on the entrepreneurship effect be determined by the DEA model?
- *Research Question 3:* Can the EAE of motivational countries be determined by the DEA model?
- *Research Question 4*: Can the EAE of countries based on the COVID-19 relationship be determined by the DEA model?
- *Research Question 5:* Can countries be clustered by hierarchical clustering analysis according to their EAEs?

To answer the research questions presented above, this research is discussed in five parts. In the second part, the conceptual framework and literature review are presented. In the third part, the research methodology is explained. In the fourth part, empirical research application is explained. In the fifth part, by presenting the results for each country, suggestions have been developed for countries to increase their EAEs.

I. CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

I.I. National Entrepreneurship

Countries are essential to create environmental conditions such as infrastructure, policies and institutions that affect scientific improvements and innovations (Lundvall et al., 2002). These conditions support to entrepreneurship that is a crucial element for economic growth and social welfare countries. Entrepreneurship is a driver of economic growth and development (Schumpeter, 1934) and contribute to decrease the unemployment through the new job opportunities (Fritsch and Mueller, 2004; Parker, 2018) including innovation, technology transfer and knowledge (Grimaldi et al., 2011; Terjesen and Wang, 2013). For Gartner (1988), entrepreneurship is a process that creates new organizations and for Kao (1993), it is the definition of doing something new and different to create wealth and added value and this can be created on regional base (Stel et al., 2005).

The other component that is important criteria playing big role for entrepreneurial activities is national circumstances (Wales et al. 2019). When the phenomenon is evaluated under country level base, the approach is defined as national entrepreneurship and governments play big role to create the national entrepreneurship ecosystem (Dedehayir et al., 2018). While examining the entrepreneurship at country level, not only socioeconomic indicators and institutional settings are considered but also integration among countries such as export diversification or global value chain should be analyzed (Nguyen et al., 2022). In some studies, the link between the entrepreneurial activity and national institutions is observed (Simón-Moya et al., 2014; Kimmitt and Munoz, 2017; Herrera-Echeverri et al., 2014; Clark and Ramachandran 2019) but it can be said that the number of these academic studies are limited.

A country level phenomenon entrepreneurship should be taken into consideration in a systemic way as it is more complicated compared to individual based to make a definition. To adopt a systematic approach to country-based entrepreneurial activities enable to become more realistic about the issue and helpful for policy makers to take decisions and designing the road map. Thus, a national system of entrepreneurship is creating an interaction among the entrepreneurs who have the ability and aspiration for founding new ventures and allocate the resources effectively. Three categories can be assigned to measures country-based entrepreneurship as output, attitude and framework indicators (Ács et al., 2014). To measure national entrepreneurship in the correct way, the quality of the efforts should be considered and investigated (Stenholm et al., 2013). The most widely referred output indicator is accepted as the Global Entrepreneurship Monitor which provides the measure of national entrepreneurship.

Academic research in general focus on entrepreneurial activity in individual-based with personal skills (Xavier, 2012; Rauch and Frese, 2007) and firm-based perspectives with institutional factors resulting the enhancement of entrepreneurship (Lanero et al., 2016; Liñán et al., 2016). Xavier et al. (2012) investigates the entrepreneurial skills on individual base and those skills include risk-taking, strategic management and technology knowledge that increase entrepreneurial activities (Shane, 2012). Schumpeterian theory considers the phenomena via an economic approach and provides a comprehensive framework between entrepreneurship and innovation both in sectorial and national level (Schumpeter, 1934; Dopfer et al., 2004; Callegari and Nybakk, 2022).

According to Drucker (1985) the entrepreneurs as founders of new ventures in risky environment with an opportunist approach. Giuere et al. define the entrepreneurs are eager to attempt founding a company through idea generation and turn it to an operative and profitable business (Gieure et al., 2020). The main characteristic of an entrepreneur is to seek for achievement and self-efficacy (Caliendo et al., 2014). Nationality is also a variable relevant to measure the tendency to entrepreneurship activities (Rosado-Cubero et al., 2021).

Although entrepreneurship is a crucial element for economic growth and social welfare, there is still different offerings for the definition of the phenomenon (Zimmerman, 2008; Kobia and Sikalieh, 2010; Leunbach, 2021; Sendra-Pons et al., 2022). The most widely accepted definition of entrepreneur is the one who takes risk since the origin of the term derives from French verb "entreprendre" meaning of undertake (Cantillon, 1755). In 18th century, the point of view is more merchandise oriented rather than creative idea generation at current time. Schumpeterian theory considers the phenomena via an economic approach and provides a comprehensive framework between entrepreneurship and innovation (Schumpeter, 1934; Dopfer et al., 2004; Callegari and Nybakk, 2022).

According to Shane and Venkataraman (2000), entrepreneurship is "the identification, evaluation, and exploitation of opportunities" and after a while, Aldrich and Cliff (2003) accepted this definition as the consensus definition (Shane, 2012). Ács et al. (2014) also define the concept entrepreneurship is fundamentally individual-level behavior; which mobilizes resources for opportunity pursuit through the creation of new firms; which is driven by complex population-level interactions between attitudes, aspirations, and ability; which is embedded within a multifaceted economic, social, and institutional context; and which drives economic productivity through the allocation of resources to efficient use (Ács, 2014).

I.II. Global Entrepreneurship Monitor (GEM)

GEM that is accepted as the most important entrepreneurship research, was started in 1997 by Babson College and London Business School with the participation of ten countries. So, GEM is a consortium that supports the understanding of entrepreneurship in the world. GEM has been publishing open-access global and national reports annually since 1999.

GEM is a global report, because of that it is used in many academic studies and used for developing public strategies and measuring the international competitive power of countries. In addition to this, WorldBank, the European Commission, the World Economic Forum, and the United Nations use GEM for developing policies and evaluating current policies (GEM, 2021). With this it focuses on measuring the entrepreneurship activities between countries, determining national factors that are affecting the main national entrepreneurship policies (Bosma, 2013), also measures the personnel contribution at the basis of entrepreneurship processes (Karadeniz and Özçam, 2018) and researches the role of entrepreneurship on the economic development processes of countries (Hessels and van Stel, 2008). GEM aims to reveal the factors used to determine national entrepreneurial activity levels, measure differences between entrepreneurial activities between countries, and determine policies that can increase national entrepreneurial activity (Bosma and Levie, 2010). According to GEM, entrepreneurship is divided into types according to the time from the idea stage to the maturity stage as following;

- *Potential entrepreneurs* that intend to be an entrepreneur who recognize the opportunities at environment, have the necessary qualifications to start it, and who are undeterred by the fear of losing it.
- *Nascent entrepreneurs* that entrepreneurs actively started to a new business, but they have not do any trading and payment to the owners of entrepreneur at least three months
- *Owner-manager of a new business* that are entrepreneurs who have been in business for 3 to 42 months.
- *Owner-manager of an established business* that are mature business owners whose ventures have been in operation for over 42 months.

GEM dataset became the answers of Adult Population Survey (APS) and National Expert Survey (NES). APS is an interview type survey that aims to collect information about entrepreneurship activities, attitudes, and expectations of entrepreneurs about the national economy (GEM, 2021). It contains the

answers of a sample aged between 18-64 years old. Between the years 1999-2018 the number of this sample was 2000, after 2000 it is 3000. The sample reflects the country's population in the view of age, gender, and position (GEM, 2021). The survey is applied to different persons, because of that it is a cross-sectional database (Velilla, 2021). APS focuses on the data about properties of entrepreneurs, their motivations, ambitions, and attitudes about entrepreneurship (GEM, 2021). It also evaluates the economic, cultural, and political conditions that restrict/prevent/deter entrepreneurship activities (GEM, 2021).

APS evaluates the entrepreneurs with attitudes and perceptions, entrepreneurship impact, activity, and motivational dimensions. Attitudes and perceptions are the part that evaluates the opinions expressed about starting, owning, and managing a business; entrepreneurship impact determines the conditions that effect entrepreneurship in an economy; activity refers numbers of early stage and established businesses, and motivational consists on the factors that affect the entrepreneurs for causing a change, maintaining and household, and supporting oneself. It is also important for referring to an individual's planned, conscious evaluation of the opportunities around her (Karabey, 2013). However, the pandemic, which changed all concepts and affected entrepreneurship positively and negatively, is also discussed under the heading Covid-19 related in the 2020/2021 report. The last GEM report that is 2021/2022 was published with the theme "Opportunity Amid Disruption" because of the Covid-19 pandemic and fifty countries participated (GEM, 2021). Because of that APS 2021 is also important for assessing the impact of the pandemic on entrepreneurs around the world. So Covid-19 related is based on the results about the entrepreneurship.

The NES focuses to understand the national entrepreneurship ecosystems of different countries. It realizes that is answered by entrepreneurship experts from the GEM countries. In general, NES, collects insights about the entrepreneurship ecosystem in that economy by selected experts in each country participating for that year and it provides information on the effects of the socio-economics characteristics of the country on national entrepreneurship.

The NES framework consists of the National Entrepreneurship Context Index (NECI). It summarizes, in one number, the average state of an economy's environment for entrepreneurship. The NECI score for any given economy is the arithmetic mean of that economy's Entrepreneurial Environment conditions (EFC) scores (Rosado-Cubero et al., 2022; GEM, 2021). The 12 dimensions of NECI are the access to entrepreneurial finance, government policies about taxes and bureaucracy; government policies about support and relevance, government entrepreneurship programs, entrepreneurial education at school, entrepreneurial education post-school, research and development transfer, commercial and professional infrastructure, ease of entry: market dynamics, ease of entry: market burdens and regulations, physical infrastructure, social and cultural norms. The experts score their national economies on a Likert scale ranging from false (0) to true (10) the relevant questions in the framework conditions at NES questionnaire. Arithmetic average of these results refers to economies' Entrepreneurial Framework Conditions (EFC) scores. The EFC score consists of the evaluation of 42 countries in the GEM2021.) by experts according to NECI dimensions with an 11-point Likert scale.

