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Review Article

REGIONAL INSIGHTS: INVESTIGATING INNOVATIVE ENTREPRENEURSHIP AND INTERNATIONAL TRADE PATTERNS IN RUSSIA

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***Abstract**: Today's globe recognizes innovative processes and entrepreneurial endeavors as essential components of dynamic economic development. Entrepreneurship, which is a transforming element in bringing new ideas to reality, and innovations, which drive development, have an impact on social interactions, the economy, and the general standard of life in society. The combined discussion in this exchange captures an extensive investigation of several aspects associated with innovative entrepreneurship and international trade. The definitions of innovative entrepreneurship as well as the main factors influencing it were considered. The work assessed the innovative entrepreneurship of the constituent entities of the Russian Federation. There is proposed a methodology for index evaluation of a region. The article presents the results of a cluster analysis of regional differentiation in the state of Russian innovative entrepreneurship in relation to international trade. Cluster analysis approaches allow different regions to be grouped into target clusters based on data of several indexes of a region's innovative and trade indicators. Study was carried out on the basis of data from official state regional statistics. The relevance of making this distinction is observed to determine further measures to improve the situation in the regions.*

***Keywords**: innovative entrepreneurship, cluster analysis, index method, international trade, innovation*

***JEL classification**: L26, O31, R11*

1. INTRODUCTION

In today's global landscape, innovative processes and entrepreneurial ventures drive economic growth globally. Entrepreneurship transforms ideas into reality, merging with innovations to advance society. This impact is crucial in regional development, where combining innovative entrepreneurship with international trade can boost economic vitality and sustainable growth.

This article embarks on a comprehensive exploration of the intricate dynamics underlying innovative entrepreneurship and international trade patterns within the context of Russia's diverse regional landscape. At its core, this investigation seeks to unravel the multifaceted nature of innovative entrepreneurship, delineate its defining characteristics, and elucidate its role as a catalyst for regional development.

The purpose of this study is to propose a method for quantitatively assessing the impact of innovative entrepreneurship on the development of international trade. Central to our inquiry is the adoption of a rigorous methodological framework grounded in cluster analysis techniques. By harnessing the power of data-driven insights, we aim to uncover the nuanced regional differentiation in the state of Russian innovative entrepreneurship vis-à-vis international trade. Through a systematic synthesis of regional indicators, we seek to identify distinct clusters that encapsulate the diverse trajectories and characteristics exhibited by different regions.

The relevance of this study extends far beyond academic discourse, resonating profoundly within the realm of policy formulation and strategic decision-making. By offering empirically grounded insights into the regional landscape of innovative entrepreneurship and international trade, this research equips policymakers, stakeholders, and researchers with the knowledge needed to craft targeted interventions that drive inclusive and sustainable development across all regions of Russia.

In the subsequent sections, we delve into a comprehensive examination of the conceptual underpinnings of innovative entrepreneurship, explore diverse definitions articulated by leading

scholars, and elucidate the key influencing factors shaping its trajectory within the Russian context.

2.GENERAL CHARACTERISTICS OF INNOVATIVE ENTREPRENEURSHIP

2.1. DEFINITIONS OF INNOVATIVE ENTREPRENEURSHIP

The foundation of any study on innovative entrepreneurship rests upon a clear understanding of its definitions and conceptual frameworks. This literature review aims to establish a robust comprehension of innovative entrepreneurship by synthesizing and analyzing its diverse definitions as presented in the scholarly literature. Numerous scholars have already examined innovative entrepreneurship in general (Романенко, Романов, 2020; Иванов, 2021; Пашаян, 2022).

The results and the comparative analysis of different definitions are presented in the table 1:

Table 1. Definitions of innovative entrepreneurship

Definitions	Authors	+/-
The process of creating and using technical and technological innovations for commercial purposes (Кадакоева, 2014)	G. Kadakoeva	+: reflects entrepreneurial concepts -: doesn't show the full picture of innovations
The process of managing, the innovative process of creating something new, which is based on the constant search for new ideas (Гетман, Ненахова, Чистова, 2011)	Hetman B. and Nenakhova O.б Chistova V.	-: doesn't reflect entrepreneurial concepts
The innovative process of managing that also includes the risk of implementing these innovations and the associated responsibility that the entrepreneur himself takes on (Шаров, 2010)	Sharov A.	+: includes the concomitant risk -: doesn't reflect entrepreneurial concepts about profit
The creation of new products, services, production methods, or business models, that critical for firm, industry, and economic growth and a key determinant of societal well-being (Bradley et al, 2021)	Bradley S.	+: reflects economical side -: doesn't reflect entrepreneurial concepts; not fully gives explanation about innovative part
A new class of entrepreneurs capable of making the transition from one technological order to another (Корсун, Бадмаева, 2022)	Korsun T. and Badmaeva C.	-: doesn't reflect entrepreneurial concepts and innovative aspects
The process leading to the creation of better goods (products, services) and technologies through the practical use of innovations (Крутилина, 2013)	Krutilina S.	-: doesn't reflect entrepreneurial concepts
Consists of entrepreneurs who are distinguished by an innovative type of thinking aimed at finding innovations, new ideas and the search for their implementation (Друкер, 2007)	Drucker P.	+: reflects correct definition of innovations -: doesn't reflect entrepreneurial concepts

Source: *compiled by the author.*

Summarizing the above, we can give an author's definition, that innovative entrepreneurship is the process of developing some kind of innovation or prior goods with new methods leading to innovative changes that result in a new market or satisfaction of new needs and brings monetary gain.

2.2.FACTORS THAT INFLUENCE ON INNOVATIVE ENTREPRENEURSHIP

The main factors that influence innovative entrepreneurship are the institutional framework of a country including political stability, government effectiveness, regulatory quality, rule of law, ease of starting a new business, and ease of obtaining credit (Nurjana et al, 2022), and the interaction between entrepreneurial competencies and innovation barriers (Sedeh, Pezeshkan and Caiazza, 2021). Additionally, the development of entrepreneurial innovation in the rural environment is influenced by factors such as competitiveness at a macroeconomic level, the interaction of elements in Porter's diamond, and external institutions (Harpa, 2017). Economic growth, unemployment, establishment size, and human capital are significant drivers of entrepreneurial activity at both the regional and country level (Civera, Mabel, Fernando). The professional and educational background of founders, the presence of intellectual property assets, and the role of research and development investment also play a role in start-ups' success (Breschi et al, 2018). Region-specific institutions, including normative, cultural-cognitive, and regulative factors, have a significant impact on regional innovative entrepreneurship (Demirdag, Eraydin, 2022).

3.METHODOLOGY

The specification of the innovation market lies in the fact that the cost and price of innovations in the market are formed under the influence of the economic resulting interaction of factors of a particular production, and not only under the influence of the magnitude of aggregate supply and demand (Киселев, 2010). The export of high-tech products is the most important result of the activities of innovative entrepreneurship in the country, primarily because export abroad to a certain extent guarantees the real competitiveness of manufactured products (Баринова et al, 2018).

The Russian economy's success hinges on developing its diverse regions to drive economic modernization, international trade growth, and entrepreneurship. Russia's regions function as intricate management systems affected by various factors. Cluster analysis groups regions based on statistical indicators to study regional development patterns, identifying common growth issues and optimizing economic processes.

The suggestive indicators for characterizing the innovative entrepreneurship and international trade are presented in the table 2. All the data can be found in the official Federal State Statistics Service of Russian Federation – Rosstat (https://rosstat.gov.ru/ (access 25.01.2024)).

Table 2. Indicators for the factors

Indicator	Characteristic
Volume of shipped innovative goods, services, works, mln rub (x_1)	Innovative Products and Technologies
Advanced production technologies used, units (x_2)	
Internal costs for research and development by constituent entities of the Russian Federation, mln rub (x_3)	Scientific and Technical Potential
Costs of innovative activities of organizations, mln rub (x_4)	
Number of personnel engaged in research and development, people (x_5)	
Share of shipped innovative products (works, services) in the total volume of shipped goods, performed works, services, % (x_6)	Economic Efficiency and Competitiveness
Innovative activity of organizations (share of organizations that carried out technological, organizational, and marketing innovations in the reporting year), % (x_7)	
Share of costs for innovation activities in the total volume of goods shipped, work performed, services, % (x_8)	
Export, mln $ (x_9)	International trade
Import, mln $ (x_{10})	

***Source**: compiled by the author.*

The data of 90 Russian entities was used for 2021 (latest fully published data from the official statistical website).

We have applied an index method in order to move from a model with initial indicators to a dimensionless model (we use a scale of 0 to 1) using the formula 1 below:

$$X_i = \frac{x-a}{b-a} \quad (1)$$

Where x – raw digit in data, a – the "minimum" value of this variable among regions, b – "maximum" value of this variable among regions.

