

## 국가 정책에 의한 창업 서비스 생태계 유형 연구: K-평균 군집분석을 중심으로\*

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## Study on the Types of Entrepreneurship Service Ecosystems by National Policy: Focusing on K-means Clustering Analysis

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## Abstract

The purpose of this study is to propose useful implications for policies related to the construction of Entrepreneurial Ecosystems (EE) from the perspective of government services. To define the distinctive characteristics of EE on a global scale for positioning nations, this paper adopts K-means cluster analysis. Thus, to specify efficient policies, this paper analyzes and compares the entrepreneurial policies of representative countries in clusters. K-means clustering analysis with an optimal number of K indicates that the USA, China, and India are star-performing nations generating superior unicorns, while the USA, Finland, Denmark, and others have extraordinary GEI performance compared to other nations. To analyze the political aspect of the nations, this paper re-positions countries according to standards of governmental support and private business service sector and classifies the US in the company-led cluster and China in the government-led cluster. Although the star-performing nations have policies covering multiple environmental aspects, their policies over social and technological aspects are outstanding. Superior EE contributes to outstanding unicorn companies, and the quality of EE can be formulated through effective governmental policies and services, as seen in the case of the government-led cluster. While outstanding companies and industrial clusters can formulate company-led EE, as in the US, China, and India, governments' policies on providing social and economic infrastructures to entrepreneurs can be considered as contributing to constructing fair EE.

*Keywords* : Entrepreneurship, Government Service, Entrepreneurship Ecosystem  
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## I. Introduction

Entrepreneurship is a crucial factor in improving a country's economic

competitiveness. Thus, entrepreneurship has been highlighted as a means to lead the economy of emerging countries by promoting innovative small and medium enterprises (SMEs) (Karadag, 2016). Though Karadag's study verifies that the global economic crisis caused severe crises for SMEs by reducing global demand, testing the resilience of EE, it also indicates that EE has a positive and significant contribution to economic resilience in the long term. Likewise, the global pandemic issues evoked in December 2019 constrained demand and supply in the global market and caused severe suffering to national economies by limiting the activities of entrepreneurs and testing the survival capabilities of numerous SMEs (Caballero-Morales, 2021). Thus, the role of the government has been emphasized under the global crisis circumstance to support the sustainability of SMEs so that they can overcome the critical situation based on the macro-policies of the government.

However, not only as a method to overcome the impact of Covid-19 but also to construct a business-familiar ecosystem is the interest of the government. Thus, numerous countries have been investing in constructing robust entrepreneurial ecosystems (EE) proactively (Fuller-Love and Akiode, 2020). Likewise, governments around the world have recognized the importance of entrepreneurship, and provide various forms of aid to support the development of EE in the multiple aspects of politics, economy, society, technology, environment, and legislation. However, the effectiveness and validity of these policies are often controversial since the previous studies on EE and frameworks to evaluate the performance are not sufficient due to the difficulties of measures. However, the development of the big data field improves the accessibility to the recent, massive, and wide data from worldwide which allows the public to measure the performance of national policies indirectly. Thus, this paper aims to suggest measuring the position of the national EE compared to the other countries through big data so that government can identify the strength and limitations of their EE and reflect them onto their further EE policy design. Moreover, since this paper focuses on governmental services as a policy provider, this paper also aims to classify the EE types based on who takes a major role in leading EE. Based on the visualization result, this paper analyzes the representative policies of selected countries that have outstanding EE to provide benchmarkable insights about how they manage EE policies and which policies can be regarded as significant to enhance EE.

## II. Conceptual Background

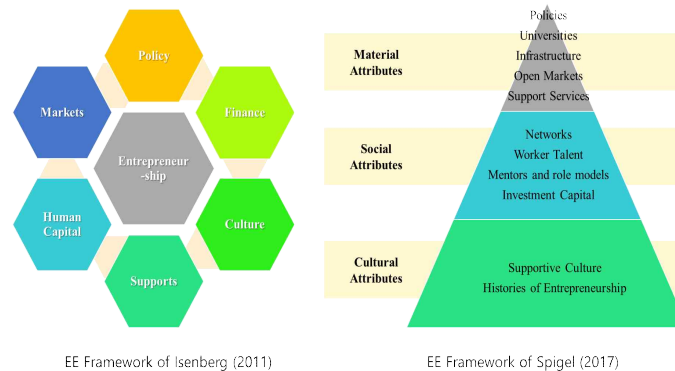
### 2.1. Entrepreneurial Ecosystem Framework

The Entrepreneurial Ecosystem (EE) is generally defined as the interactive business ecosystem that focuses on incubating and accelerating the ventures (Liguori et al., 2019). On the perspective of supporting business activities, EE is similar to the business ecosystem described as the wholistic ecosystem influencing the overall operation and management of business under the business cycle by Moore (1993). However, Isenberg (2010) differentiate EE, which is also expressed as start-up ecosystem, since it primarily considers the emergence and growth of the ventures which can generate distinctive value based on its innovativeness. Isenberg's EE framework examines how ecosystem's resources such as policy, market, finance, culture, human capital, and others stimulate the emergence of innovative entrepreneurs (Isenberg, 2011). After the studies of the Isenberg, there are various attempts to examines major components of EE and verify their contribution to the performance. On the empirical study of Spigel (2017) analyzing the Canadian case, it defines the EE framework constructed by cultural, social, and materialistic attributes and insists their interaction with entrepreneurs constantly improves the EE.

The EE framework of Isenberg and Spigel's studies emphasizes the role of the policies, support services, and infrastructures that can be provided by the government as <Figure 1>. However, those models also include the contribution of the financial, enterprise network, and others which are the private market area. From the perspective of national competitiveness, EE also has adhesive relation with economic competitiveness in the business context. Thus, the government and the market are frequently discussed as the major drivers of economic growth. Likewise, the main leader who leads the economic growth and their performance has been continuously discussed and generally, depends on the government investment and their intervention level to the market, the national economy, and their business ecosystem has been categorized into market-led and government-led (Subramaniam and Kasipillai, 2007). Thus, the previous studies on EE also denote the importance of the government, the market, and their cooperation. Similarly, Yim et al. (2006) examine the dynamics of the venture ecosystem from the perspective of economic policy promoting investment to enhance

the venture quality. Likewise, government and market have a mutual-beneficiary relationship as the government can support the business activities and also can expect to enhance national benefit through promoting employment, economy, infrastructures, and others (Park et al., 2012).

