DEVELOPMENT OF AN ENTREPRENEURIAL START-UP ECOSYSTEM: SOCIO-ECONOMIC AND LEGAL FACTORS INFLUENCING THE ACHIEVEMENT OF ESG PRINCIPLES (CASE OF ASIAN COUNTRIES)

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ABSTRACT

Objective: The article aims at determining priority areas for creating a reliable innovation ecosystem based on the principles of open innovation to increase the innovative activity of companies, especially in developing regions.

Methods: We selected five countries in the Asian region for the study of the startup ecosystem. The study included a comparative assessment of development indicators of innovation ecosystems in five Asian countries (South Korea, Japan, India, China, and Kazakhstan); correlation and regression analysis reflecting the dependence and influence of ecosystems on innovation activity.

Results: The results obtained indicate a direct and strong relationship between the level of innovation activity and the qualitative development of the ecosystem. There is a high degree of correlation among the level of innovative activity, the elements of quantitative development, and the business environment. The study demonstrates that countries with a well-developed startup ecosystem are characterized by a higher innovation activity and the best indicators of innovation development. At the same time, countries forming a business ecosystem, including the Republic of Kazakhstan, show relatively weak indicators of innovation development in comparison with other countries.

Conclusion: The above-mentioned results allow the authors to identify a set of priority measures and strengthen and promote the effective development of innovative startup ecosystems.

Keywords: business ecosystem, green startup, green tech projects, cleantech projects, venture capital market.
DESENVOLVIMENTO DE UM ECOSISTEMA EMPREENDEDOR DE START-UPS: FATORES SOCIOECONÔMICOS E LEGAIS QUE INFLUENCIAM O ALCANCE DOS PRINCÍPIOS ESG (CASO DE PAÍSES ASIÁTICOS)

RESUMO

Objetivo: O artigo visa determinar áreas prioritárias para a criação de um ecossistema de inovação confiável com base nos princípios da inovação aberta para aumentar a atividade inovadora das empresas, especialmente em regiões em desenvolvimento (por exemplo, Cazaquistão).

Métodos: Seleccionamos cinco países da região asiática para o estudo do ecossistema de startups. O estudo incluiu uma avaliação comparativa de indicadores de desenvolvimento de ecossistemas de inovação em cinco países asiáticos (Coréia do Sul, Japão, Índia, China e Cazaquistão); análise de correlação e regressão refletindo a dependência e influência dos ecossistemas na atividade de inovação.

Resultados: Os resultados obtidos indicam uma relação direta e forte entre o nível de atividade de inovação e o desenvolvimento qualitativo do ecossistema. Existe um alto grau de correlação entre o nível de atividade inovativa, os elementos de desenvolvimento quantitativo e o ambiente de negócios. O estudo demonstra que os pacarreises com um ecossistema de startups bem desenvolvido são caracterizados por uma maior atividade de inovação e os melhores indicadores de desenvolvimento de inovação. Ao mesmo tempo, os países que formam um ecossistema de negócios, incluindo a República do Cazaquistão, mostram indicadores relativamente fracos de desenvolvimento da inovação em comparação com outros países.

Sugestões: Os resultados acima mencionados permitem aos autores identificar um conjunto de medidas prioritárias e fortalecer e promover o desenvolvimento efetivo de ecossistemas inovadores de startups.

Palavras-chave: ecossistema de negócios, inicialização verde, projetos de tecnologia verde, projetos de tecnologia limpa, mercado de capital de risco.

1 INTRODUCTION

The key factor in the sustainable innovative activity of any state is entrepreneurship, which creates additional values and contributes to job creation. If a person or a group of people decide to start a business, they should understand their opportunities to implement new ideas or new technologies in order to create a startup, i.e. a new company with a business model that supports innovation (Ghezzi et al., 2022). In other words, a startup is a new business entity that applies innovative solutions (Beknazarov et al., 2020). Projects implemented by startups have high risks and therefore
their survival rate is rather low. However, successful startups that have survived and thrived can bring great economic benefits.

The hypothesis of the study states that the effective implementation of startups largely depends on, in our opinion, favorable conditions: the availability of incentives for the development of entrepreneurship, the necessary infrastructure, and educational programs. Therefore, the issues of creating a strong and open business ecosystem and assessing its impact on innovation activity in countries are of particular relevance for the implementation of startups.

Thus, the article aims at developing effective solutions for the formation of an innovative startup ecosystem to increase the innovation activity of companies and the development of open innovations.

2 THEORETICAL FRAMEWORK

While considering real-time innovation in the condition of uncertainty, Fransman (2018) developed the idea of an "innovation ecosystem" as a system of interconnected parties and processes that jointly create innovation. O'Keeffe (2018) defined an innovation ecosystem as the flow of technology and information among people, enterprises, and institutions, which is the key to the innovation process. It contains interactions of actors that are necessary to turn an idea into a process, product, or service on the market. After conducting an analytical review of the subject field, Akberdina and Vasilenko (2021) revealed the fundamental concept of an innovation ecosystem and determined factors influencing the effective development of innovation ecosystems, which allows scientists to connect theory and practice.