The GEM dataset provides a source for much academic research. Some of them are shown at Table 1.

Table 1. Literature Review

Authors	Data Sources	Variables	Analytical Procedures	Results
Rocha and Sternberg (2005)	GEM/ TEA	Industrial Agglomerations, Clusters, Entrepreneurship	Multiple Regression Analysis, Fixed-Effects Model	Industrial agglomerations do not affect entrepreneurship, but clusters change it. Clusters are good than market structures for developing entrepreneurship.
Wennekers et al. (2005)	GEM/ TEA	Economic And Non-Economic	Regression Analysis	The relationship between levels of economic development as calculated by the innovative capacity index or per capita income is U-shaped. The U-shaped patterns for total nascent entrepreneurship, opportunity and necessity influence entrepreneurship
Koellinger (2008)	GEM/APS	Entrepreneurial Innovativeness	Logit Model Estimations	Entrepreneurial opportunities have objective components. The capacity to recognize, promote, and use an opportunity is related to elements that affect an entrepreneur's individual judgments and do entrepreneur more innovative than others.
Thompson et al. (2009).	GEM/APS	Women Entrepreneurship, Home-Based Entrepreneurship		High household income levels reduce the probability of women being a home-based entrepreneur, and ownership of a more establishes business.
Arafat and Saleem (2017)	GEM/APS	Entrepreneurial Intention	Logistic Regression	Women and students are less likely to become entrepreneurs. Part-time and non-working individuals are twice as likely to start their own businesses as full-time workers. All perceptual factors have a significant impact on entrepreneurial intention.
Tokatlıoğlu and Yalçın (2019)	GEM/ TEA	Individual Perceptions	Ward Method &K-Means Method	There is a relationship between individual perceptions of entrepreneurial behavior and the level of entrepreneurial activity. Positive individual perceptions can sometimes create an untapped potential for entrepreneurial behavior.
Sarreal (2019)	GEM/APS	Motives of Entrepreneurs	Multinomial Logistic Regression	Socio-demographic personalities apply important synergy effect on the relation of urbanization and the decision to enter the informal economy. For deciding to become an informal entrepreneur is the necessity oriented, having no other choice to work as the main motivation and goal of being an entrepreneur.
Vodă et al. (2020).	GEM/ TEA	Entrepreneurial Opportunities, Entrepreneurial Activity, Self-Confidence, Fear of Failure, Networking	Binary Logistic Models, Logistic Regressions,	Gender is an important determinant affecting the possibility of becoming an entrepreneur, and men are more prone to entrepreneurship than women. Self-confidence, opportunity perception and networking ability positively and significantly affect early-stage entrepreneurial actions. The fear of failure has a negative and important effect on entrepreneurial action
Velilla et al. (2020)	GEM/APS	Entrepreneurial Intent	Fuzzy-Set Qualitative Comparative Analysis	Peer influences, social perception, entrepreneurial skills are determinants of entrepreneurial intention.
Velilla (2021)	GEM/ TEA	Individual Determinants	Algorithmic Method	Entrepreneurship and management skills, ability to innovate, lack of competition in the local environment, sharing experiences of other entrepreneurs are significant effects on the motivation of entrepreneurs.
Moterased et al. (2021).	GEM/ TEA	Entrepreneurial Exit, Entrepreneurial Intention, Fear of Failure, Opportunity and Capacity Perception	Random Forest Algorithm	Perceived intention, opportunity, and capability and role model are affecting to exit the business.

According to Table 1, it can be said that GEM data is a very significant dataset for academic studies on different disciplines. Since GEM offers comprehensive datasets on entrepreneurship, reference was used in this study, as in other studies. It is a database because of it consists of much comparable data from a lot

of countries, containing all entrepreneurship activities, and including new and current entrepreneurship (Bergmann and Stephan, 2013). With this context it is clear that GEM defines entrepreneurship with a consistent and established definition. When the dataset of this study was created, the 2021-2022 report has not been published yet, so the 2020-2021 report was used in the study. The 2020-2021 report is the 21. Global GEM Repost that develop new understandings of the nature and role of entrepreneurship in various contexts (GEM, 2021). The report contains data on 42 countries of different sizes, income levels and development stages in the GEM survey. The number of countries changes with their development levels and the countries that will be at GEM give permission to conduct these surveys to entrepreneurs for the next year.

II. METHODOLOGY

II.I. Data Envelopment Analysis

Data Envelopment Analysis (DEA) is the method used to determine the efficiency levels according to the input and output variables. Different DEA models have been developed in the literature. In this study, the "The Banker Charnes and Cooper (BCC)" model was used. This model considers variable coefficients instead of fixed coefficients. In addition, the output-oriented BCC model (BCC-O) was preferred to maximize output variables. The BCC-O model is presented in Equation (1) (Santana et al., 2014). The BCC method is a valuable approach for identifying a unit's deficiencies and making improvements by benchmarking against best-practice units. Additionally, it is useful for comparative analyses to determine a unit's effectiveness in relation to other similar units. This method is preferred in this research as it emphasizes comparisons among units.

Subject to:

$$Min \ \sum_{j=1}^{n} v_j x_{j0} - w$$

$$\sum_{i=1}^{m} u_i y_{i0} = 1$$

$$\sum_{i=1}^{m} u_i y_{ik} - \sum_{j=1}^{n} v_j x_{jk} + w \ \leq 0, for \ k = 1,2, \dots, h \qquad (1)$$

x_{jk} represents amount of input j of decision-making unit k.

y_{ik} represents amount of output i of decision-making unit k.

x_{j0} represents amount of input j of decision-making unit under analysis.

y_{i0} represents amount of output i of decision-making unit under analysis.

v_j represents weight of input j of decision-making unit under analysis.

u_i represents weight of output i of decision-making unit under analysis.

w represents the scale factor.

m represents the number of outputs.

n represents the number of inputs.

h represents the number of decision-making units.

Indices:

i represents each output.

j represents each input.

k represents each decision-making unit.

In this research, four output-oriented DEA models were created. Table 2 shows the parameters and indices of the DEA models.

Table 2. Indices for DEA Models

Indices	DEA-1	DEA-2	DEA-3	DEA-4
i	Entrepreneurship activity (m=3)	Entrepreneurship activity (m=3)	Entrepreneurship activity (m=3)	Entrepreneurship activity (m=3)
j	Attitudes and perceptions (n=6)	Entrepreneurship impact (n=5)	Motivational (n=4)	COVID-19-related (n=4)
k	Country (h=42)	Country (h=42)	Country (h=42)	Country (h=42)

II.II. Hierarchical Cluster Analysis

Cluster analysis is a multivariate statistical analysis based on the clustering of data according to the distances between the data in the data set (Tryon, 1939). There are various clustering analysis methods in the literature as hierarchical cluster analysis, non-hierarchical cluster analysis, fuzzy cluster analysis. In this study, hierarchical clustering analysis was applied because the cluster numbers are not known. Hierarchical cluster analysis clusters the data by considering the distances between the data. There are many calculation methods in the literature to determine the distances between data. In this study, Ward's method based on the most widely used Squared Euclidean distance measurement was applied. The Squared Euclidean distance calculation is presented in Equation (2) (Murtagh & Legendre, 2014).

$$ESS = \sum_{i=1}^{n} x_i^2 - 1/2(\sum_{i=1}^{n} x_i)^2 \quad (2)$$

Parameters:

n represents the number of observations.

x_i represents the score of i of observations.

Indices:

i represents each observation.

III. EMPIRICAL ANALYSIS

III.I. Variables and Sampling

This research was carried out in two stages. In the first stage, efficiency analyzes based on entrepreneurship data obtained from 2021 GEM reports were made with four DEA models. Each model was handled with the BCC-O method and the EAE of the countries were determined. In the second stage, hierarchical clustering analysis was performed based on the data obtained from the efficiency analysis., hierarchical clustering analysis based on Euclidean distance calculation was performed. Variables and sampling of all analyzes applied in the study are presented in the Table 3. The countries included in the scope of the research are presented in Appendix 1. There are two motivations for determining the sample

area. The first is their selection from among all the countries in the world. The second is to maximize the coverage of the dataset. Therefore, all countries with data in the GEM report are included in the research scope. With this approach, the research becomes generalizable on a global scale.