<Figure 1> Entrepreneurship Ecosystem Framework of Isenberg and Spigel



## 2.2. Entrepreneurial Ecosystem Performance Measurement

To enhance the quality of EE and policies to support it, there are several evaluation methods to measure the performance of EE. Kim et al. (2021) develop indexes to measure the EE under the biological principles and Liguori et al. (2019) develop a multi-dimensional measurement to evaluate EE to define the relationship between the innovative cluster and regions. Also, global institutions such as Global Entrepreneurship Monitor (GEM) and Global Entrepreneurship and Development Institute (GEDI) evaluate the global EE. GEDI releases the annual Global Entrepreneurship Index (GEI) based on the entrepreneurs' aspirations, abilities, and attitudes variables within institutional and individual levels reflecting the compiled national economic activity of nations (GEDI, 2019). In contrast to GEDI, GEM compares entrepreneurship among countries through the EE Quality Composite Index (ESI). ESI analyzes a sequence of how national conditions impact entrepreneurship under the social, cultural, political, and economic context, regarding entrepreneurial output as new jobs, value-creation of the company, social-economic development outcomes of the nations, and how it re-influence into other environmental factors through the national expert survey (GEM, 2022).

However, as indicated in the OECD's case study about the national policies for EEs, still various governments struggle to construct a competitive EE to cultivate innovative entrepreneurs and unicorn companies (Mason and Brown, 2014). Thus, to suggest the measurement method using the immediate big data opened to the public, Lee and Cho (2022) develop the EE models using open-source data from United Nations Development Programme, Organization for Economic Cooperation and Development, World Bank, GEM, CB Insights, and GEDI. Based on the Multiple Linear Regression model (MLR), this model examines that social, technological, and economic factors have a positive contribution to the EE performances, the number and value of the unicorn companies and GEI (Lee and Cho, 2022). However, Lee and Cho's study indicate that among financial variables, the financial factors increasing the liability of the company can have a negative impact on the performance of EE (Lee and Cho, 2022). Based on Lee and Cho (2022)'s three EE models which have high explanation power, this paper conducts K-means clustering and policy comparison to explore the quality of EE from the perspective of government service, regarding the importance of the political supports denoted in both Isenberg and Spigel's EE framework.

### III. Methodology

Referring to the research on the EE framework and its performance measurement method, this paper sets major EE factors using the PESTLE framework to analyze overall external environments surrounding EE. Thus, this paper regards the number (UNIC) and value of the unicorn companies (UNIV) and GEI of the nations as major performance indexes as verified in a previous study named M1, M2, and M9, having fair adjusted R-square values of 0.877, 0.882, and 0.77 (Lee and Cho, 2022). Thus, this paper utilizes the annual data retrieved as <Table 1>, using the data from 2000 to 2022 which is preprocessed through imputing missing data and selecting variables with VIF less than 10.

<Table 1> Variable Description Table of EE Models

Var.	Description	Source	Var.	Description	Source
<b>Identifier</b>			<b>Social</b>		
REG	Region	WB	EODBS	Ease of doing business	GEM
INC	Income group	WB	UP	Urban population	GEM
CC	Country code	WB	POP	Population aged 25-64	GEDI

				years thousands	
CN	Country name	WB	POPGR	Population growth annual	GEDI
REG	Region	WB	HDI	Human Development Index	GEM
INC	Income group	WB	PC	Perceived capabilities	GEM
YR	Year	WB	FOF	Fear of failure rate	GEM
<b>Politics</b>			MI	Motivational Index	GEM
GSP	Governmental support & policies	GEM	FM	Female Male TEA ratio	GEM
TB	Taxes & bureaucracy	GEM	BSS	Business Services Sector	GEM
<b>Economic</b>			HSSE	High Status to Successful Entrepreneurs	GEM
CAB	Current account balance	WB	EAGCC	Entrepreneurship as a Good Career Choice	GEM
TCG	Technical cooperation grants	WB	BSET	Basic school entrepreneurial education and training	GEM
FDI	Foreign direct investment	WB	PSET	Post school entrepreneurial education and training	GEM
GDPGR	GDP growth annual	WB	CPI	Commercial and professional infrastructure	GEM
GDPPC	GDP per capita	WB	IMD	Internal market dynamics	GEM
GDE	Gross domestic expenditure	WB	IMO	Internal market openness	GEM
GERDR FTE	GERD per researcher FTE	WB	PSI	Physical and services infrastructure	GEM
GERDR HC	GERD per researcher HC	WB	CSN	Cultural and social norms	GEM
GEE	Government expenditure on education	WB	OP	Opportunity Perception	GEI
<b>Technology</b>			SS	Startup Skills	GEI
ATR	Air transport	GEM	RA	Risk Acceptance	GEI
FBS	Fixed broadband subscriptions	GEM	NET	Networking	GEI
SIS	Secure Internet servers	GEM	CS	Cultural Support	GEI
RD	R&D transfer	GEM	OS	Opportunity Startup	GEI
RFTE	Researchers FTE	OECD	TA	Technology Absorption	GEI
RHC	Researchers HC Total	OECD	HC	Human Capital	GEI
RPTTE FTE	Researchers per total employment FTE	OECD	COMP	Competition	GEI
RPTTE HC	Researchers per total employment HC	OECD	PDI	Product Innovation	GEI
<b>Regulation/Legitimacy</b>			PCI	Process Innovation	GEI
TSDRG	Time spent dealing with	WB	HG	High Growth	GEI

	regulation requirements				
TRS	Time required to start a business	WB	INT	Internationalization	GEI
SPB	Start up procedures to register a business	WB	RC	Risk Capital	GEI
<b>Outcomes</b>					
UNIV	Unicorn Valuation	CB	GEI	Global Entrepreneurship Index	GEDI
UNIC	Unicorn Company	CB	Data with 5830 obs, 65 variables (N=378,950)		