According to IDIA (2022) experts, innovative ideas require coordinated actions and resources of various actors (governments, civil society, universities, entrepreneurs), collectively called an "innovation ecosystem", to be efficiently generated, tested, and implemented in terms of their impact on development.

Granstrand and Holgersson (2020) reviewed various definitions of innovation ecosystems and related concepts, revealed an unbalanced emphasis on complementarity, cooperation, and actors in the adopted definitions, and proposed a generalized definition of the innovation ecosystem, including competition components and artifacts (products and technologies) in the conceptualization of the innovation ecosystem.

The relationship between business ecosystems and new business opportunities
presented in the work of Mets and Trabskaya (2019) shows that state and successful entrepreneurs who become role models make the greatest contribution to the creation of structural conditions for the development of a business ecosystem. At the same time, the history of successful startups contributes to the growth of confidence in an innovation ecosystem and has a positive effect on the investment activity of enterprises.

Despite the widespread use of the entrepreneurial ecosystem approach, the corresponding literature mostly neglects the influence of business systems on innovation activity at the state level. Within the framework of this study, we dwelled on the nature and strength of such influence as exemplified by Asian countries with different income levels.

3 METHODS
3.1 STUDY DESIGN

Normalization, correlation, and regression analysis, as well as comparative analysis, were used as the main research methods. Normalization allows one to adequately compare the achievements of various countries according to certain indicators. Correlation analysis establishes the nature and strength of the relationship between the selected variables. Regression analysis assesses indicators of innovative activity under the influence of the innovative entrepreneurial ecosystem.

Further, within the framework of this study, we have conducted a comparative analysis of the development of startup ecosystems in the selected Asian countries, previously divided into two groups. The first included two high-income countries (Japan and South Korea), and the second group three middle-income countries (China, India, and Kazakhstan).

This approach made it possible to compare countries in terms of the level of development of the startup entrepreneurial ecosystem, calculate the index of innovation activity, and then explore the relationship between the level of development of the startup ecosystem and the index of business innovation activity. The choice of the five countries from the Asian region is due to the fact that a study of the activity of countries in the same region will help to better explore the quality of ties and their comparison since when comparing with countries from different regions, we would encounter additional difficulties due to their economic, political, geographical, and cultural characteristics.
3.2 METHODS FOR ASSESSING THE DEVELOPMENT OF STARTUP ECOSYSTEMS

The main parameter for assessing the development of a startup ecosystem in world countries is the rating indicator introduced by the StartupBlink research center. This rating is based on StartupBlink's database, as well as partner databases compiled by Crunchbase and SimilarWeb.

A total score is calculated for each country, which is the sum of three groups of indicators that measure the following components:

Quantity (startups, coworking space, business accelerators, influential well-developed startups, startup-related events);

Quality (customer base, government policies, unicorn companies, and global coworking brands, a critical amount of startups, 100 global influencers);

Business environment and critical amount. This component combines both the success of local startup ecosystems and general metrics related to infrastructure, business environment, and the ability to freely operate as a startup founder in some country or city. To assess the business environment of countries, a weighted average considers a wide range of elements within each country. Some examples of these elements include international indices (for example, the World Bank's Doing Business Report) that show how easy it is to do business in a given country. Other measurable elements are Internet speed, Internet freedom, R&D investment, and more metrics that can be analyzed through the initial data contained in StartupBlink's database.

The main purpose of the overall score is to conduct a comparative assessment not only to build a rating but also to reveal the main differences between startup ecosystems in various geographic locations.

3.3 METHODS FOR CALCULATING THE INDEX OF INNOVATION ACTIVITY

The innovation activity index is based on an assessment of two data sets reflecting the results of inventive and innovative activities (Table 1).
Table 1. Indicators of innovative entrepreneurial activity

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Interpretation</th>
<th>Source</th>
</tr>
</thead>
</table>
| Innovation activity of enterprises | The ratio of enterprises with innovations to the total number of registered companies | The national statistics of countries: National Bureau of Statistics of China
https://data.stats.gov.cn/easyquery.htm?cn=C01
The Statistics Bureau of Japan
https://www.stat.go.jp/english/
Indiastat https://www.indiastat.com/
Statistics Korea (KOSTAT)
https://www.kostat.go.kr/portal/eng/index.action
National Bureau of Statistics of the Republic of Kazakhstan |
| Inventive activity index         | The ratio between the number of patent applications and the number of researchers | The World Intellectual Property Organization (WIPO), https://www.wipo.int/ipstats/en/statistics/country_profile/ |

Source: compiled by the authors.

All the indicators are normalized for comparative purposes through the following equation:

\[ I_n = \frac{(F_n - F_{\text{min}})}{(F_{\text{max}} - F_{\text{min}})} \]  

Where,

- \( I_n \) is the business innovation activity index;
- \( F_n \) is the value of this indicator for n country;
- \( F_{\text{min}} \) is the minimum value of the indicator for a group of compared countries;
- \( F_{\text{max}} \) is the maximum value of the indicator for a group of compared countries.