Table 3. Variables and Sampling

Analysis	Models		Variables	Year	Sampling
DEA	DEA-1	Inputs	I1: "Know someone who has started a new business" I2: "Good opportunities to start a business in my area" I3: "It is easy to start a business" I4: "Personally have the skills and knowledge" I5: "Fear of failure (opportunity)" I6: "Entrepreneurial intentions"	2021	42 Countries
		Outputs	O1: "Total early-stage Entrepreneurial Activity" O2: "Established Business Ownership rate" O3: "Entrepreneurial Employee Activity"		
	DEA-2	Inputs	I1: "Job expectations (expecting to employ six or more people in five years' time)." I2: "International (25%+ revenue)" I3: "National scope (customers and products/ process)" I4: "Global scope (customers and products/ process)" I5: "Industry (% TEA in business services)"	2021	42 Countries
		Outputs	O1: "Total early-stage Entrepreneurial Activity" O2: "Established Business Ownership rate" O3: "Entrepreneurial Employee Activity"		
	DEA-3	Inputs	I1: "To make a difference" I2: "Build great wealth" I3: "Continue family tradition" I4: "To earn a living"	2021	42 Countries
		Outputs	O1: "Total early-stage Entrepreneurial Activity" O2: "Established Business Ownership rate" O3: "Entrepreneurial Employee Activity"		
	DEA-4	Inputs	I1: "Pandemic has led household income to decrease" I2: "Know someone who started business due to pandemic" I3: "Know someone who stopped business due to pandemic" I4: "Pursue new opportunities due to pandemic"	2021	42 Countries
		Outputs	O1: "Total early-stage Entrepreneurial Activity" O2: "Established Business Ownership rate" O3: "Entrepreneurial Employee Activity"		
Hierarchical Analysis			Entrepreneurial activity efficiency level based on attitudes and perceptions Entrepreneurial impact efficiency level based on attitudes and perceptions Motivational efficiency level based on attitudes and perceptions COVID-19-related efficiency level based on attitudes and perceptions	2021	42 Countries

III.II. DEA Findings

In this empirical research, it is aimed to analyze the efficiency of various entrepreneurial activities by using the entrepreneurship data of the countries for 2021 and to cluster the countries according to their efficiency levels. In this context, four DEA models were created. With the DEA-1 model, the EAE of the countries based on "Attitudes and perceptions" were determined. With the DEA-2 model, the EAE of the countries based on the "Entrepreneurship impact" were determined. With the DEA-3 model, the EAE of the countries based on "Motivational" were determined. With the DEA-4 model, the EAE of the countries based on "COVID-19-related" were determined. The features of DEA models are presented in the Table 4.

Table 4. Features of the DEA Models

	Model Features			
Model Name	**DEA-1:** Entrepreneurial efficiency analysis based on attitudes and perceptions	**DEA-2:** Entrepreneurial efficiency analysis based on entrepreneurship impact	**DEA-3:** Entrepreneurial efficiency analysis based on motivational	**DEA-4:** Entrepreneurial efficiency analysis based on COVID-19-related
Model Type	BCC-O			
Model Orientation	Output-Oriented			
Model Efficiency Type	Tech			
Model RTS	Variable			
Model Description	The Banker Charnes and Cooper Model called BCC. This model was first introduced in 1984 to introduce VARIABLE Returns to Scale (the CCR model only assumed CONSTANT RTS).			

The raw dataset of DEA models was compiled from 2021 GEM reports. Raw datasets of DEA-1, DEA-2, DEA-3, and DEA-4 models are presented in Appendix-1, Appendix-2, Appendix-3 and Appendix-4, respectively. Correlation relationships between raw data were obtained by Pearson correlation test. Pearson correlation findings of DEA-1, DEA-2, DEA-3, and DEA-4 models are presented in Appendix-5, Appendix-6, Appendix-7, and Appendix-8, respectively. The highest and most significant relationship between input and output variables for DEA-1 is between "Entrepreneurial intentions" and "Total early-stage Entrepreneurial Activity" ($r(42)=0.595$, $p<0.01$). The highest correlation for DEA-2 is between "Industry (% TEA in business services)" and "Entrepreneurial Employee Activity" ($r(42)=0.637$, $p<0.01$). The highest correlation for DEA-3 is between "To earn a living" and "Total early-stage Entrepreneurial Activity" ($r(42)=0.406$, $p<0.01$). The highest correlation for DEA-4 is between "Pandemic has led household income to decrease" and "Entrepreneurial Employee Activity" ($r(42)=0.406$, $p<0.01$).

As a result of the DEA analyzes made with the open-source data envelopment analysis program (OSDEA), the efficiency levels of the countries were determined. EAE of countries calculated for DEA-1, DEA-2, DEA-3, and DEA-4 models are presented in Appendix-9, Appendix-10, Appendix-11, and Appendix-12, respectively. In the DEA-1 model, 21 countries are at full efficiency. The remaining 21 countries are not at full efficiency level. In the DEA-2 model, 22 countries are at full efficiency. The remaining 20 countries are not at full efficiency level. In the DEA-3 model, 18 countries are at full efficiency. The remaining 24 countries are not at full efficiency level. In the DEA-4 model, 18 countries are at full efficiency. The remaining 24 countries are not at full efficiency level.

Projections values have been calculated so that countries that are not at the full efficiency level can reach the full efficiency level. Calculated projections values for DEA-1, DEA-2, DEA-3, and DEA-4 models are presented in Appendix-13, Appendix-14, Appendix-15, and Appendix-16.

For the DEA-1 Model, the changes that should be made in the output values for the countries that are not at the efficiency level to reach the full efficiency level should be as follows:

- Total Early-Stage Entrepreneurial Activity (O1) values should be increased. These increase rates are as follows: Angola (%15), Brazil (%4), Burkina Faso (%84), Chile (%33), Colombia (%28), Egypt (%21), Guatemala (%61), India (%162), Indonesia (%47), Kazakhstan (%31), Kuwait (%2), Luxembourg (%31), Morocco (%167), Netherlands (%23), Oman (%264), Panama (%18), Saudi Arabia (%144), Slovenia (%53), United Arab Emirates (%143), United Kingdom (%9), Uruguay (%105).
- Established Business Ownership rate (O2) values should be increased. These increase rates are as follows: Angola (%69), Brazil (%4), Burkina Faso (%35), Chile (%63), Colombia (%114), Egypt (%125), Guatemala (%31), India (%162), Indonesia (%40), Kazakhstan (%279), Kuwait (%7), Luxembourg (%74), Morocco (%138), Netherlands (%23), Oman (%428), Panama (%180), Saudi Arabia (%144), Slovenia (%10), United Arab Emirates (%327), United Kingdom (%9), Uruguay (%163).
- Entrepreneurial Employee Activity (O3) values should be increased. These increase rates are as follows: Angola (%15), Brazil (%4), Burkina Faso (%276), Chile (%33), Colombia (%33), Egypt (%957), Guatemala (%31), India (%1230), Indonesia (%40), Kazakhstan (%54), Kuwait (%2), Luxembourg (%31), Morocco (%184), Netherlands (%90), Oman (%264), Panama (%18), Saudi Arabia (%161), Slovenia (%10), United Arab Emirates (%143), United Kingdom (%9), Uruguay (%702).

For the DEA-2 Model, the changes that should be made in the output values for the countries that are not at the efficiency level to reach the full efficiency level should be as follows:

- Total Early-Stage Entrepreneurial Activity (O1) values should be increased. These increase rates are as follows: Burkina Faso (%72), Chile (%13), Colombia (%67), Egypt (%23), Israel (%1), Kuwait (%2), Latvia (%144), Luxembourg (%43), Morocco (%65), Netherlands (%75), Norway (%8), Panama (%45), Russian Federation (%236), Slovak Republic (%68), Spain (%75), Switzerland (%9), Taiwan (%115), United Arab Emirates (%160), United Kingdom (%6), Uruguay (%33).
- Established Business Ownership rate (O2) values should be increased. These increase rates are as follows: Burkina Faso (%12), Chile (%44), Colombia (%120), Egypt (%41), Israel (%58), Kuwait (%15), Latvia (%7), Luxembourg (%70), Morocco (%65), Netherlands (%75), Norway (%49), Panama (%175), Russian Federation (%208), Slovak Republic (%68), Spain (%75), Switzerland (%9), Taiwan (%1), United Arab Emirates (%294), United Kingdom (%8), Uruguay (%50).
- Entrepreneurial Employee Activity (O3) values should be increased. These increase rates are as follows: Burkina Faso (%200), Chile (%13), Colombia (%67), Egypt (%415), Israel (%1), Kuwait (%2), Latvia (%7), Luxembourg (%43), Morocco (%108), Netherlands (%75), Norway (%8), Panama (%45), Russian Federation (%208), Slovak Republic (%68), Spain (%75), Switzerland (%9), Taiwan (%1), United Arab Emirates (%160), United Kingdom (%6), Uruguay (%340).

For the DEA-3 Model, the changes that should be made in the output values for the countries that are not at the efficiency level to reach the full efficiency level should be as follows:

- Total Early-Stage Entrepreneurial Activity (O1) values should be increased. These increase rates are as follows: Angola (%9), Brazil (%6), Burkina Faso (%88), Chile (%33), Colombia (%54),

Egypt (%179), Guatemala (%13), India (%1106), Indonesia (%28), Iran (%516), Italy (%490), Kuwait (%4), Luxembourg (%36), Netherlands (%32), Oman (%265), Panama (%30), Poland (%220), Russian Federation (%241), Saudi Arabia (%169), Slovak Republic (%9), Slovenia (%11), Taiwan (%34), United Arab Emirates (%163), United Kingdom (%7).

- Established Business Ownership rate (O2) values should be increased. These increase rates are as follows: Angola (%35), Brazil (%6), Burkina Faso (%35), Chile (%41), Colombia (%102), Egypt (%179), Guatemala (%13), India (%186), Indonesia (%28), Iran (%16), Italy (%433), Kuwait (%10), Luxembourg (%36), Netherlands (%32), Oman (%430), Panama (%149), Poland (%14), Russian Federation (%241), Saudi Arabia (%164), Slovak Republic (%9), Slovenia (%7), Taiwan (%16), United Arab Emirates (%302), United Kingdom (%7).
- Entrepreneurial Employee Activity (O3) values should be increased. These increase rates are as follows: Angola (%102), Brazil (%6), Burkina Faso (%272), Chile (%33), Colombia (%54), Egypt (%799), Guatemala (%80), India (%663), Indonesia (%28), Iran (%30), Italy (%433), Kuwait (%4), Luxembourg (%36), Netherlands (%125), Oman (%265), Panama (%30), Poland (%115), Russian Federation (%241), Saudi Arabia (%169), Slovak Republic (%9), Slovenia (%11), Taiwan (%34), United Arab Emirates (%163), United Kingdom (%7).