Similar to the study of Costa e Silva et al. (2021) which analyzes the European EE through clustering analysis, this paper adopts K-means clustering analysis can differentiate the clusters and indicates the features of the clusters statistically and visually. Thus, this paper re-scales the data in <Table 1> to promote comparison among clusters, based on the Euclidean distance calculated through Formula 1 (Suwanda et al., 2020), and repeats the process until it finds homogeneous cluster groups making the distance into minimum as Formula 2 (Coates and Ng, 2012). Thus, the national EE can be categorized into homogeneous clusters by predetermined K. Using the elbow method number of K can be determined based on the immediate decreasing point of the inertia which means the sum of the cluster distance (WSS) as Formula 3 (Gustriansyah et al., 2020). Though in contrast to the hierarchical model, the K-mean model has a limitation of setting the value of K before conducting the K-mean algorithm, to define distinctive characteristics of clusters and mapping on a two-dimensional graph for visible comparison, this paper selects the K-mean clustering method. To evaluate the performance of the K-means clustering model, this paper utilizes the AUC-ROC curve and regards the K-means model below 0.7 as inferior since AUC over 0.7 is generally considered acceptable (Bowers and Zhou, 2019). For K-means Clustering Analysis, this paper uses the kmean and fviz\_cluster packages and for AUC-ROC analysis, this paper adopts the AUC package supported in R 4.2.0.

$$d_{ij} = \sqrt{(\sum_{k=1}^n (\chi_{ik} - \chi_{jk}))^2} \text{ (Formula. 1)}$$

$$C_i : = \arg \min_j \|\chi_i - \mu_j\|^2 \text{ (Formula. 2.a)}$$

$$\mu_j : = \frac{\sum_{i=1}^m 1\{C_i = j\} \chi_i}{\sum_{i=1}^m 1\{C_i = j\}} \text{ (Formula. 2.b)}$$

$$WSS = \sum_{i=1}^{N_c} \sum_{\chi \in C_i} d(\chi, \bar{\chi}_{C_i})^2 \text{ (Formula. 3)}$$



Based on the K-mean clustering analysis, this paper identifies the EE types and their features. Moreover, to define the main leader of constructing EE, this paper constructs the comparative positioning maps. Also, focusing on the EE with superior performance, this paper analyzes the distinctive policies of the representative countries as <Figure 2>.

<Figure 2> Research Process Scheme

Steps	Contents
Step1. Literature Review	Research of EE Framework and Performance
↓	
Step2. EE Framework Selection	Select models having number(UNIC, M1) and value(UNIV, M2) of unicorn companies and GEI(M9) as performance index whose $R^2$ is over 0.75
↓	
Step3. Data Collection	(1) Missing Value Imputation , (2) VIF < 10
↓	
Step 4. K-means Clustering Analysis	Conduct K-means clustering for full & step-wised model
↓	
Step 5. Comparative Politics Mapping	Classify EE by the major service provider (Company-led, Cooperative, Developing, Government-led)
↓	
Step 6. Comparative Politics	Comparing representative policies of the nation representing each cluster which has superior EE performance

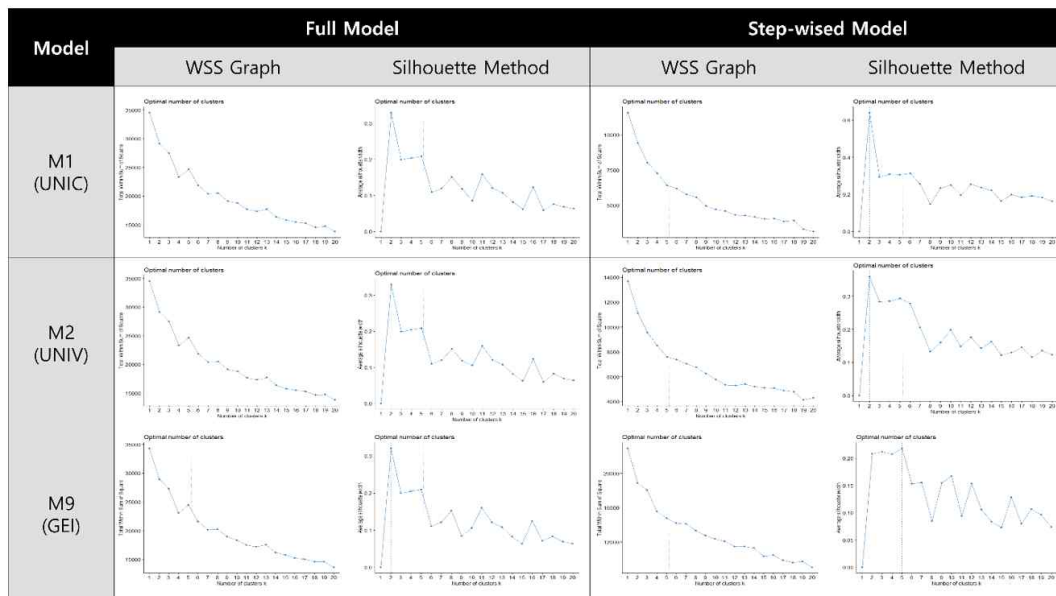
## IV. Result

### 4.1. K-means Clustering Analysis

To define the K-folds, this paper utilizes the elbow method as <Figure 3>, which sets an immediate decreasing point of WSS (Within-Cluster Sum of Square) as a K value by testing the sequence of K values (Abidar et al., 2020). <Figure 3> contains both the full and step-wise models to compare how the overall PESTLE components and the significant variables make a difference among clusters. However, since model 1 (M1) and 2 (M2) has optimal K number as 2, it is hard to segregate the detailed difference between cluster. Thus, using the Silhouette Coefficient method

additionally, this paper decides to use the number of clusters which has a secondly high score which is  $K=5$ . This is also for the coincidence with model 9 (M9) which has 5 clusters as the optimal number.