The independent variable is the general indicator of innovation activity (\( I_{ia} \)) of a particular country, which is calculated as the sum of two normalized indicators of innovation activity of enterprises and their inventive activity:

\[ I_{ia} = I_{ie} - I_{pa} \]  

Where,

- \( I_{ie} \) is the normalized indicator of innovation activities of enterprises;
- \( I_{pa} \) is the normalized indicator of inventive activity.

3.4 CORRELATION ANALYSIS

To analyze the relationship between the development of a startup ecosystem and the index of business innovation activity, we used the correlation method. The result is
the correlation coefficient (value from -1 to +1) which reflects the nature and strength of the relationship between variables. The strength of the relationship between the selected variables is assessed according to the Chaddock scale: weak (from 0.1 to 0.3); moderate (from 0.3 to 0.5); noticeable (from 0.5 to 0.7); high (from 0.7 to 0.9); strong (from 0.9 to 1.0). A positive coefficient value reflects a positive correlation when variables move in the same direction, i.e. as the X variable increases, the Y variable also grows. On the contrary, a negative coefficient value reflects inverse correlations, i.e. when the X variable decreases, the Y variable also declines.

3.5 REGRESSION ANALYSIS

The predictive assessment of innovation activity with a change in the level of development of the innovative business environment was conducted using a linear regression function in Microsoft Excel.

To check the reliability of the model developed, we used the following indicators:
R-squared reflects the power of influence of the X variable on the Y variable on the following scale:
Over 0.95 means a high level of the accuracy of approximation;
0.8-0.95 stands for a moderate level of the accuracy of approximation;
0.6-0.8 implies a low level of accuracy;
Less than 0.6 reveals that the model is inaccurate and requires improvement.

With highly reliable results and no randomness, the Significance F should not exceed 0.05.

4 RESULTS
4.1 RESULTS OF ASSESSING THE DEVELOPMENT OF INNOVATION STARTUP ECOSYSTEMS

According to StartupBlink's study (2022), 63 startup ecosystems operated in these five countries in 2020. India (38 ecosystems and 4,108 startups) and China (20 ecosystems and 6,344 startups) have the largest amount of startup ecosystems. The smallest number of startup ecosystems are found in South Korea and the Republic of Kazakhstan. The results of ranking countries by the development of their startup ecosystems are presented in Figure 1.
4.2 CHINA

One of the most successful regional players is China which ranks first in the Asian region. By 2020, China held 1.48% of the world's coworking space. The country hosts 304 coworking offices with the largest capacity in the world. There are 282 people per seat, which is more than twice the average capacity of premises in the United States (105 people) (Di Risio, 2020).

After several years of positive growth, in 2021 China experienced the most significant loss of development rate among the 10 largest countries, dropping from the 7th to the 10th position in the world listing in terms of the strength of its startup system. The country has also lost its leadership in the Asia-Pacific region and now ranks 3rd behind Singapore and Australia. Even though half of the regional investment in Asia-Pacific startups goes to China, the pace of unicorn production and exits in China lags far behind that of the USA.

In China, there are 165 business accelerators and incubators included in the top ten state business incubators in the world. Furthermore, among Chinese business incubators, the IE Orchard National Incubator holds a position within the top five private business incubators, while Chinaccelerator is recognized as one of the leading private business accelerators. Given the size of the country's economy, the Chinese ecosystems have been able to achieve impressive growth and create an extraordinary number of startups and unicorns.

China's business ecosystem is home to 227 unicorn companies, which has grown by 21 if compared to the indicators of 2019. By this indicator, China is second only to the United States, where there are 233 companies. China's most famous unicorns work on
automation and artificial intelligence, along with a strong focus on hardware and IoT presence in the startup ecosystem of Shenzhen.

The most effective startup systems in China are located in Beijing, Shanghai, and Shenzhen. These cities host 2,521 startups, i.e. about 58% of the total number of startups in the country. Being a model for an open and global startup ecosystem in China, Hong Kong ranks fairly high. At the same time, most Chinese startups aim only at the Chinese economy and have a limited regional or global presence (Larionov et al., 2020).

The most successful and prospective startups are implemented in e-commerce and retail industries (for example, Youdao, Bilibili, GearBest, etc.), hardware and IoT (Xiaomi, Insta360, RAYSEES, Deptrum, etc.), software and big data (GSX Techedu, Chindata Group, Anxinsec, etc.), social and leisure services (Wechat, Jiangsu, Hupu, etc.). A few years ago, the Chinese corporations became active and efficient players in the global consumer market, with Alibaba, Xiaomi, Huawei, and Tencent leading the way. The restrictions imposed by Western economies on some of these tech giants put pressure on global companies and limited their growth. In our opinion, if the Chinese government eases restrictions on its startups and successful entrepreneurs, it could potentially mitigate some of that damage.