For the DEA-4 Model, the changes that should be made in the output values for the countries that are not at the efficiency level to reach the full efficiency level should be as follows:

- Total early-stage Entrepreneurial Activity (O1) values should be increased. These increase rates are as follows: Angola (%39), Austria (%37), Brazil (%9), Chile (%47), Colombia (%67), Egypt (%421), Guatemala (%114), India (%1399), Indonesia (%520), Israel (%40), Italy (%620), Kuwait (%5), Morocco (%114), Oman (%145), Panama (%45), Poland (%186), Russian Federation (%175), Saudi Arabia (%169), Slovak Republic (%65), Spain (%144), Switzerland (%9), United Arab Emirates (%164), United Kingdom (%44), Uruguay (%147).
- Established Business Ownership rate (O2) values should be increased. These increase rates are as follows: Angola (%62), Austria (%2), Brazil (%9), Chile (%59), Colombia (%120), Egypt (%230), Guatemala (%31), India (%199), Indonesia (%40), Israel (%46), Italy (%367), Kuwait (%12), Morocco (%114), Oman (%328), Panama (%175), Poland (%18), Russian Federation (%175), Saudi Arabia (%164), Slovak Republic (%65), Spain (%92), Switzerland (%9), United Arab Emirates (%307), United Kingdom (%11), Uruguay (%652).
- Entrepreneurial Employee Activity (O3) values should be increased. These increase rates are as follows: Angola (%39), Austria (%2), Brazil (%9), Chile (%47), Colombia (%67), Egypt (%361), Guatemala (%31), India (%564), Indonesia (%40), Israel (%6), Italy (%437), Kuwait (%5), Morocco (%114), Oman (%145), Panama (%45), Poland (%42), Russian Federation (%227), Saudi Arabia (%164), Slovak Republic (%65), Spain (%200), Switzerland (%9), United Arab Emirates (%164), United Kingdom (%11), Uruguay (%652).

III.III. Hierarchical Analysis Findings

In the first stage of the research, the EAE of the countries were determined with four different DEA models. In the second stage of the research, the clusters that emerged when the EAE of the countries were considered were determined. EAE scores used for cluster analysis are presented in Appendix-17. When creating Appendix 17, the EAE values obtained from the four DEA models are compiled and presented in tabular form, thus forming the dataset for hierarchical regression analysis. The hierarchical cluster analysis method was preferred as the cluster analysis method. Since the number of clusters according to the EAE of the countries is not known, this method was applied. Hierarchical cluster analysis was done with SPSS. Considering the Euclidean distance calculation, the Wards' clustering method was preferred. In the

literature, it is suggested that the Wards' clustering method gives more accurate results compared to other clustering methods (Hands and Everitt, 1987; Ferreira and Hitchcock, 2009; Tekin, 2018). Dendrogram diagram obtained as a result of hierarchical clustering analysis is shown in Appendix 18. Countries are divided into three clusters according to their EAE (the cluster separation point is 10.). The clustering of countries is shown in Table 5. Cluster-1, Cluster-2, and Cluster-3 were described as high, middle, and low EAE clusters, respectively.

Table 5. Clusters

Cluster-1			Cluster-2	Cluster-3	
Togo	Taiwan	Germany	Egypt	Guatemala	Luxembourg
United States	Brazil	Greece	Italy	Indonesia	Morocco
Croatia	Kuwait	Cyprus	Russian Federation	Angola	Uruguay
Korea	United Kingdom	Iran	India	Panama	Slovak Republic
Sweden	Poland	Austria	Saudi Arabia	Chile	Spain
Norway	Kazakhstan	Israel	Oman	Burkina Faso	Colombia
Qatar	Slovenia	Latvia	United Arab Emirates	Netherlands	
Switzerland					

IV. RESULTS AND SUGGESTIONS

In this study, the EAE of the countries included in the GEM report were discussed from four different perspectives. In the first approach, the EAE are focused on "attitudes and perceptions". In the second approach, the EAE are focused on "entrepreneurship impact". In the third approach, the EAE are focused on "Motivational". In the fourth approach, the EAE are focused on "COVID-19-related". Then, the EAE determined separately in each approach were accepted as the cluster analysis data set. Thus, four variables were taken as basis in the cluster analysis. As a result of the clustering analysis, countries were divided into three clusters according to their EAE. The research results based on the findings are evaluated on a country basis and suggestions are developed for each country.

- Entrepreneurial activities in Angola, Guatemala, and Indonesia exhibit full efficiency solely concerning their impact on entrepreneurship, placing these countries within the low EAE cluster. There is a need for enhancements in the efficiency of entrepreneurial activities in these nations.
- Austria does not attain full effectiveness in terms of COVID-19-related measures. This nation falls within the high EAE cluster.
- In the context of entrepreneurship impact, Brazil operates at peak efficiency, positioning itself within the high EAE cluster.
- Burkina Faso, Luxembourg, and the Netherlands exhibit full efficiency in the context of COVID-19-related measures. These countries belong to the low EAE cluster, yet there is room for improvement in terms of entrepreneurship.
- Chile, Colombia, Egypt, Panama, and the United Arab Emirates do not operate at full activity levels. These countries fall within the low EAE cluster, and there is a clear need for significant improvements in the domain of entrepreneurship.
- Croatia, Cyprus, Germany, Greece, Qatar, South Korea, Sweden, Togo, and the United States have achieved full event-level effectiveness. These countries belong to the high EAE cluster.

- India operates at peak efficiency when considering "entrepreneurship impact." However, this nation falls within the middle EAE cluster, indicating potential areas of improvement in its entrepreneurial ecosystem.
- Iran does not reach full efficiency in terms of "motivation." Despite this, the country is situated within the high EAE cluster. There is a need for further development of entrepreneurship motivation.
- Israel, Latvia, and Norway do not attain full efficiency in terms of "entrepreneurship impact." Despite this, these countries are classified within the high EAE cluster. There is a need for the development of entrepreneurial impact.
- Italy does not achieve full efficacy levels concerning both "Motivational" and "COVID-19-related" factors. This positions the country within the middle EAE cluster, indicating a need for the enhancement of entrepreneurship motivation.
- Kazakhstan falls short of full efficiency in terms of "Attitudes and perceptions." Nevertheless, this country is positioned within the high EAE cluster. There is a need for the development of perceptions and expectations regarding entrepreneurship.
- Kuwait and the United Kingdom do not achieve full efficiency across all entrepreneurial activities. Despite being in the high EAE cluster, there is room for improvement in their entrepreneurial endeavors.
- Morocco operates at peak efficiency when it comes to "entrepreneurship impact." However, this places the country within the low EAE cluster, suggesting the need for further development of entrepreneurial activities.
- In Oman, entrepreneurial activities are operating at full efficiency levels in terms of "entrepreneurship impact." Nevertheless, this places the country within the middle EAE cluster. There is a need for the development of entrepreneurial motivation and fostering positive attitudes towards entrepreneurship.
- Russia achieves full efficacy levels in terms of "attitudes and perceptions." However, despite this accomplishment, the country is positioned within the middle EAE cluster, signifying a need for the development of entrepreneurship motivation.
- Saudi Arabia operates at peak efficiency concerning "entrepreneurship impact." Nevertheless, it falls within the middle EAE cluster, indicating a need for the development of entrepreneurial activity efficiency.
- The Slovak Republic does not attain full efficiency levels in both "motivational" and "entrepreneurship impact" aspects. Despite this, the country is placed within the low EAE cluster, highlighting the need for the development of entrepreneurship motivation.
- Slovenia falls short of full efficacy levels in both "Attitudes and perceptions" and "COVID-19-related" factors. However, it is positioned within the high EAE cluster. There is a need for the development of entrepreneurial expectations and attitudes.
- Spain does not operate at full efficiency levels regarding both "motivational" and "COVID-19-related" aspects. Nevertheless, it falls within the high EAE cluster, signifying a need for the development of entrepreneurial attitudes.
- Switzerland does not achieve full efficacy levels in both "entrepreneurship impact" and "COVID-19-related" dimensions. Despite this, it is categorized within the high EAE cluster, indicating the need for the development of entrepreneurial attitudes and motivation.
- Taiwan does not reach full efficiency levels concerning both "motivational" and "entrepreneurship impact" factors. Despite being in the high EAE cluster, there is a clear need for the development of entrepreneurship motivation.

- Uruguay exhibits full efficiency in terms of "motivational" aspects of entrepreneurial activities. However, this places the country within the low EAE cluster, indicating a need for the development of entrepreneurial attitudes.

Suggestions for researchers are as follows: (i) EAE of countries can be determined by considering them from different perspectives. (ii) Countries can be clustered with different clustering analyzes according to their entrepreneurial activities. The results obtained can be compared. (iii) Countries can be clustered by non-hierarchical cluster analysis based on the number of clusters determined in this study. The results obtained can be compared. (iv) Countries can be clustered according to GEM report scores rather than entrepreneurial efficiency levels. (v) DEA and cluster analyze can be repeated for 2020. In addition, after the 2022 data are published, the same study can be repeated for 2022. The limitations of the research are: (i) Forty-two countries were included in the scope of the research. (ii) The efficiency levels of the entrepreneurial activities of the countries are taken as basis. (iii) DEA and Clustering analyzes were performed using secondary data. (iv) Analyzes were made for the year 2021. Previous years are outside the scope of the research. Finally, with this research, the efficiency levels of the entrepreneurial activities of the countries were determined and clustered. It is evaluated that the findings will be beneficial in the evaluations of the entrepreneurship levels of the countries.