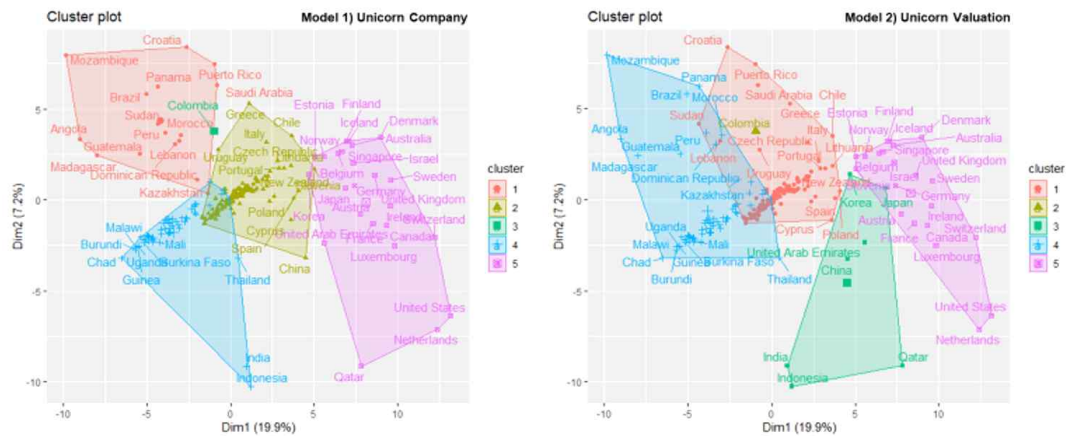
<Figure 3> WSS and Silhouette Coefficient Graph for M1, M2, and M9



Therefore when conducting clustering analysis with  $K$  value 5, models 1 and 2's full data cluster has results as <Figure 4>. Cluster 2 in model 1 has the lowest number of unicorn companies, and cluster 5 is the opposite. The cluster with the superior number of unicorn companies such as the United States, United Kingdom, France, Japan, and other countries, including many Northern European countries, has a foreign attractive economy, actively invests in technology, has a fair entrepreneurship level, stable social factors and fluent governmental supports like supporting program though it is revealed as not significant in the confidence level of 95%. However, in contrast to the first clustering analysis, in model 2, Korea and Japan categorize into Chinese and Indian clusters, separating from the United States and Northern European clusters. This model has similarities with the cultural cluster. For instance, cluster 3 in model 2 is mostly formed in nations which has high-risk avoidance, communitarianism, and conservative cultural norm including Confucian countries, UAE, India, Indonesia, etc. However, this different categorization between

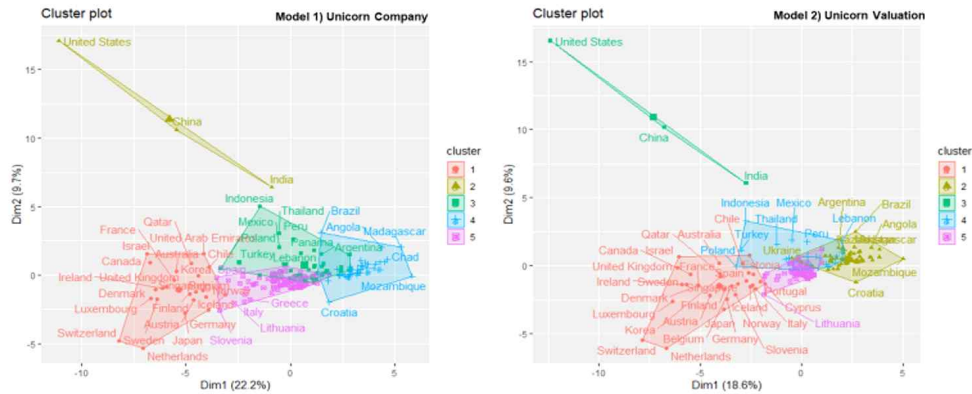
UNIC and UNIV can imply that though the overall EEs of the nations are quite similar, the step-wise EEs constructed with significant variables determine the quality of the unicorns, not only limited to the number of unicorn companies but considering their economic value and having different cluster components.

<Figure 4> Full Data K-means Clusters Based on M1 (Left) and M2 (Right)



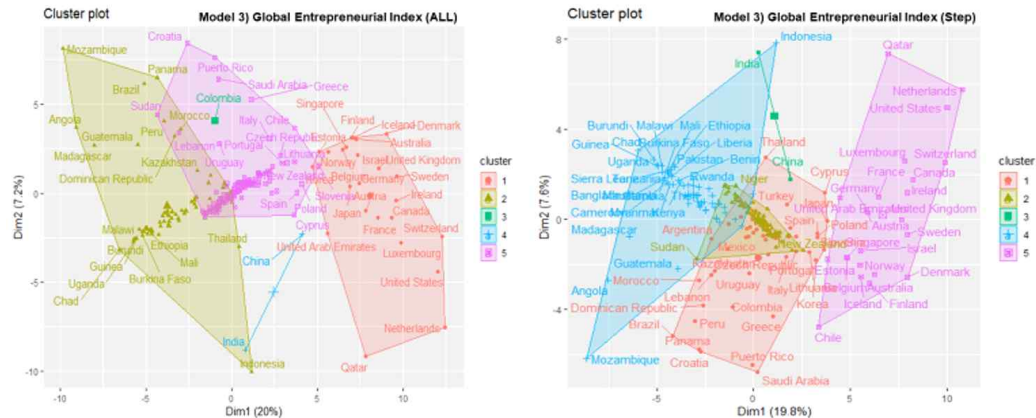
However, conducting clustering analysis with the step-wised variable model which is assumed as containing significant EE variables, has considerably different results from <Figure 5>, by categorizing the United States, China, and India in the same cluster. However, since these countries have various valuable and innovative unicorn companies, more focusing on the performance dimension, this clustering method also seems reasonable despite the overall entrepreneurship ecosystems being quite heterogeneous as <Figure 5>.

<Figure 5> K-means Clusters with Step-wised M1 (Left) and M2 (Right)



The centroid of clusters, the star performing cluster 2 of US, China, and India has similar characteristics to cluster 1, it has fewer financial resources of loans. Instead, it has a high technological and fair social perception of entrepreneurship.