China is now actively engaged in accelerating the adoption of environmental technologies. Most of China's green innovations are related to environmental management, in particular to reducing air and water pollution; a small part deals with water-related adaptation such as water conservation; while the vast majority (76%) is associated with climate change mitigation (Song, 2018). The infrastructure to support green startups is being actively formed. Therefore, to develop startups in the green industry, the first acceleration platform Green Startup huge was launched in 2013. In 2019, the China Green Fund created an angel investment agency in the green sphere, Green Leaf Investment. In total, over the 15 years of the Fund's existence, about 200 green startups have been implemented, in which more than 1 billion yuan have been invested (Green Startup, 2022).

4.3 INDIA

Following China, India is a runner-up and earns 12.48 points. India is the leader among the above-mentioned Asian countries and ranks second in the world after the United States in terms of coworking space. In 2021, the country had 1,789 coworking
offices, i.e. 9.33% of the total number of coworking offices around the world.

Having more than 250 incubators, India ranks third in the world. Universities and educational institutions manage a large number of incubators. Moreover, there are many private incubators and accelerators: some of them are Indian and the others work in cooperation with foreign partners. One of the Indian business accelerators (Kerala Startup Mission) is included in the top 5 of the world's public business accelerators.

One of the growing trends is corporate accelerators. Over the past three or five years, many multinational corporations have created their own incubator and accelerator programs, striving for the latest innovations and offering technical expertise and mentorship to young startups. Such Indian companies as Yes Bank and JioGenNext have these programs. At the same time, the leading educational institutions (IITs and IIMs) operate some of the largest national incubators for entrepreneurship development.

In India, 38 regional ecosystems host 73,075 startups. According to Startupindia (2022a), there are currently 7,476 cleantech projects in India, or 14.3% of the total number of startups. Of these, 2,811 (5.3% of the total number of startups) are in the field of green technologies, 3,688 startups (7%) – in renewable energy sources, and 977 projects (1.9% of the total number of startups) – in the field of waste management. One-third (2,544 projects) of cleantech startups are in the pre-seed stage, 2,060 startups are in the seed stage, 1,935 startups are in the early stage, and 937 are in the expansion stage (Startupindia, 2022b). Among the successfully implemented green startups in India are Sarvajal (water treatment), Bounce (electric scooter production), ReNew Power (renewable energy), etc.

4.4 JAPAN

Japan is the third most developed country on the list and has a high business ranking. However, Japan's score is comparatively low. Japan has a thriving startup ecosystem, backed by key factors such as its location, state-of-the-art technology, skilled workforce, access to shipping lanes with modernized ports, and government regulation.

Although Japan is the third economy in the world, it does not produce any tech giants like the USA and China. In 2019, Japan had only four unicorn companies (Mercari, Preferred Networks (PFN), Liquid, and SmartNews). The main reason is the lack of investment in Japanese startups if compared to other countries. Firstly, Japan does not have enough venture capital. Secondly, Japan is not prone to risk and prefers to invest in
companies that can be trusted, i.e. companies that have been listed and become public. Thirdly, many companies with great potential and ambitions go public too early, reducing the possibility of obtaining large investments.

At present, Japan encompasses five distinct ecosystems, with Tokyo, Osaka, and Nagoya standing out as particularly vibrant. The country hosts a total of 467 coworking offices, constituting 2.44% of the global coworking space. Japan boasts a noteworthy presence of 51 accelerators and incubators, including prominent names such as BCG Digital Ventures, DEEPCORE, Samurai Incubate, Mistletoe, Skyland Ventures, and Archetype.

The most developed industries determining the impetus for its development and attracting the largest amounts of investment are artificial intelligence and cloud technologies (SmartNews, From Scratch, Tier IV, Synspective, etc.), fintech (Money Forward, Free, Coincheck, Wealthnavi, etc.) and healthcare (BULK HOMME, AI Medikal Service, Anispi Holdings, RABO, etc.) (Initial, 2019).

Simultaneously, the number of private green startups in Japan remains limited, with the nation primarily focusing on exporting greentech initiatives, thus elevating their quality standards. This strategic approach has enabled Japan to secure a robust standing in the global index of the most ecologically conscious nations. Most green startups are in clean energy and automotive and waste recycling. As successfully implemented large greentech projects, one can single out Astroscale, Enechange, i4SEE TECH, and Electrochaea.

4.5 SOUTH KOREA

South Korea's startup ecosystem is a regional leader in innovations, ranking 21st globally and 4th among the Asian countries reviewed. It is worth mentioning that the Republic of Korea was one of the poorest countries in the Asian region 60 years ago. Currently, it is a developed industrial state and a world leader in innovations. This change happened thanks to government support for startups, including:

- The Tech Incubator Program for Startup (TIPS) provides R&D and related funds to selected startup teams with investments from venture capitalists.
- The Startup Leader Universities Program offers startups excellent university-supported infrastructure.
- The Smart Venture Startup Schools Program supports startups in
promising knowledge-intensive industries, including software and content development.

The Korean startups also received venture capital investment, whose amount reached 78% year-on-year in 2021, surpassing 7.7 trillion won ($6.4 billion) (Yoon, 2022). In 2021, the number of new jobs created by startups exceeded the number of jobs created by the top four conglomerates combined. The most popular industries are social and entertainment startups, as well as educational and fintech startups.