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APPENDIX

Appendix-1: Raw Data for DEA-1 Model

Country	I1	I2	I3	I4	I5	I6	O1	O2	O3
Angola	70.7	75.6	69.8	82.3	34.8	83	49.6	9.2	1.3
Austria	53.9	31.2	47.5	53.3	36.8	4.1	6.2	7.8	5.4
Brazil	74.2	57.3	41.4	67.8	43.4	52.7	23.4	8.7	4.5
Burkina Faso	60.7	75.5	44	84.1	49.1	51.9	23	12.4	0.3
Chile	65.8	46.7	46.1	71.7	46.3	50.6	25.9	6.1	3.2
Colombia	66.9	47.9	33.2	64.8	39.5	33.9	31.1	5.5	2.1
Croatia	67.8	47.2	30.7	75	52.1	24.3	12.7	4.2	6.4
Cyprus	68.1	21.1	49.7	58.1	49.1	20.5	8.6	7.3	6
Egypt	34.9	65.7	61.6	56.1	41.6	55.7	11.3	5.2	0.2
Germany	44.4	36	54.4	47.6	31	10.8	4.8	6.2	6.4
Greece	32.5	27.9	25.9	53.3	53.1	11.3	8.6	14.6	1.2
Guatemala	71.4	62.7	48.8	74.4	40	49.7	28.3	12.3	1.1
India	61.9	82.5	78.5	81.7	56.8	20.3	5.3	5.9	0.1
Indonesia	79.2	80.6	73.4	79	23.5	26	9.6	11.4	1.1
Iran	33.8	13.3	21.3	64.9	17.7	23.9	8	14.5	0.8
Israel	68.1	25	12.3	37.7	45	19.8	8.5	4.2	6.1
Italy	40.07	62.2	78.1	60.8	28.4	4.5	1.9	2.2	0.7
Kazakhstan	84.3	84.3	51.1	63.8	17.5	59.4	20.1	4.3	0.9
Kuwait	58.2	62.6	64.5	63.4	47.8	57.5	19.2	5.9	6
Latvia	36.8	37.1	33.2	55.3	41.6	17.2	15.6	11.1	3.4
Luxembourg	45.9	41.9	63.8	45.7	42.3	11.1	8	3.6	4.3
Morocco	42.3	57.3	53.9	63.4	38.7	48.7	7.1	6.8	0.5
Netherlands	60.8	48.8	82.9	43.6	38.3	13.1	11.5	7	1.7
Norway	44.7	57	84.1	41.6	27.4	5.6	7.6	4.1	5.8
Oman	84.2	83.8	67.8	64.5	42.8	56.5	16	2.5	0.8
Panama	52.6	47.2	55.9	72.7	39.8	46.1	32.4	4.1	2.7
Poland	62.7	51.6	58.9	60	41.2	4.7	3.1	12.2	0.9
Qatar	52.6	72.3	67.9	68.2	41.3	45.6	17.2	6.1	6.6
Korea	39.9	44.6	33.9	53	13.9	25.9	13	16.1	1.5
Russian Federation	54.5	33.5	30.6	34.5	46.5	8.3	8.5	4.7	0.4
Saudi Arabia	57.3	90.5	91.5	86.4	51.6	25.1	17.3	5.1	1.1
Slovak Republic	71.9	40.9	26	56.4	48.7	13.8	13.9	6.5	2.5
Slovenia	57.9	42	62	59.4	43.8	12	6	7	5.2
Spain	37.4	16.5	34.6	51.9	53.6	6.8	5.2	6.7	0.8
Sweden	48.5	62.5	80.1	52.1	42.8	8.3	7.3	6	6.2
Switzerland	44.6	26.7	55.5	44.5	33.5	7.3	9.2	6.7	5.2
Taiwan	32.3	39.3	42.5	42.5	42.6	15.5	8.4	11.1	2.3
Togo	68.5	78.5	58.5	58.5	44.2	48.3	84.6	17.8	0.6

United Arab Emirates	65.5	62.1	69.5	54.7	47.1	29.3	15.4	2.5	1.7
United Kingdom	49.8	49.8	49.8	54.5	48.3	48.3	7.8	6.5	5.4
United States	60.9	48.6	68.6	64	41.2	12.6	15.4	9.9	4.8
Uruguay	63.6	47.3	39.4	65.6	48.8	33	21.9	5.1	0.2

Note: "I1: Know someone who has started a new business, I2: Good opportunities to start a business in my area, I3: It is easy to start a business, I4: Personally have the skills and knowledge, I5: Fear of failure (opportunity), I6: Entrepreneurial intentions, O1: Total early-stage Entrepreneurial Activity, O2: Established Business Ownership rate, O3: Entrepreneurial Employee Activity"

Appendix-2: Raw Data for DEA-2 Model

Country	**I1**	**I2**	**I3**	**I4**	**I5**	**O1**	**O2**	**O3**
Angola	16.4	0.6	1.7	0.2	4.9	49.6	9.2	1.3
Austria	0	0.9	1.1	0.5	36.6	6.2	7.8	5.4
Brazil	8.4	0.3	1.1	0.1	16.1	23.4	8.7	4.5
Burkina Faso	4.3	1	0.7	0.2	2.5	23	12.4	0.3
Chile	9.2	0.4	2.6	0.3	19.7	25.9	6.1	3.2
Colombia	16.8	2.2	5.1	1.3	15.8	31.1	5.5	2.1
Croatia	2.7	2.6	2.3	0.7	33.7	12.7	4.2	6.4
Cyprus	2.8	2.4	2.4	0.7	41	8.6	7.3	6
Egypt	3.7	0.4	0.7	0	5.4	11.3	5.2	0.2
Germany	1.2	0.6	0.8	0.3	29.8	4.8	6.2	6.4
Greece	1.1	1.4	1.6	0.5	17.5	8.6	14.6	1.2
Guatemala	6.3	0.5	0.9	0.1	6.3	28.3	12.3	1.1
India	0.9	0	0.1	0	3.5	5.3	5.9	0.1
Indonesia	0.3	0.2	0.3	0	3.1	9.6	11.4	1.1
Iran	1.3	0.2	0.4	0.1	24.1	8	14.5	0.8
Israel	1.5	0.9	1.2	0.3	34.3	8.5	4.2	6.1
Italy	0	0.1	0.5	0	23.4	1.9	2.2	0.7
Kazakhstan	5.5	0	0.1	0	14.3	20.1	4.3	0.9
Kuwait	9.5	2.3	6	0.9	17.2	19.2	5.9	6
Latvia	4.6	3.1	2.1	0.8	21.2	15.6	11.1	3.4
Luxembourg	2.7	2.2	2.3	0.4	43.6	8	3.6	4.3
Morocco	1.4	0.2	0.4	0.1	8.6	7.1	6.8	0.5
Netherlands	1.5	2	2.7	0.8	41.2	11.5	7	1.7
Norway	2.2	1	1.5	0.6	41.8	7.6	4.1	5.8
Oman	1.5	0.4	0.7	0	9.5	16	2.5	0.8
Panama	13.9	2.1	7	1.1	14.6	32.4	4.1	2.7
Poland	0.7	0	0.4	0	25.4	3.1	12.2	0.9
Qatar	11.4	1.8	7.8	0.3	15	17.2	6.1	6.6
Korea	4	0.6	2	0.4	19.7	13	16.1	1.5
Russian Federation	3.7	0.7	0.5	0.2	17.1	8.5	4.7	0.4
Saudi Arabia	9.4	0.8	0.8	0	3.9	17.3	5.1	1.1
Slovak Republic	4	1.9	1.9	1.2	33.8	13.9	6.5	2.5
Slovenia	1.5	1.2	1.1	0.5	22.7	6	7	5.2
Spain	0.5	0.3	0.4	0.1	30.8	5.2	6.7	0.8
Sweden	1.1	1.4	1.2	0.4	34.4	7.3	6	6.2
Switzerland	0.9	1.2	1.4	0.9	33.6	9.2	6.7	5.2
Taiwan	2	0.5	2.3	0.8	9.6	8.4	11.1	2.3
Togo	4.9	2.2	0.4	0.1	1.5	84.6	17.8	0.6
United Arab Emirates	10.6	2.9	4.1	1.2	15.8	15.4	2.5	1.7
United Kingdom	1.3	0.7	0.9	0.3	26.4	7.8	6.5	5.4
United States	4.2	0.5	1.8	0.8	34.3	15.4	9.9	4.8
Uruguay	4.6	0.4	1.8	0.2	12.4	21.9	5.1	0.2

Note: "I1: Job expectations (expecting to employ six or more people in five years' time)., I2: International (25%+ revenue), I3: National scope (customers and products/ process), I4: Global scope (customers and products/ process), I5: Industry (% TEA in business services), O1: Total early-stage Entrepreneurial Activity, O2: Established Business Ownership rate, O3: Entrepreneurial Employee Activity"