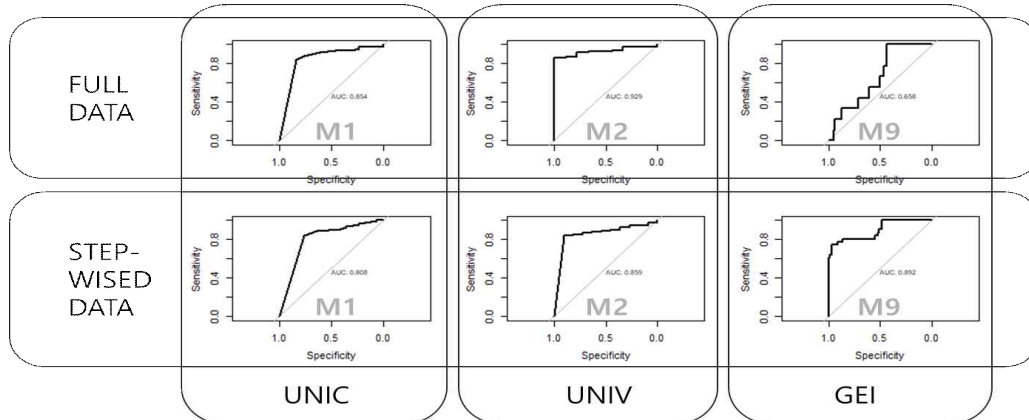
<Figure 6> K-means Clusters Based on M9 (Left) and Step-wised M9 (Right)



However, in contrast to Figures 4 and 5, the clustering analysis model for Model 9 which is targeting GEI classifies China and India as the same cluster as Korea, Singapore, United States, Japan, United Arab Emirates (UAE), and other Northern European nations as the same cluster. Thailand, Brazil, Mozambique and etc. categorize in the same cluster, and Italy, Spain, and Greece become a homogeneous cluster. However, when using the step-wise data on the right, Korea is re-categorized into

the Turkey, Croatia, Poland, Spain, and Japan clusters separated from the star-performing class. Since the cluster model with step-wise data has more predictive performance regarding the AUC value, this implies that Korea has a slight discrepancy in entrepreneurship ecosystem quality with a star-performing cluster which contributes to entrepreneurship significantly though it seems like advanced within the overall environment factor. The USA, Korea, Japan, and other advanced countries were in the same group, cluster 1. It has high research and development following China and India. Therefore, it has a high social entrepreneurship infrastructure compared to the other clusters by having high-risk acceptance, networking, and others. Cluster 5 with India and China has high social infrastructure such as risk acceptance, networking, and so on, has low debt, and private business sectors indicated as BSS. Though the clustering models in <Figures 4–6> look similar, referring to the ROC curve in <Figure 7> to measure the predictability performance of each cluster model, the model with significant variables under the step-wise regression model indicates improved AUC.

<Figure 7> ROC curve and AUC for clustering analysis performance evaluation



Thus, this paper summarizes the result of the cluster analysis with superior AUC comparing full and step-wise models in <Table 2>. Though there are minor differences, the cluster components and the number of clusters in both unicorn company (M1) and unicorn company valuation (M2) have high similarities. Therefore, except for the GEI (M9) which has a quite heterogeneous result with other models, this

paper sums up the result by indicating differences between models 1 and 2 with bold italics. Those clusters can be summarized into the star, fair, medium, and low performers based on the target variables. However, on the GEI result, cluster 3 and 4 indicates a high tendency for government-led by having high government support.

<Table 2> Cluster Means Summary of Clusters with higher AUC

Model	Cluster	Nations	Characteristic
Unic (M1) <i>Univ</i> (M2)	Cls 1 <i>Cls 1</i>	Korea, Japan, UAE, Canada, UK, Israel, etc.	<b>Fair Performer</b> , Stable Economy, Superior Social Infrastructure, High Research & Commercial Infrastructure Investment, Stable Social Norm, Low SME Bankruptcy, etc.
	Cls 2 <i>Cls 3</i>	USA, China, India	<b>Star Performer</b> , More Import (Fair Domestic Market), Attractive Economy, Superior Social Infrastructure, High Private Business Service Sector, High Investment On Research & Commercial Infrastructure & Discrete Social Norm, Strong Networking Infrastructure, High GEI, Low Entrepreneurial Finance, High SME Bankruptcy, etc.
	Cls 3 <i>Cls 4</i>	Indonesia, Mexico, Thailand, etc.	<b>Medium UNIC/UNIV</b> , Fair Economy, Instable Society, Passive Investment On Research And Development, Inferior technological Infrastructure, Low risk Acceptance, Low entrepreneurship, etc.
	Cls 4 <i>Cls 2</i>	Croatia, Brazil, Chad, etc.	<b>Low UNIC/UNIV</b> , Instable Society, Passive R&D Investment, Low Entrepreneurship, Low Risk Acceptance, High Liability Dependent Entrepreneurial Finance, etc.
	Cls 5 <i>Cls 5</i>	Italy, Greece, Slovenia, Lithuania, etc.	<b>Medium UNIC/UNIV</b> , High Liability Dependent Entrepreneurial Finance, Ease to Satisfy Government Requirement for Business, etc.
GEI (M9) <i>GEI</i> (Step wised M9)	Cls 1 <i>Cls 5</i>	Korea, Japan, Greece, Italy, Croatia, etc.	<b>Fair Performer</b> , Fair to do the business, fair human development level, conservative society, High investment on technology, concrete social norm
	Cls 2 <i>Cls 3</i>	Niger, Sudan, etc. <i>Colombia Only</i>	Low entrepreneurship, hard to do business, instable society, lack of innovation and passive investment on R&D
	Cls 3 <i>Cls 4</i>	China, India	<b>Government-led</b> , Fair to do the business, high governmental support on entrepreneurial financing, high R&D investment
	Cls 4 <i>Cls 2</i>	Uganda, Angola, etc.	<b>High entrepreneurship, instable society</b> but high encouragement on entrepreneurship, low technological innovation and R&D investment, but has fair commercial and legal infrastructure and perceived opportunity
	Cls 5 <i>Cls 1</i>	USA, UK, Denmark,	<b>Star Performer</b> , Ease to do the business, Low Entrepreneur Financing, Respectful toward entrepreneurs.

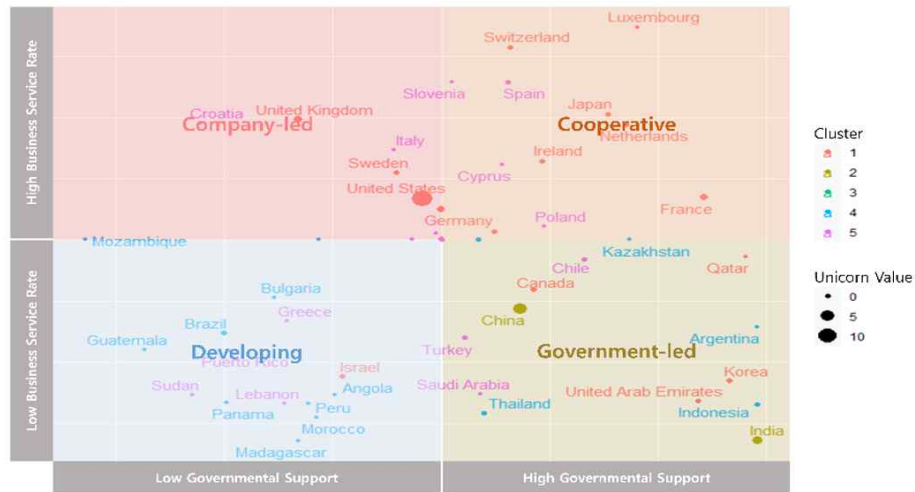
		Germany, etc. <i>Korea, Japan</i>	Advanced Economy, High risk acceptance, networking, and social infrastructure, High investment on R&D
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## 4.2. Comparative Politics