In 2008, South Korea announced "Low Carbon, Green Growth" as its vision for medium- and long-term development. Within the framework of the state program, financial resources are allocated to create 1.9 million new jobs by 2025.

4.6 KAZAKHSTAN

The development of the Kazakh ecosystem is significantly lower than that of the other Asian countries. A full-fledged startup ecosystem in the Republic of Kazakhstan has not been formed but there are almost all of its elements.

The Kazakh government takes the necessary measures to attract startups by creating innovative infrastructure: technology parks, hubs, and acceleration programs. Currently, the country has about 40 organizations positioning themselves as technology business incubators (MOST, Astana Business Campus, nFactorial, TechGarden, Astana Hub, Impact Hub, etc.) and four business accelerators (Ico.Startup Kazakhstan, Astana Business Campus Quick Start, Technation, and MOST Business Accelerator).

The Republic of Kazakhstan has two regional ecosystems: Almaty and Nur-Sultan. The latter ranks second among the fastest-growing ecosystems in the Global Startup Ecosystem Index 2022.

The most promising startup subsectors are fintech and smart city. Thus, the National Bank of Kazakhstan launched Invest Online, a blockchain-based application for securities trading. It is a free tool for investing in government securities. To ensure the growth of fintech innovation and not weaken consumer protection in Nur-Sultan, the Astana International Financial Center introduced a fintech regulatory sandbox and visa-free travel for citizens of 65 countries in 2018.

To dwell on the Smart City concept, the Astana Innovations Challenge project is implemented. Within its framework, the first open data hackathon was established in 2018.
To create favorable conditions for the development of startups in the Republic of Kazakhstan, Kazakhstan’s Association of Business Incubators and Innovation Centers was created.

To promote green technologies and support green entrepreneurship, the International Center for Green Technologies and Investment Projects has been operating since 2018. The center is the main operator of the Clean Tech (UNIDO, 2022) project (The Global Clean Tech Innovation Program – GCIP), aimed at the development, acceleration, and commercialization of startups in Kazakhstan.

According to the Center, as of 01.01.2020, 380 green technologies were implemented in the Republic of Kazakhstan in the following segments: 161 – in the field of waste management, 99 – in the field of renewable energy, 84 – in the field of energy efficiency, 24 – in dust collection, 4 – in the agro-industrial complex, 3 – in oil and gas production, 3 – in green construction, and 2 – in the mining and metallurgical industry.

Currently, the Center's database includes more than 3,009 green patents and 380 green technologies and projects. The largest share in the structure of green technologies in Kazakhstan is occupied by waste management – 161 projects (42.4%), in the field of renewable energy – 99 projects (26%), 84 projects in the field of energy efficiency (22.1%), 24 projects on dust collection (6.3%). An insignificant part of green projects covers the sphere of the agro-industrial complex (four projects), three projects each affect the spheres of green construction and in the extractive industry, and two – in the mining and metallurgical industry (IGTIC, 2020).

However, it should be noted that, despite the efforts made by the government of the Republic of Kazakhstan, the level of innovative activity of green entrepreneurship in the country remains rather low. In 2020, there were 25 green projects underway, which is 15.5% of the total number of startups registered in the base of the Center.

At the same time, in our opinion, the development of a startup ecosystem in the Republic of Kazakhstan is hindered by the following factors: an underdeveloped startup infrastructure, difficulties in attracting venture funding, and insufficient activity in knowledge exchange.

4.7 RESULTS OF ASSESSING THE INNOVATION ACTIVITY OF COUNTRIES

The study results have demonstrated that China is the leader in terms of innovation activity among the above-mentioned Asian countries, where 46.3% of enterprises
implement technological, organizational, and marketing innovations. The lowest level of innovation activity of enterprises is noted in the Republic of Kazakhstan and amounts to 10.5% (Figure 2).

Figure 2. The level of innovation activity of enterprises in the Asian countries, %

![Figure 2: The level of innovation activity of enterprises in the Asian countries, %](image)

Source: compiled by the authors.

The initial data for analyzing the inventive activity of the countries under consideration are presented in Table 2. The results of standardizing such indicators for a comparative analysis of the innovation activity of these countries are presented in Table 3.