Appendix-3: Raw Data for DEA-3 Model

Country	I1	I2	I3	I4	O1	O2	O3
Angola	65.3	63.8	37.3	89.5	49.6	9.2	1.3
Austria	39	33.4	21.1	49.3	6.2	7.8	5.4
Brazil	65.6	57.7	27.4	81.9	23.4	8.7	4.5
Burkina Faso	21.4	76.1	34	79.4	23	12.4	0.3
Chile	58.4	53.7	37.1	81.2	25.9	6.1	3.2
Colombia	62.9	61.7	37.1	77	31.1	5.5	2.1
Croatia	39	47	28.7	69.4	12.7	4.2	6.4
Cyprus	37.5	85.2	21.3	77.4	8.6	7.3	6
Egypt	49.2	62.9	38.1	54	11.3	5.2	0.2
Germany	39.8	52.2	62	45.1	4.8	6.2	6.4
Greece	26.9	45.8	35.7	69	8.6	14.6	1.2
Guatemala	76.7	54.8	46.9	91.1	28.3	12.3	1.1
India	80.7	74.7	76.8	87.3	5.3	5.9	0.1
Indonesia	44.7	49.8	41.8	71.4	9.6	11.4	1.1
Iran	30.1	88.9	19	64.8	8	14.5	0.8
Israel	35.6	71.2	17.5	53.6	8.5	4.2	6.1
Italy	26.6	95.3	26.5	82.2	1.9	2.2	0.7
Kazakhstan	0.4	94.9	8.6	40	20.1	4.3	0.9
Kuwait	40.1	76	30.6	59.6	19.2	5.9	6
Latvia	39.8	41.8	27.5	73.6	15.6	11.1	3.4
Luxembourg	51.1	40.3	16.6	44.3	8	3.6	4.3
Morocco	11.8	45.2	21.4	72.8	7.1	6.8	0.5
Netherlands	46.6	40.9	24.6	47.8	11.5	7	1.7
Norway	36.7	30.1	11.8	23.1	7.6	4.1	5.8
Oman	47.9	82.2	48.9	89.8	16	2.5	0.8
Panama	66.6	56.3	45.3	84.7	32.4	4.1	2.7
Poland	22	52.8	20.4	62	3.1	12.2	0.9
Qatar	37.6	77.5	27.7	56.6	17.2	6.1	6.6
Korea	10	68.6	5	32.9	13	16.1	1.5
Russian Federation	24.2	68.7	16.5	71.4	8.5	4.7	0.4
Saudi Arabia	60.8	86.9	53.2	89.5	17.3	5.1	1.1
Slovak Republic	33.6	38.3	32.4	73.8	13.9	6.5	2.5
Slovenia	44.6	39.7	21.6	72.2	6	7	5.2
Spain	32.3	32.3	17.4	72.3	5.2	6.7	0.8
Sweden	41.5	42.8	24.2	28.9	7.3	6	6.2
Switzerland	42.5	32.5	20.1	52	9.2	6.7	5.2
Taiwan	52.5	57.2	25.6	32.8	8.4	11.1	2.3
Togo	36.9	85.5	32.6	84.6	84.6	17.8	0.6
United Arab Emirates	52.4	77.7	47.6	74.7	15.4	2.5	1.7
United Kingdom	57.6	59.4	20.7	54.4	7.8	6.5	5.4
United States	68.2	66	28.6	50.2	15.4	9.9	4.8
Uruguay	31.7	41.4	25.9	80.1	21.9	5.1	0.2

Note: "I1: To make a difference, I2: Build great wealth, I3: Continue family tradition, I4: To earn a living, O1: Total early-stage Entrepreneurial Activity, O2: Established Business Ownership rate, O3: Entrepreneurial Employee Activity"

Appendix-4: Raw Data for DEA-4 Model

Country	I1	I2	I3	I4	O1	O2	O3
Angola	84.1	62.1	71.4	46	49.6	9.2	1.3
Austria	32.3	11.9	24.1	36.5	6.2	7.8	5.4
Brazil	63.2	52.1	63.7	58.3	23.4	8.7	4.5
Burkina Faso	73.1	13.9	28.7	8.2	23	12.4	0.3
Chile	73.5	55.2	56.5	52.9	25.9	6.1	3.2
Colombia	78.6	54.6	52.9	62.2	31.1	5.5	2.1
Croatia	39.7	15.9	40.7	29	12.7	4.2	6.4
Cyprus	43.7	29.2	38.5	38.8	8.6	7.3	6

Egypt	81.2	30.6	45	35.3	11.3	5.2	0.2
Germany	29.7	7.3	20.8	24.9	4.8	6.2	6.4
Greece	55.1	13	45.6	20.6	8.6	14.6	1.2
Guatemala	71.8	53.9	57.8	44.8	28.3	12.3	1.1
India	85.8	53.4	60.1	65.2	5.3	5.9	0.1
Indonesia	80.1	69.8	72	42.8	9.6	11.4	1.1
Iran	51.4	16.8	39.6	18.1	8	14.5	0.8
Israel	42.2	30.1	58.2	70.4	8.5	4.2	6.1
Italy	51.7	7.6	37.1	40.1	1.9	2.2	0.7
Kazakhstan	92.6	9.6	59.1	30.8	20.1	4.3	0.9
Kuwait	54.4	30.6	50.9	60.6	19.2	5.9	6
Latvia	36.1	7.9	22.7	32.9	15.6	11.1	3.4
Luxembourg	26.3	6.3	17.2	30.7	8	3.6	4.3
Morocco	70.9	16.9	43.5	18.2	7.1	6.8	0.5
Netherlands	21.5	16	25.9	41	11.5	7	1.7
Norway	18.8	7.5	17.8	37.8	7.6	4.1	5.8
Oman	47.6	62.4	66.5	60.1	16	2.5	0.8
Panama	78.6	63.2	54.1	64.1	32.4	4.1	2.7
Poland	55.6	12.8	47.4	35.3	3.1	12.2	0.9
Qatar	51.4	23.6	42.7	41.9	17.2	6.1	6.6
Korea	34	34	34.2	7.7	13	16.1	1.5
Russian Federation	61.2	13.4	40	20.5	8.5	4.7	0.4
Saudi Arabia	71	41.6	57.1	52.1	17.3	5.1	1.1
Slovak Republic	50.5	20.6	31.9	32	13.9	6.5	2.5
Slovenia	44.7	6.4	25.4	32.3	6	7	5.2
Spain	42.7	12.7	41.8	25.5	5.2	6.7	0.8
Sweden	23.7	10.5	17.9	17.9	7.3	6	6.2
Switzerland	40	9.8	21.6	24.2	9.2	6.7	5.2
Taiwan	39.8	8.1	15.5	43.2	8.4	11.1	2.3
Togo	89.8	27	50.7	50.7	84.6	17.8	0.6
United Arab Emirates	68.1	40.4	59.5	45.6	15.4	2.5	1.7
United Kingdom	38.5	22.1	32.9	49.4	7.8	6.5	5.4
United States	39.6	21.8	41.5	46.7	15.4	9.9	4.8
Uruguay	62.1	43.4	48.9	44.4	21.9	5.1	0.2

Note: "I1: Pandemic has led household income to decrease, I2: Know someone who started business due to pandemic, I3: Know someone who stopped business due to pandemic, I4: Pursue new opportunities due to pandemic, O1: Total early-stage Entrepreneurial Activity, O2: Established Business Ownership rate, O3: Entrepreneurial Employee Activity"

Appendix-5: Descriptive Statistics and Correlation for DEA-1 Model

Variables	Mean	S.D.	I1	I2	I3	I4	I5	I6	O1	O2	O3
I1	56.47	14.27	1								
I2	52.02	19.70	0.476**	1							
I3	53.40	18.95	0.108	0.644**	1						
I4	60.30	12.74	0.421**	0.597**	0.234	1					
I5	40.79	9.87	0.097	-0.019	-0.058	0.110	1				
I6	28.64	20.15	0.416**	0.551**	0.043	0.550**	-0.015	1			
O1	15.67	14.41	0.385*	0.382*	0.019	0.337*	0.045	0.595**	1		
O2	7.55	3.80	-0.163	-0.101	-0.283	0.112	-0.209	0.032	0.340*	1	
O3	2.81	2.27	-0.040	-0.311*	0.011	-0.289	0.064	-0.219	-0.219	-0.253	1

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Appendix-6: Descriptive Statistics and Correlation for DEA-2 Model

Variables	Mean	S.D.	I1	I2	I3	I4	I5	O1	O2	O3
I1	4.39	4.39	1							
I2	1.07	0.88	0.322*	1						

I3	1.78	1.78	0.657**	0.607**	1					
I4	0.41	0.38	0.326*	0.725**	0.636**	1				
I5	20.62	12.43	-0.372*	0.283	0.056	0.393*	1			
O1	15.67	14.41	0.578**	0.238	0.169	0.006	-0.465**	1		
O2	7.55	3.80	-0.118	-0.092	-0.225	-0.153	-0.259	0.340*	1	
O3	2.81	2.27	-0.031	0.389*	0.361*	0.392*	0.637**	-0.219	-0.253	1

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Appendix-7: Descriptive Statistics and Correlation for DEA-3 Model

Variables	Mean	S.D.	I1	I2	I3	I4	O1	O2	O3
I1	42.59	17.56	1						
I2	59.74	18.55	-0.065	1					
I3	30.07	14.21	0.614**	0.187	1				
I4	65.42	18.37	0.329*	0.281	0.529**	1			
O1	15.67	14.41	0.216	0.262	0.173	0.406**	1		
O2	7.55	3.80	-0.145	0.021	-0.112	0.009	0.340*	1	
O3	2.81	2.27	0.131	-0.271	-0.208	-0.450**	-0.219	-0.253	1

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Appendix-8: Descriptive Statistics and Correlation for DEA-4 Model

Variables	Mean	S.D.	I1	I2	I3	I4	O1	O2	O3
I1	54.68	20.17	1						
I2	27.28	19.32	0.587**	1					
I3	42.36	15.83	0.754**	0.812**	1				
I4	39.04	15.55	0.305*	0.630**	0.561**	1			
O1	15.67	14.41	0.547**	0.416**	0.400**	0.318*	1		
O2	7.55	3.80	0.101	-0.039	-0.035	-0.324*	0.340*	1	
O3	2.81	2.27	-0.609**	-0.280	-0.407**	0.094	-0.219	-0.253	1