To examine the political impact on EE, this paper analyzes the representative EE policies. However, the construction of EE does not only depend on government policy but also relies on market infrastructures. Mercan and Goktas (2011) denote that an innovative ecosystem cannot be governed by public policies but can be influenced by dynamics among institutions, policies, market conditions, culture, and so on. Considering those mutual interactions, this paper conducts comparative policy analysis referring to the quantitative graph which has high governmental support (GS) and a superior business environment by having a high private business service sector (BSS) as <Figure 8>. This quadrant graph in <Figure 8> is defined as governmental-led, company-led, cooperative, and developing clusters as well. The governmental-led cluster has high governmental support and low private business and China, India, Korea, Canada, etc., are categorized in the fourth quadrant. The second quadrant, which is a company-led cluster, has superior business service in the private dimensions including the United States, United Kingdom, Sweden, and Germany. The first quadrant has high governmental support and also has superior support from the private business service sector, though the unicorn company is not superior to other clusters, it includes companies with stable performance such as Japan, Luxembourg, Netherlands, and others including a considerable amount of nations from Northern European Cluster.

In the following section, analyzing the major policies of the countries, this paper selects companies having superior EE performance regarding UNIC, UNIV, and GEI compositely. However, the countries categorized in the developing cluster are excluded as their EE performances are relatively low and their policies are dynamic due to the attempts to enhance their EE performances.

<Figure 8> Entrepreneurship Ecosystem Political Cluster Positioning Map



#### 4.2.1. Government-led: India, Korea, China

As in <Figure 8>, India, Korea, and China are categorized in the government-led cluster. Those countries denote superior government service to construct EE infrastructure. The government-led cluster supports EE through government-leading initiatives, policies, and legislation. Also, they manage their EE policies through the government department and channels communicating with entrepreneurs and the public.

For instance, India's entrepreneurship policy is currently led by a governmental initiative, named "Start-up India." The prime minister of India, Narendra Modi on August 15, 2015 (Jain, 2016). This entrepreneurship policy focuses on 1) Financial support and incentive, 2) Simplification and hand-holding, and 3) Entrepreneurship Incubation and Industry-Academia Partnership\*. India's government empowers the Department of Industry and Internal Trade Promotion (DPIIT) to manage the entrepreneurship policy with other government departments.

Also, China, the representative government-led country, manages its EE under its short-term, mid-term, and long-term economic strategies. By the lead of Li Keqiang, the premier of the State Council of China, Chinese entrepreneurship has

\* Government of India. <https://www.startupindia.gov.in/content/sih/en/government-schemes.html>



been stimulated from October 27th, 2013 under the “Outline of the Twelfth Five-Year Plan for National Economic and Social Development of the People's Republic of China (中华人民共和国国民经济和社会发展第十二个五年规划纲要).” Thus, the Chinese EE is politically constructed in 2015 under the initiative of “Mass Entrepreneurship and Innovation(大众创业、万众创新)” and has been discussed up to now under the Fourteenth Five-Year Plan from 2021 to 2025 (Chinese Government Network, 2014). This policy aims to improve national industry competitiveness by constructing innovative EE corresponding to the rise of the sharing economy and information technology.\* Chinese Mass Entrepreneurship and Innovation (MEI) focuses on 1) cultivating entrepreneurial culture, 2) supporting financial and technological resources, and 3) constructing EE through ensuring social infrastructure and alleviating regulations. Also, MEI has been managed by the State Council and performed with the cooperation of the other government ministries.†

Korean EE has formed from 1986 through the Korean government legislated the “Support For Small And Medium Enterprise Establishment Act.” Under the Ministry of SMEs and Start-ups (MSME), this Act led to two times of venture booms in 2000 and 2020. Compared to the first venture boom which generated 61,456 companies, in 2020, 123,305 companies have been generated corresponding to the growth of the EE. Also, the “Support For Small And Medium Enterprise Establishment Act” aims to stimulate the establishment of SMEs and construct a wholesome industrial structure for economic growth. Not only focusing on scaling up the EE but MSME indicates that the policy's purpose is to enhance EE quality and contribution of government to improving EE. Based on the Act, the EE policy focuses on creating entrepreneurship incubators, constructing innovative clusters, increasing entrepreneurial infrastructure, supporting the commercialization of innovative ideas, and cultivating competitive technology through stimulating entrepreneurship. The Korean EE policy struggles to transmute from quantitative growth to qualitative growth by cultivating innovative technology. Thus, in addition to the cultural and educational support to enhance the public

\* Chinese Government Network (2014.12.29). Full record of mass entrepreneurship and innovation. Retrieved from [http://www.gov.cn/xinwen/2014-12/29/content\\_2798382.htm](http://www.gov.cn/xinwen/2014-12/29/content_2798382.htm)

† Chinese Government Network (2014.12.29). Full record of mass entrepreneurship and innovation. Retrieved from [http://www.gov.cn/xinwen/2014-12/29/content\\_2798382.htm](http://www.gov.cn/xinwen/2014-12/29/content_2798382.htm)

perception of entrepreneurship, Korean EE has multiple aspects of policies such as supporting technology-based start-ups, constructing entrepreneurial infrastructure which can provide transparent and obvious information, expanding sales channels, providing financial support, reducing regulation, etc (Support For Small And Medium Enterprise Establishment Act, 2022). Furthermore, by constructing a council, the Korean government has a system to explore the problem of EE and respond rapidly to emergent issues or trends and struggles to provide integrated service to support the commercialization of innovative ideas with projects such as the "Initial Start-up Package\*."