The following formulas were implemented (2-7) for calculating indicators:

$$InE = \sqrt{IPT * STP * EEC} \quad (2)$$

$$IT2 = \sqrt{IT1} \quad (3)$$

$$IPT = \sqrt{x_1 \times x_2} \quad (4)$$

$$STP = \sqrt[3]{x_3 \times x_4 \times x_5} \quad (5)$$

$$EEC = \sqrt[3]{x_6 \times x_7 \times x_8} \quad (6)$$

$$IT1 = \sqrt{x_9 \times x_{10}} \quad (7)$$

Where InE – Innovative entrepreneurship, IPT – Innovative products and technologies, STP – Scientific and technical potential, EEC – Economic efficiency and competitiveness, IT1 – International trade (initial), IT2 – International trade (final).

An additional transformation was applied to the international trade indicator to ensure comparability and balance among the indicators used in our cluster analysis. While the initial square root transformation helped mitigate the skewness in the distribution of international trade values, we found that applying another transformation, such as a square root, further normalized the data and improved the alignment with the innovative entrepreneurship indicator. This additional transformation aimed to enhance the robustness of our analysis by ensuring that all indicators contribute equally to the clustering process, thus facilitating a more meaningful interpretation of the results.

As a starting point (InE0, IT0), we took the arithmetic mean value of the InE and IT indexes.

The groups are gathered by the following system (Table 3):

Table 3. Groups of measurement

Group 1	InE > InE0, IT > IT0
Group 2	InE > InE0, IT < IT0
Group 3	InE < InE0, IT < IT0
Group 4	InE < InE0, IT > IT0

***Source**: compiled by the author.*

4.RESULTS

Results of the cluster analysis are presented in Table 4, where R states for Region, Rep states for Republic:

Table 4. Distribution of regions by groups

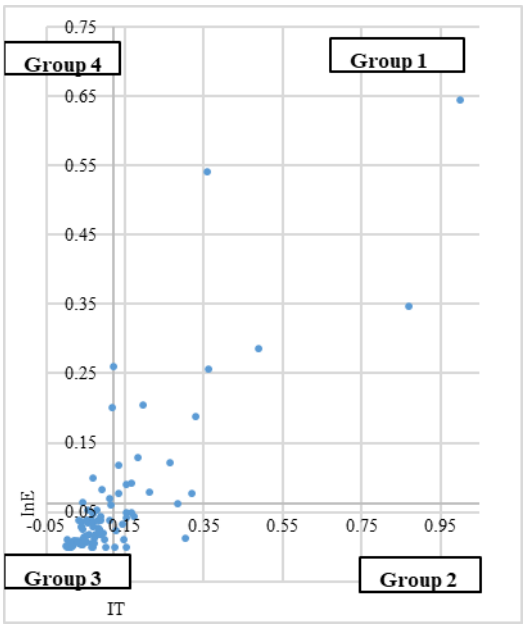
Cluster	Regions	Amount
Group 1	Central Federal District, Moscow R, Moscow, Northwestern Federal District, St. Petersburg, Southern Federal District, Rostov R, Volga Federal District, Rep of Tatarstan, Samara R, Ural Federal District, Sverdlovsk R, Tyumen R, Siberian Federal District, Altai Rep, Omsk R, Rep of Buryatia	17
Group 2	Belgorod R, Tula R, Rep of Bashkortostan, Perm R, Nizhny Novgorod R, Far Eastern Federal District	6
Group 3	Bryansk R, Vladimir R, Voronezh R, Ivanovo R, Kaluga R, Kursk R, Lipetsk R , Ryazan R, Smolensk R, Tambov R, Tver R, Yaroslavl R, Rep of Karelia, Komi Rep, Arkhangelsk R, Vologda R, Murmansk R , Novgorod R, Pskov R, Rep of Adygea, Rep of Kalmykia, Rep of Crimea, Astrakhan R, Volgograd R, Sevastopol, North Caucasus Federal District, Rep of Dagestan, Rep of Ingushetia, Kabardino-Balkarian Rep, Karachay-Cherkess Rep, Northern Rep Ossetia - Alania, Chechen Rep, Stavropol Territory, Mari El Rep, Mordovia Rep, Udmurt Rep, Chuvash Rep, Kirov R, Orenburg R, Penza R, Saratov R, Ulyanovsk R, Kurgan R, Rep of	57