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Appendix-9: BCC-O Analysis Findings for DEA-1 Model

Country	Objective	Efficient	Country	Objective	Efficient	Country	Objective	Efficient
Angola	0.86		Iran	1	Yes	Korea	1	Yes
Austria	1	Yes	Israel	1	Yes	Russian	1	Yes
Brazil	0.95		Italy	1	Yes	Saudi Arabia	0.40	
Burkina	0.73		Kazakhstan	0.93		Slovak Republic	1	Yes
Chile	0.74		Kuwait	0.97		Slovenia	0.90	
Colombia	0.77		Latvia	1	Yes	Spain	1	Yes
Croatia	1	Yes	Luxembourg	0.75		Sweden	1	Yes
Cyprus	1	Yes	Morocco	0.41		Switzerland	1	Yes
Egypt	0.82		Netherlands	0.80		Taiwan	1	Yes
Germany	1	Yes	Norway	1	Yes	Togo	1	Yes
Greece	1	Yes	Oman	0.27		United Arab	0.40	
Guatemala	0.75		Panama	0.84		United Kingdom	0.91	
India	0.38		Poland	1	Yes	United States	1	Yes
Indonesia	0.711		Qatar	1	Yes	Uruguay	0.48	

Appendix-10: BCC-O Analysis Findings for DEA-2 Model

Country	Objective	Efficient	Country	Objective	Efficient	Country	Objective	Efficient

Angola	1	Yes	Iran	1	Yes	Korea	1	Yes
Austria	1	Yes	Israel	0.99		Russian	0.32	
Brazil	1	Yes	Italy	1	Yes	Saudi Arabia	1	Yes
Burkina	0.88		Kazakhstan	1	Yes	Slovak Republic	0.59	
Chile	0.88		Kuwait	0.97		Slovenia	1	Yes
Colombia	0.59		Latvia	0.92		Spain	0.56	
Croatia	1	Yes	Luxembourg	0.69		Sweden	1	Yes
Cyprus	1	Yes	Morocco	0.60		Switzerland	0.91	
Egypt	0.81		Netherlands	0.57		Taiwan	0.99	
Germany	1	Yes	Norway	0.91		Togo	1	Yes
Greece	1	Yes	Oman	1	Yes	United Arab	0.38	
Guatemala	1	Yes	Panama	0.68		United Kingdom	0.94	
India	1	Yes	Poland	1	Yes	United States	1	Yes
Indonesia	1	Yes	Qatar	1	Yes	Uruguay	0.48	

Appendix-11: BCC-O Analysis Findings for DEA-3 Model

Country	Objective	Efficient	Country	Objective	Efficient	Country	Objective	Efficient
Angola	0.91		Iran	0.85		Korea	1	Yes
Austria	1	Yes	Israel	1	Yes	Russian	0.29	
Brazil	0.93		Italy	0.18		Saudi Arabia	0.37	
Burkina	0.73		Kazakhstan	1	Yes	Slovak Republic	0.91	
Chile	0.74		Kuwait	0.95		Slovenia	0.93	
Colombia	0.64		Latvia	1	Yes	Spain	1	Yes
Croatia	1	Yes	Luxembourg	0.73		Sweden	1	Yes
Cyprus	1	Yes	Morocco	1	Yes	Switzerland	1	Yes
Egypt	0.35		Netherlands	0.75		Taiwan	0.86	
Germany	1	Yes	Norway	1	Yes	Togo	1	Yes
Greece	1	Yes	Oman	0.27		United Arab	0.38	
Guatemala	0.88		Panama	0.76		United Kingdom	0.93	
India	0.34		Poland	0.87		United States	1	Yes
Indonesia	0.78		Qatar	1	Yes	Uruguay	1	Yes

Appendix-12: BCC-O Analysis Findings for DEA-4 Model

Country	Objective	Efficient	Country	Objective	Efficient	Country	Objective	Efficient
Angola	0.71		Iran	1	Yes	Korea	1	Yes
Austria	0.97		Israel	0.93		Russian	0.36	
Brazil	0.91		Italy	0.21		Saudi Arabia	0.37	
Burkina	1	Yes	Kazakhstan	1	Yes	Slovak Republic	0.60	
Chile	0.67		Kuwait	0.94		Slovenia	1	Yes
Colombia	0.59		Latvia	1	Yes	Spain	0.51	
Croatia	1	Yes	Luxembourg	1	Yes	Sweden	1	Yes
Cyprus	1	Yes	Morocco	0.46		Switzerland	0.91	
Egypt	0.30		Netherlands	1	Yes	Taiwan	1	Yes
Germany	1	Yes	Norway	1	Yes	Togo	1	Yes
Greece	1	Yes	Oman	0.40		United Arab	0.37	
Guatemala	0.75		Panama	0.68		United Kingdom	0.89	
India	0.33		Poland	0.84		United States	1	Yes
Indonesia	0.71		Qatar	1	Yes	Uruguay	0.40	

Appendix-13: Projections Value for DEA-1 Model

Country	I1	I2	I3	I4	I5	I6	O1	O2	O3
Angola	58.57	67.62	56.09	54.95	34.80	37.32	57.42	15.57	1.51
Brazil	64.43	36.82	41.40	51.61	43.40	25.52	24.38	9.07	4.69
Burkina Faso	51.64	58.52	44.00	55.26	26.34	35.10	42.40	16.80	1.13

Chile	65.80	46.70	46.10	54.15	45.06	31.66	34.70	9.96	4.29
Colombia	61.77	45.01	33.20	51.49	39.50	32.42	40.03	11.80	2.81
Egypt	34.90	40.88	42.67	44.62	41.60	18.17	13.71	11.72	2.11
Guatemala	55.13	60.40	48.80	56.68	30.58	34.61	45.71	16.20	1.45
India	37.76	38.53	31.33	53.36	32.58	20.30	13.92	15.50	1.33
Indonesia	40.71	45.18	34.89	53.28	14.84	26.00	14.12	16.02	1.55
Kazakhstan	43.30	48.63	36.82	53.65	17.50	28.56	21.51	16.30	1.39
Kuwait	57.61	62.60	54.67	63.40	43.16	39.50	19.59	6.34	6.12
Luxembourg	45.90	41.90	62.90	45.70	31.30	10.50	10.56	6.28	5.68
Morocco	42.30	47.44	35.96	53.46	16.44	27.78	19.01	16.24	1.42
Netherlands	44.18	35.36	47.68	43.60	38.30	13.10	14.21	8.65	3.23
Oman	62.17	75.79	62.47	61.74	42.80	46.46	58.25	13.22	2.91
Panama	52.60	47.20	53.65	51.29	38.19	24.13	38.36	11.50	3.20
Saudi Arabia	57.30	55.98	55.54	54.06	40.39	25.10	42.31	12.47	2.88
Slovenia	52.16	40.28	59.83	54.66	35.97	12.00	9.22	7.73	5.74
United Arab Emirates	55.13	59.28	59.95	54.70	38.44	29.30	37.57	10.69	4.15
United Kingdom	49.80	34.99	49.80	48.92	33.95	14.71	8.50	7.09	5.89
Uruguay	56.90	47.30	39.40	55.62	39.48	33.00	44.91	13.42	1.60

Note: "I1: Know someone who has started a new business, I2: Good opportunities to start a business in my area, I3: It is easy to start a business, I4: Personally have the skills and knowledge, I5: Fear of failure (opportunity), I6: Entrepreneurial intentions, O1: Total early-stage Entrepreneurial Activity, O2: Established Business Ownership rate, O3: Entrepreneurial Employee Activity"

Appendix-14: Projections Value for DEA-2 Model

Country	I1	I2	I3	I4	I5	O1	O2	O3
Burkina Faso	2.15	1.00	0.34	0.04	2.50	39.57	13.97	0.90
Chile	9.20	0.40	1.09	0.11	13.78	29.42	8.84	3.64
Colombia	8.05	2.01	3.99	0.20	8.04	51.94	12.13	3.51
Egypt	3.70	0.40	0.50	0.00	5.40	13.93	7.34	1.03
Israel	1.50	0.73	0.89	0.30	28.50	8.57	6.66	6.15
Kuwait	9.03	1.69	6.00	0.31	17.20	19.70	6.81	6.16
Latvia	4.60	1.18	1.62	0.47	21.20	38.13	11.94	3.66
Luxembourg	2.70	1.32	1.83	0.40	28.29	11.48	6.14	6.17
Morocco	1.40	0.20	0.37	0.01	8.60	11.76	11.26	1.04
Netherlands	1.50	1.23	1.23	0.43	23.54	20.15	12.27	2.98
Norway	2.20	1.00	1.50	0.35	28.80	8.27	6.12	6.31
Panama	8.51	1.98	4.51	0.21	9.00	47.18	11.30	3.93
Russian Federation	3.07	0.70	0.50	0.10	17.10	28.57	14.50	1.23
Slovak Republic	4.00	0.74	1.53	0.64	28.73	23.41	10.95	4.21
Spain	0.50	0.27	0.40	0.07	10.47	9.14	11.78	1.41
Switzerland	0.90	1.04	1.02	0.40	32.39	10.04	7.31	5.68
Taiwan	2.00	0.50	0.57	0.09	9.60	18.12	11.15	2.31
United Arab Emirates	7.39	2.10	4.10	0.31	13.89	40.18	9.87	4.44
United Kingdom	1.30	0.67	0.77	0.28	26.40	8.28	7.06	5.73
Uruguay	4.60	0.40	0.18	0.02	10.43	29.31	7.66	0.88