Likewise, the government-led EE has political or legal bases and is managed by government ministries, leading the continuous support to entrepreneurs. Furthermore, EE policies of government-led clusters are provided through national official channels and it allows entrepreneurs and the public access to the concrete policy and resources from this policy through the integrated portal websites. For instance, the Indian government supports start-ups to connect with local incubators, accelerators, mentors, government departments, and investors through "Start-up in India", websites. This website also provides online courses for entrepreneurs and a start-up guidebook for potential entrepreneurs. Moreover, "Start-up in India" allows start-ups to register themselves to DPIIT so that they can receive tax exemption benefits and reduce the regulatory burden with self-regulatory compliance verification online. Patent and IPR applications, public procurement, and closing business processes are also simplified using the website. Furthermore, "Start-up India" releases information about the workshop, challenge, and event programs led by both private and government as a host and participants. Through the websites, start-ups also can have the opportunity to enter the global market by having partnerships, visa support, education, and consults. China also has a Chinese Government network to promote its initiatives, policies, achievement, and further improvements. Furthermore, to enhance entrepreneurs' accessibility to information, Korean MSME manages its websites as a channel for education, seeking resources, networking, and information search.

Those government service leads rapid development of the EE and resulted in

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\* Initial Start-up Package: [https://www.mss.go.kr/site/smba/supportPolicy/supportPolicyDetailDiv.do?target=2&searchSeq=ST\\_000000001081665](https://www.mss.go.kr/site/smba/supportPolicy/supportPolicyDetailDiv.do?target=2&searchSeq=ST_000000001081665)

visible performance. Modi's Start-up India project has been evaluated as constructing EE infrastructure and enhancing business information transparency. Also, it reduces regional entrepreneur discrepancy and encourages the Indian economy. Likewise, with the lead of the state council, the whole country of China is the actor in the innovation with the cooperation of multiple government departments. Supporting various filed of the business environment including education, cultural aspect, finance, equality, etc. it gets the achievement of cultivating various unicorn companies. Furthermore, since China has constructed an entrepreneurship infrastructure, this can promote further innovation rapidly corresponding to the market demand. Premier Li indicates that MEI has achieved cultivating market stakeholders, increased economic growth, and enhanced internal dynamics of market conditions.\* Yen (2021) denotes that from January 2021 to April 2021, the increase of start-ups improves employment by 2.92 million and the total employment employed by innovative start-ups is around 200 million. Also, Korean policies mainly implemented by MSME with the cooperation of the other departments increase the innovative technology-based company by around 22.9 percent in 2020 (MSME, 2021). According to the report of MSME (2021), the number of unicorn companies also increased from 2 to 13, and the social perception of entrepreneurship has drastically increased from the world's 46th in 2016 to 7th in 2019, based on the GEM study. Furthermore, by increasing the EE policy budget around twice from 2016 to 2020 which are per 376.6, and 849.2 billion won, according to the survey from MSME (2021), start-ups evaluate that the government contribution to EE is increasing from 44 to 66.5 during 2016 and 2020.

However, as government-led EE relies on the service quality and leadership of the government, government-led EE can face threats of service failure of government, low independency, and low autonomy. Modi's initiative is also in front of several criticisms that it fails to improve equality issues on gender and Caste groups (Tiwari, Hogan, and O'Gorman, 2021). Also despite the attempts to reduce corruption and bureaucratic inefficiency among 33 thousand Indian

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\* Chinese Government Network (2021.6.23). Li Keqiang presided over the executive meeting of the State Council, deployed the "14th Five-Year Plan" period to further promote mass entrepreneurship and innovation, stimulate market vitality, promote development, expand employment, and benefit people's livelihood, etc.  
Retrieved from [https://www.gov.cn/premier/2021-06/23/content\\_5620380.htm](https://www.gov.cn/premier/2021-06/23/content_5620380.htm)

start-ups, over 80 percent of them responded that they did not receive benefits, and 50 percent denote there are still corruption and inefficiency issues (Sanghani, 2019). 90 percent of start-ups fail within five years and the increase in zombie unicorns without proper business models (Sriram, 2022). Thus, there are some concerns that though this project has superior performance in increasing the unicorn number and enhancing EE, if the zombie unicorns increase corresponds to the start-up boom, this can cause further social issues when these start-ups collapse. China also has oversupply issues of entrepreneurs and the need to re-adjust the strategies and the initiative based on the market conditions has been proposed. Moreover, Korean EE policy has concerns that financial support without a proper monitoring system cultivates zombie companies relying on government subsidies (Niazi et al., 2021). Also, the over competitiveness of start-ups, low survival rate, lack of private funds, lack of resources from post-start-ups, low globalization rate of start-ups, low commercialization rate of public technology, and various negative regulations which hamper innovation, biased development among capital and regions, etc. are highlighted as critical issues of Korean EE system\*.

It is obvious that government strives to improve its EE and its policies to construct entrepreneurial infrastructure are quite successful. However, regarding the cases above, the government-led cluster can increase interdependency between countries and companies and evoke the issue of spreading subsidies. Thus, a monitoring system that can trace the usage of subsidies transparently and reflect it on future evaluations would be required to enhance the efficiency of the policy. Also, there is a need to expand cooperation with the private business sector which can enhance EE quality, and construct a social infrastructure that can be independent from government aid.

#### 4.2.2. Company-led: United States

United States is the representative nation that has EE led by the private sector. Though it also has a legal base for supporting start-ups which is the “Support Start-up Businesses Act,” it is also evaluated as having a superior EE created from

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\* Asan Nanum Foundation & Science and Technology Policy Institution. International Comparative Study for Improving the Competitiveness of Korea's Startup Ecosystem. Asan. <https://asan-nanum.org/>

post-innovative start-ups in certain clusters such as Silicon Valley. Thus, the entrepreneurship policy of the United States quite relied on organic connections within the private business sector and the government establishes passive policies to promote an entrepreneur-friendly environment minimizing the government's direct intervention (Garrett and Wall, 2005). However, to promote entrepreneurship and EE further, the Center for American Entrepreneurship (CAE) (2019) proposes agenda to cultivate innovative ideas, enhance accessibility to the capital and labor market for superior talents, and reduce the bureaucratic and taxation burden and this lead to the governmental movement to restore the entrepreneurship in America.