Table 2. Initial data for analyzing inventive activity

<table>
<thead>
<tr>
<th>Indicator</th>
<th>India</th>
<th>Japan</th>
<th>Kazakhstan</th>
<th>South Korea</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patent applications, units</td>
<td>37,880</td>
<td>423,254</td>
<td>1,548</td>
<td>260,610</td>
<td>1,441,085</td>
</tr>
<tr>
<td>Number of researchers, people</td>
<td>59,190</td>
<td>689,889</td>
<td>18,228</td>
<td>446,738</td>
<td>2,181,134</td>
</tr>
<tr>
<td>Inventive activity index</td>
<td>0.64</td>
<td>0.61</td>
<td>0.08</td>
<td>0.58</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Source: compiled by the authors.
Table 3. Standardization of indicators for assessing the innovation activity of countries

<table>
<thead>
<tr>
<th>Indicator</th>
<th>India</th>
<th>Japan</th>
<th>Kazakhstan</th>
<th>South Korea</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation activity index</td>
<td>0.77</td>
<td>0.33</td>
<td>0.00</td>
<td>0.23</td>
<td>1.00</td>
</tr>
<tr>
<td>Inventive activity index</td>
<td>0.97</td>
<td>0.92</td>
<td>0.00</td>
<td>0.87</td>
<td>1.00</td>
</tr>
<tr>
<td>General innovation activity index</td>
<td>1.74</td>
<td>1.25</td>
<td>0.00</td>
<td>1.10</td>
<td>2.00</td>
</tr>
</tbody>
</table>

Source: compiled by the authors.

Today, China produces innovations comparable to those of the high-income group and leads in several indicators related to intellectual property. The Republic of Kazakhstan demonstrates a low level of innovation activity in comparison with the selected countries.

The results obtained allowed us to conduct a correlation analysis of the dependence between the level of innovation activity and the development of a startup ecosystem. The initial data for this analysis are presented in Table 4.

Table 4. Initial data for correlation analysis

<table>
<thead>
<tr>
<th>Country</th>
<th>Level of innovation activity</th>
<th>Level of quantitative development of ecosystem</th>
<th>Level of qualitative development of ecosystem</th>
<th>Business valuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>1.74</td>
<td>2.19</td>
<td>7.62</td>
<td>2.46</td>
</tr>
<tr>
<td>Japan</td>
<td>1.25</td>
<td>2.41</td>
<td>6.61</td>
<td>2.93</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>0.01</td>
<td>0.26</td>
<td>0.15</td>
<td>0.5</td>
</tr>
<tr>
<td>South Korea</td>
<td>1.35</td>
<td>1.43</td>
<td>6.95</td>
<td>3.25</td>
</tr>
<tr>
<td>China</td>
<td>2</td>
<td>1.97</td>
<td>16.04</td>
<td>2.65</td>
</tr>
</tbody>
</table>

Source: Compiled by the authors.

The results of the correlation analysis are presented in Table 5.

Table 5. The results of correlation analysis

<table>
<thead>
<tr>
<th></th>
<th>Level of innovation activity</th>
<th>Level of quantitative development of ecosystem</th>
<th>Level of qualitative development of ecosystem</th>
<th>State of business environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of innovation activity</td>
<td>1.00</td>
<td>0.86</td>
<td>0.90</td>
<td>0.73</td>
</tr>
<tr>
<td>Level of quantitative development</td>
<td>0.86</td>
<td>1</td>
<td>0.64</td>
<td>0.8</td>
</tr>
<tr>
<td>Level of qualitative development</td>
<td>0.90</td>
<td>0.64</td>
<td>1</td>
<td>0.62</td>
</tr>
<tr>
<td>State of business environment</td>
<td>0.73</td>
<td>0.80</td>
<td>0.62</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: Compiled by the authors.

The results of correlation analysis show that the level of innovation activity is closely connected with the qualitative development of the ecosystem and its elements, including the policy of public authorities, unicorns and global influencers, and global
coworking brands. The relationship between the level of innovation activity and the other two variables is lower but still relatively high.

Consequently, countries with a developed entrepreneurial innovation ecosystem are characterized by a fairly high level of innovation and inventive activity.

Thus, the strengthening and development of national entrepreneurial ecosystems lead to an increase in the innovation activity of countries.

The regression model used in this study has an average level of approximation (0.907) and the Significance F less than 0.05, which indicates its quality and reliability. A graphical linear regression model is presented in Figure 3.

![Linear regression model](image)

Based on the linear regression equation, a forecast was made for changes in the level of innovation activity with due regard to the development of the innovation ecosystem for each country. According to the forecast, the innovation activity development index might decrease in two countries: for India, this indicator will decrease from 1.74 to 1.37; for the Republic of Korea, it will fall from 1.35 to 1.28.

At the same time, the Republic of Kazakhstan has significant potential to improve its business activity index, which, according to the forecast, might reach 0.17. The study results have demonstrated that the creation and strengthening of a startup ecosystem has a positive impact on the results of innovation activities and the innovation activity of enterprises.
5 DISCUSSION

The above-mentioned methodology for assessing the impact of a well-formed startup innovation ecosystem on innovation activity in the country allows stakeholders to objectively identify weaknesses and outline directions for improving their national startup ecosystem and, as a result, increasing the innovation activity of entrepreneurs.

However, the effective use of these methods has limitations associated with the lack of a unified statistical base of initial indicators. The necessary quantitative indicators are collected according to national statistical databases, which does not always meet the requirements of uniformity and timeliness of the statistical indicators necessary for the analysis in question.