Note: "I1: Job expectations (expecting to employ six or more people in five years' time)., I2: International (25%+ revenue), I3: National scope (customers and products/ process), I4: Global scope (customers and products/ process), I5: Industry (% TEA in business services), O1: Total early-stage Entrepreneurial Activity, O2: Established Business Ownership rate, O3: Entrepreneurial Employee Activity"

Appendix-15: Projections Value for DEA-3 Model

Country	I1	I2	I3	I4	O1	O2	O3
Angola	65.3	63.8	37.3	89.5	49.6	9.2	1.3
Brazil	65.6	57.7	27.4	81.9	23.4	8.7	4.5
Burkina Faso	21.4	76.1	34	79.4	23	12.4	0.3
Chile	58.4	53.7	37.1	81.2	25.9	6.1	3.2

Colombia	62.9	61.7	37.1	77	31.1	5.5	2.1
Egypt	49.2	62.9	38.1	54	11.3	5.2	0.2
Guatemala	76.7	54.8	46.9	91.1	28.3	12.3	1.1
India	80.7	74.7	76.8	87.3	5.3	5.9	0.1
Indonesia	44.7	49.8	41.8	71.4	9.6	11.4	1.1
Iran	30.1	88.9	19	64.8	8	14.5	0.8
Italy	26.6	95.3	26.5	82.2	1.9	2.2	0.7
Kuwait	40.1	76	30.6	59.6	19.2	5.9	6
Luxembourg	51.1	40.3	16.6	44.3	8	3.6	4.3
Netherlands	46.6	40.9	24.6	47.8	11.5	7	1.7
Oman	47.9	82.2	48.9	89.8	16	2.5	0.8
Panama	66.6	56.3	45.3	84.7	32.4	4.1	2.7
Poland	22	52.8	20.4	62	3.1	12.2	0.9
Russian Federation	24.2	68.7	16.5	71.4	8.5	4.7	0.4
Saudi Arabia	60.8	86.9	53.2	89.5	17.3	5.1	1.1
Slovak Republic	33.6	38.3	32.4	73.8	13.9	6.5	2.5
Slovenia	44.6	39.7	21.6	72.2	6	7	5.2
Taiwan	52.5	57.2	25.6	32.8	8.4	11.1	2.3
United Arab Emirates	52.4	77.7	47.6	74.7	15.4	2.5	1.7
United Kingdom	57.6	59.4	20.7	54.4	7.8	6.5	5.4

Note: "I1: To make a difference, I2: Build great wealth, I3: Continue family tradition, I4: To earn a living, O1: Total early-stage Entrepreneurial Activity, O2: Established Business Ownership rate, O3: Entrepreneurial Employee Activity"

Appendix-16: Projections Value for DEA-4 Model

Country	I1	I2	I3	I4	O1	O2	O3
Angola	79.06	24.60	48.33	46.00	69.40	14.96	1.82
Austria	32.30	11.90	24.08	23.96	8.51	7.98	5.52
Brazil	51.05	23.21	43.23	45.39	25.59	9.51	4.92
Chile	63.39	24.66	45.20	44.65	38.25	9.75	4.73
Colombia	71.19	25.35	46.82	46.44	51.94	12.13	3.51
Egypt	69.82	29.51	44.79	35.30	58.96	17.19	0.92
Guatemala	71.80	27.36	46.31	42.54	60.71	16.20	1.45
India	85.80	27.50	49.52	47.62	79.47	17.68	0.66
Indonesia	71.01	27.18	46.22	42.80	59.59	16.02	1.55
Israel	42.20	16.69	33.42	34.69	11.94	6.14	6.52
Italy	37.82	7.60	23.24	32.78	13.68	10.28	3.76
Kuwait	53.14	23.75	43.06	42.30	20.25	6.63	6.33
Morocco	56.56	16.90	41.46	18.20	15.26	14.62	1.07
Oman	47.60	18.84	34.18	44.23	39.26	10.71	1.96
Panama	68.48	25.11	46.26	45.81	47.18	11.30	3.93
Poland	54.35	12.80	44.70	21.08	8.87	14.46	1.29
Russian Federation	61.20	13.40	32.19	20.50	23.42	12.95	1.31
Saudi Arabia	62.26	24.15	45.65	48.51	46.63	13.47	2.90
Slovak Republic	43.37	18.09	31.90	29.63	23.07	10.79	4.15
Spain	42.70	12.70	32.29	25.50	12.71	12.90	2.40
Switzerland	31.01	9.74	21.60	24.20	10.06	7.33	5.69
United Arab Emirates	64.83	24.79	45.50	44.98	40.78	10.19	4.50
United Kingdom	38.50	15.92	32.72	35.78	11.23	7.22	6.00
Uruguay	62.10	21.95	39.75	44.40	54.29	13.28	1.50

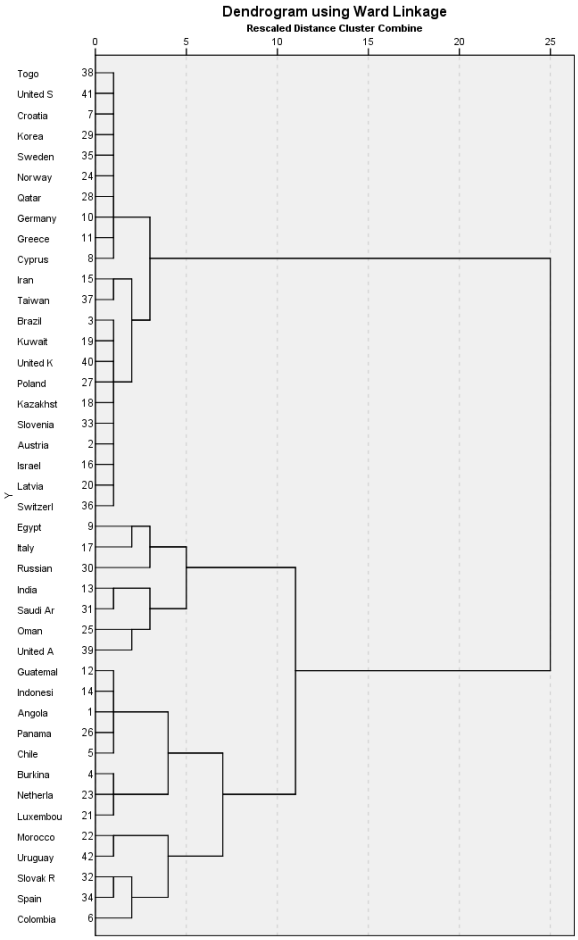
Note: "I1: Pandemic has led household income to decrease, I2: Know someone who started business due to pandemic, I3: Know someone who stopped business due to pandemic, I4: Pursue new opportunities due to pandemic, O1: Total early-stage Entrepreneurial Activity, O2: Established Business Ownership rate, O3: Entrepreneurial Employee Activity"

Appendix-17: Efficiency Scores for Hierarchical Clustering Analysis

Country	Efficiency Scores				Country	Efficiency Scores			
	DEA-1	DEA-2	DEA-3	DEA-4		DEA-1	DEA-2	DEA-3	DEA-4
Angola	0.86	1	0.91	0.71	Morocco	0.41	0.57	1	0.46

Austria	1	1	1	0.97	Netherlands	0.80	0.91	0.75	1
Brazil	0.95	1	0.93	0.91	Norway	1	1	1	1
Burkina Faso	0.73	0.88	0.73	1	Oman	0.27	0.68	0.27	0.40
Chile	0.74	0.88	0.74	0.67	Panama	0.84	1	0.76	0.68
Colombia	0.77	0.59	0.64	0.59	Poland	1	1	0.87	0.84
Croatia	1	1	1	1	Qatar	1	1	1	1
Cyprus	1	1	1	1	Korea	1	1	1	1
Egypt	0.82	0.81	0.35	0.30	Russian Federation	1	0.32	0.29	0.36
Germany	1	1	1	1	Saudi Arabia	0.40	1	0.37	0.37
Greece	1	1	1	1	Slovak Republic	1	0.59	0.91	0.60
Guatemala	0.75	1	0.88	0.75	Slovenia	0.90	1	0.93	1
India	0.38	1	0.34	0.33	Spain	1	0.56	1	0.51
Indonesia	0.711	1	0.78	0.71	Sweden	1	1	1	1
Iran	1	1	0.85	1	Switzerland	1	0.91	1	0.91
Israel	1	0.99	1	0.93	Taiwan	1	0.99	0.86	1
Italy	1	1	0.18	0.21	Togo	1	1	1	1
Kazakhstan	0.93	1	1	1	United Arab Emirates	0.40	0.38	0.38	0.37
Kuwait	0.97	0.97	0.95	0.94	United Kingdom	0.91	0.94	0.93	0.89
Latvia	1	0.92	1	1	United States	1	1	1	1
Luxembourg	0.75	0.69	0.73	1	Uruguay	0.48	0.48	1	0.40

Appendix-18: Dendrogram Diagram



Etik Beyanı : *Bu çalışmanın tüm hazırlanma süreçlerinde etik kurallara uyulduğunu yazarlar beyan eder. Aksi bir durumun tespiti halinde ÖHÜİİBF Dergisinin hiçbir sorumluluğu olmayıp, tüm sorumluluk çalışmanın yazar(lar)ına aittir.*

Bu çalışmada kullanılan veriler, herkesin kullanımına açık şekilde paylaşıldığından ve etik kurul izni gerektiren araştırmalar içerisinde bulunmadığından etik kurul izni alınmamıştır.

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Çıkar Beyanı : *Yazarlar arasında çıkar çatışması yoktur.*

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