Thus, the “Support Start-up Businesses Act (2018)” has established by Senate Risch in 2018 to provide technical support and incentives for innovative companies. Similar to the other government-led cluster, on the aspect of the governmental effort to cultivate the EE, beyond this Act, there are several Federal and State level policies to stimulate the activities of entrepreneurs and these can be categorized into direct and indirect policies. Within direct policies, there are taxation policy, regulation, funding, capital market access enhancement, and right protection. To attract innovative ideas, more than ten states provide tax deductions- or exemption benefits for research and development, operation, succession, etc (Garrett, 2005). Also alleviating regulation reduces the burden of entrepreneurs on commercialization and administration.

Farrell and Wheat (2019) analyze the EE of the United States as a hotbed of free enterprise and government policy has an auxiliary role. The rise of an innovative company creates the advantages of agglomeration in certain regions and it attracts other innovative businesses and private business services to support them (Farrell and Wheat, 2019). Farrell and Wheat (2019) introduce a financial subsidy policy that is not focused on the amount but invests in private businesses and universities to stimulate the technology. To allow continuous involvement of the start-up, politically, the government adjust market quality, protects rights, and provide incentives to the region to construct EE by attracting innovative company. Thus, rather than supporting whole steps of start-ups or individual companies, the US policy focuses on creating a social infrastructure that allows companies to network and develop. Based on the support of the local education institute, the local businesses of the United States are proactive in forming EE to find out attractive ideas, talents, funds, etc. For instance, in Silicon Valley, Birch (2021) denotes that it has over 677 billion dollars thanks to professionals, mentors, technology, and others. Also, its cultural tendency not to fear

failure contributes to nurturing around 614 unicorn companies, according to the data from CB insights in 2022. Therefore, the United States is a successful EE model leading the other countries' entrepreneurship policies by having various innovative countries. By attaining independent and autonomous EE, American EE is less influenced by government failure and maintains continuous development competence regardless of the national political externality.

#### 4.2.3. Cooperative: Japan

Though Japan is one of the Asian-Confucius cluster members, it has a minor discrepancy with China and Korea since it has a relatively low number of unicorn companies. However, instead, Japan has various competitive SMEs cumulating the technology for a long time. This tendency is similar to the case of the northern European cluster, which has a cooperative EE system that has quite balanced support from both government and private business sectors. This implies that its innovative and rapid growth competencies are not that extraordinarily compared to the company-led and government-led clusters, instead, it has strength in accumulating the technology and stable-gradual growth.

This tendency can also be found in the lack of formal Japanese policy on cultivating entrepreneurship through several short-term projects and agendas that have been proposed, except for the "Start-up and New Business Promotion policy." Under the governance of the Ministry of Economy, Trade, and Industry (METI), there are various systemical policies to support the individual industrial field such as the "Monozukuri" initiative which supports Japanese manufacturing (Maruyama, 2011), despite the research and discussion, the policy focusing on cultivating entrepreneurship and culture does not exist. This crisis and social phenomenon of inferior entrepreneurship status are also highlighted as issues in Japan, and to overcome this issue with the cooperation of private companies, Japan struggles to improve entrepreneurship and achieves improvement on the fear of failure field. However, still, it has a margin to be improved due to the high bureaucratic culture, low ICT usage, and labor market issues.

Specifically, the Start-up and New Business Promotion initiative has the J-start-up project and Start-up-Visa as the main policies to promote start-ups, innovative ideas, and entrepreneurship (METI, 2019). Start-up-Visa is the policy to support the Japanese labor market by attracting talent and supporting SMEs' administrative processes to utilize them. J-start-up is the policy that denotes the coop-

erative characteristics of Japan since it provides support to businesses with public and private resources. It connects the start-up, secretariat, and supporters and stimulates the EE within this connection. On the private support, using the private business service companies which provide workspace, R&D equipment, test environment, accelerating program, consult, and marketing resources, start-ups can access the high-quality service from the integrated information platform. Also, publically, government verifies the quality of the start-up product, increases products' public exposure rate through media marketing support, stimulates business expansion in the domestic and international market, provides financial resources including funds, subsidies, loans, etc., supports networking through connecting large corporation, department, agencies, and start-ups, alleviate regulation burden using the regulation sandbox, and provides administration help on regulatory processes.

## V. Conclusion

The EE is a significant issue that determines the further competitiveness of the nations by cultivating profitable businesses with innovative ideas. Therefore, to reveal a competitive company that can grow as a global major company in the future, it is important to ensure the opportunity to start the business and stimulates challenge. Thus, there are numerous political attempts to formulate an EE by the government. Therefore, to verify types of EE, and which policies significantly contribute to forming superior EE quality, this study conducted clustering and comparative policy analysis.

Through the cluster analysis, the countries with superior performance have high performance in social infrastructure and cultural perception, which denotes negative relations in the financial indicators assumed as an indication of unstable financial structure in the country. Considering these differences derived from the indirect influence of policies, this paper re-positions nations with government support and the private business service sector. Selecting the representative countries from each cluster, this paper selects Korea, India, and China as the government-led cluster, the United States as a company-led country, and Japan as the cooperative country. Though there are each strengths and weaknesses in the countries' policies, there is a need for a complement between government-led and company-led clusters since government-led such as Korea and China can have reasonable social safety nets and

systematical supporting infrastructure but company-led countries like the United States can have rapid and flexible decision making on the company unit, and various innovations regardless to government failure but autonomously.

Based on the result, it is available to conclude that the policy, governmental service, and regulation have an indirect impact on the creation of the EE. The social and cultural factors including the perception of entrepreneurs, social infrastructure, education, etc, that can be influenced and controlled by policy indirectly turn out as significant. Also, the technology and economy components have a high influence on EE and this implies that the Korean EE policy has appropriate political direction since it has a high political effort on entrepreneurial culture, technology, and market condition under the economy. However, in the case of Finance, which is considered as it can have a negative impact on EE presuming deterioration of the financial stability and increasing dependency on subsidies, the policy should be thoroughly reviewed from the perspective that whether it has a proper monitoring system. Since this paper utilizes big data which is publically opened, this paper has implications in proposing the method to measure its performance of the government service, positioning compared to the competitors, and improving the EE policy referring to the other countries' cases.

However, for the sake of analysis convenience to compare nations, cluster analysis has generalization issues and may ignore significant characteristics of countries and distort the mean result. Thus, the qualitative analysis of the EE characteristics should be followed up. Also, this study can be improved by pre-setting macro-environmental factors and sub-variables and collecting primary data based on the pre-determined variables in the future.



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