The results obtained confirm Marakhina’s conclusions (2020) that a startup ecosystem at the macro level has a significant impact on the formation, development, and growth of innovation activity of all actors at the micro level. We agree with Abzhalelova’s ideas (2019) that the Republic of Kazakhstan has significant potential to become a regional center for the application of innovative technologies. To attain this end, it is necessary to improve an ecosystem and increase its efficiency.

As the results of our research have shown, the Republic of Kazakhstan is at the initial stage of forming an innovative business ecosystem but the country builds networks and infrastructure to support the growing ecosystem of scientific and technical startups.

5.1 STARTUP SUPPORT

Several scholars, in particular, Al-Mubaraki and Busler (2014) (emphasized that business incubators should create new jobs, implement R&D achievements and increase the company's sustainability), Albort-Morant and Oghazi (2016) (presented effective mechanisms of cooperation between business incubators and venture capitalists), Ayatse, Kwahar and Iyortsuun (2017) (proved that business incubation mostly affects such performance indicators as income growth, employment, venture funding, networking, and alliance building), highlight that business incubators and business accelerators can support new and growing businesses. Businesses supported by incubators tend to have better survival rates, create more jobs and generate more income.

While there are few examples of business incubators and accelerators that support business startups for specific groups of the population (e.g. women, young people, migrants, seniors, unemployed, and people with disabilities), there is still evidence of
their positive results. As examples of successful acceleration programs for entrepreneurs from certain groups of the population, we can mention Women's Entrepreneurship Accelerator, Migration Hub, Teensinal, AVINDÊ, etc. Thus, in our opinion, we can talk about the untapped potential for the wider use of business incubators and accelerators.

5.2 GREEN ENTREPRENEURSHIP SUPPORT

Our study findings underscore that young innovative entrepreneurs are confronted with the challenge of striking an optimal equilibrium among economic advancement, social accountability, and ecological conservation to attain sustainable development.

We fully support the point of view of Fichter and Olteanu (2022) who point out that, in addition to economic contributions, green startups make a decisive contribution to the environmental goals of a green economy and are thus a major factor in the movement towards a sustainable economic system.

The findings confirm other studies related to green startups and allow us to conclude that such startups are not limited to specific industries, technology areas, or business models (GreenBiz Group, 2021). They can be found in all sectors of the economy, however, the bulk of greentech projects are implemented in the areas of renewable energy and waste management.

However, despite signs of increasing private investment in the green economy, there remains a significant funding gap for such projects. Since green startups are characterized by high uncertainty and risks with low returns at the initial stage, private investors are still reluctant to invest in greentech projects. Unlike traditional investors, green investors benefit from green value. The greatest financial opportunity exists for green value startups.

Therefore, we support the view of Noh (2018) that governments should financially support the green industry in the early stages of business, as well as create conditions for a capital market and a green finance support system. One of the most effective approaches to stimulating green investments is the development of public-private partnerships. An example of the creation of such a model is the Korean Fund of Funds model (Korea Venture Investment Corporation, 2022), which unites all existing systems of entrepreneurship support in the country.
5.3 FOSTERING FAVORABLE ENVIRONMENTS FOR VENTURE MARKET ADVANCEMENT

We align with Ständer's perspective (2017), asserting that thriving startup ecosystems hinge not solely on research infrastructure and entrepreneurial ethos but also on adequate financial support. Venture capital serves as a potent catalyst for nurturing innovative startup ecosystems.

Banks view a startup as an opaque asset and a risky investment. It usually has a small security deposit, its business model lacks proof, and failure is very likely.

OECD experts (2019) put forward two main arguments in favor of government intervention in the venture capital market: firstly, market failures are the reason for low-level funding; secondly, venture capital markets are useful for the economy as a whole due to their positive impact on employment and innovation activity.

The experts have determined the following means of government intervention (World Economic Forum, 2016):

Direct intervention through government venture funds established and managed by national assistance institutions (non-profit organizations);

The use of targeted tax incentives to reduce the riskiness of venture capital investments, for example, by lowering a corporate income tax or capital gains tax.

The main goal of public investment is to develop a profitable and self-sufficient private market. Acting as venture capitalists, government bodies have enough freedom as they are involved in the allocation of financial resources. This can contribute to the development of strategic sectors that are not competitive yet. Despite ambiguous data on the effectiveness of public venture financing and the theoretical question of whether public actors can be private investors selecting the most promising companies, public funding is undoubtedly an important stabilizer during a crisis.

Venture capital public companies comprise Banque Publique d'Investissement (Bpifrance) in France, British Business Bank (BBB) in Great Britain or Kreditanstalt für Wiederaufbau (KfW) in Germany. All of them use a diverse set of equity instruments to compensate for the shortcomings of the venture capital market.

Regarding tax incentives for venture capital investments, government support measures include the development of such tax incentives as advance tax credits or exemptions from losses on a more favorable basis than the basic tax system. However, the current impact of tax incentives on venture capital investments remains a controversial
issue. Thus, the studies conducted by Cumming and Li (2013), Hendon et al. (2012), and Van Pari (2012) had ambiguous results, indicating numerous problems inherent in assessing the effectiveness of tax incentives and the need for additional theoretical and empirical research in this area, as well as systematic monitoring by the state.

5.4 BUILDING A KNOWLEDGE EXCHANGE SYSTEM

Regional cooperation organizations' analyses and case studies highlight knowledge sharing as a vital aspect of the "open innovation" model. It proves effective in fostering innovation ecosystem development and augmenting innovation activity. This complements financial and technical cooperation. Companies aim to access external knowledge, driving them to establish a nationally valuable innovation ecosystem that heightens entrepreneurial innovation activity (Fransman, 2018). The globalization process intertwines with evolving innovation activity models, forming a reciprocal relationship. To harness this knowledge and realize set objectives, novel innovative organizational forms become essential.

When developing an action plan to expand and update knowledge exchange through its main components, the following recommendations should be considered:

As outlined by specialists affiliated with the European Innovation Management Academy (World Economic Forum, 2015), nations lacking mature innovation startup ecosystems should forge collaborations with international frontrunners in innovation and entrepreneurship (I&E). This approach ensures that their innovation endeavors align with regional economic expansion. The influence of open knowledge exchange is most pronounced when it encompasses policy-makers and practitioners who possess firsthand experience in reform efforts and comprehend the inherent potential of these processes, along with their political and economic limitations.

Countries and international organizations should intensify their collaboration to provide easier access to the relevant development experience that is currently kept on various platforms or not recorded at all. Multilateral organizations can act as links connecting countries to the related knowledge, opening information technology platforms and initiating knowledge sharing.

If possible, knowledge sharing should go beyond government-to-government relationships and involve non-state actors to ensure a diversity of perspectives. The process of knowledge exchange should make wise use of various tools, including face-
to-face meetings, video conferencing, and online collaboration to facilitate the long-term interaction of practitioners.

Within the framework of open innovation, cooperation programs for knowledge exchange have been developed and implemented by many international organizations, such as the UNDP, OECD, World Bank, European Commission, Asian Development Bank (ADB), Economic Cooperation Organization (ECO), South Asian Association for Regional Cooperation (SAARC), Shanghai Cooperation Organization (SCO), etc.

5.5 FACILITATING GLOBAL HACKATHONS AND SIMILAR EVENTS TO PROMOTE KNOWLEDGE EXCHANGE

Apart from fostering novel concepts and validating prospective ventures, hackathons mitigate product development risks, enhance employee involvement and retention, identify skilled individuals, stimulate customer-centric innovation and engagement, expedite innovative solutions and troubleshooting, bolster team collaboration, realize cost efficiencies through research and development, and establish a community, brand, and leadership presence.

Japan became the first Asian country to take part in the Green Hackathon series of international events in 2014 in several European cities. A prime example of successful hackathons is the Greena-Thon, a green tech hackathon hosted by the Indian Department of State (The #BuildforCOVID19 Global Online Hackathon, 2022). The winner of the hackathon was the startup Krimanshi Technologies Private Limited, which presented a sustainable, unconventional, and cost-effective solution for feeding the country's huge cattle population. The startup was awarded a work order of 10 lakh Indian rupees from the Rajasthan State Environmental Pollution Control Board.

Knowledge-sharing activities and programs should be, in our opinion, developed and implemented to achieve specific results. This will bring certain results in developing the potential of an innovation ecosystem.

Thus, strengthening international cooperation on an ongoing basis, as well as holding international hackathons and other events facilitating knowledge sharing and attracting competitive employees demonstrating the training of young specialists, will help companies interact with an external audience and, in general, will contribute to the development of knowledge exchange and disseminate innovative practices of startups in various areas of the economy.
6 CONCLUSIONS

Out of five Asian business ecosystems, the most efficient are innovative startup ecosystems in China and India. These countries are leaders in terms of innovation activity. The development of innovative startup ecosystems in the Republic of Kazakhstan significantly lags behind the leading countries. As the analysis has shown, the main constraining factors for the development of the Kazakh innovation ecosystem are an underdeveloped startup infrastructure, difficulties in attracting venture funding, and insufficient activity in knowledge exchange.

We think that nations in the process of shaping their business ecosystems should adopt strategies aimed at enhancing their innovative startup landscapes. Primary strategies encompass supporting the establishment of startup infrastructures, cultivating an environment conducive to venture capital market expansion, establishing cross-border knowledge exchange systems through open innovation collaborations, and organizing international hackathons and similar events to stimulate innovation and knowledge dissemination. The practical implications of our findings hold relevance for stakeholders in the innovation market, offering actionable insights to reinforce domestic startup ecosystems and guide efforts to elevate enterprise innovation activity.

At the same time, the comparative quantitative analysis of ecosystems was based on the data contained in the StartupBlink database, which is somewhat different from the data provided by the national start-up platforms. In addition, significant limitations of the conducted research are the lack of a unified database on greentech projects in the context of different countries, as well as the inaccessibility of indicators on the volume of attracted green investments.

Thus, the problems of developing the ecosystem of green startups, as well as methodological aspects of determining the green value of startups and the factors of their attractiveness for green investors require further research.
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