	Tyva, Rep of Khakassia, Altai Territory, Krasnoyarsk Territory, Tomsk R, Rep of Sakha (Yakutia), Transbaikal Territory, Kamchatka Territory, Primorsky Territory, Amur R, Magadan R, Sakhalin R, Jewish Autonomous R, Chukotka Autonomous R	
Group 4	Kostroma R, Oryol R, Kaliningrad R, Leningrad R, Krasnodar R, Chelyabinsk R, Irkutsk R, Kemerovo R, Novosibirsk R, Khabarovsk R	10

***Source**: compiled by the author.*

Picture 1 shows the distribution of these regions by clusters, where IT is the Y axis, InE is the X axis:

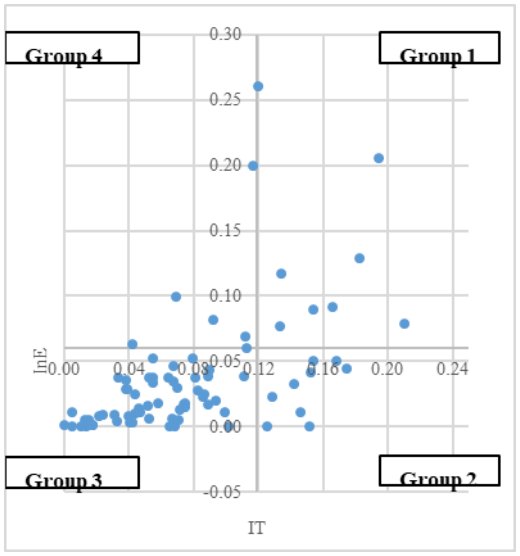
***Picture 1**. Distribution of regions by cluster*



***Source:** compiled by the author.*

Picture 2 shows an enlarged representation:

***Picture 2.** Enlarged distribution of regions by clusters*



***Source:** compiled by the author.*

5.DISCUSSIONS AND CONCLUSIONS

The first cluster represents regions characterized by robust levels of both innovative entrepreneurship and international trade activities. These areas likely boast thriving economies supported by robust innovation ecosystems and active integration into global trade networks.

In contrast, the second cluster presents a nuanced scenario where regions demonstrate significant levels of innovative entrepreneurship but comparatively lower engagement in international trade. Despite possessing vibrant innovation ecosystems and sustained investment in innovative initiatives, these regions encounter challenges in achieving optimal levels of international trade activity. These challenges may stem from constraints in accessing international markets or participating in global trade networks.

Conversely, the third cluster mirrors the characteristics of the first cluster but in a negative context, albeit comprehensible. Here, innovative entrepreneurship inadequately contributes to the advancement of international trade in Russia.

The fourth cluster highlights regions exhibiting notable levels of international trade activity even in the absence of significant innovative entrepreneurship. Despite potential for further improvement through enhanced innovation efforts, these regions demonstrate higher reliance on trade activities for economic growth.

Regarding to the distribution of the regions by clusters we proved again that there is a giant gap between the leaders (Central Federal District, Northwestern Federal District and Moscow) and

remaining country. This discrepancy underscores the limited extent to which innovative activity contributes to Russia's international trade.

Based on the provided cluster analysis of Russian regions based on indicators of innovative entrepreneurship and international trade, it appears that the majority of regions fall into the third group, characterized by low values on both axes. This suggests a prevailing lack of substantial engagement in innovative entrepreneurial endeavors and international trade across these regions.

The significant gap observed between the majority of Russian regions and three leaders could be attributed to a combination of several factors like economic concentration, infrastructure, and global connectivity (key industrial centers, ports, and strategic transportation networks, facilitating robust economic growth and development), innovation ecosystems (including educational and research institutions), some policy priorities and support, and even some historical and cultural factors.

In essence, addressing these disparities necessitates nuanced policy interventions and strategic initiatives tailored to harness regional strengths and mitigate structural constraints, thereby fostering more equitable and sustainable economic development trajectories across the country.

In conclusion, this article has shed light on the intricate interplay between innovative entrepreneurship and international trade patterns in the context of Russia's regional landscape. By meticulously examining various definitions of innovative entrepreneurship and identifying key influencing factors, we have laid a solid foundation for our subsequent analysis.

The centerpiece of our investigation lies in the application of cluster analysis techniques to unveil regional differentiation in the state of Russian innovative entrepreneurship vis-à-vis international trade.

The theoretical significance of this study lies in its contribution to advancing our comprehension of the dynamics shaping innovative entrepreneurship within the realm of international trade. By elucidating the connections between various factors and their impact on regional development, our work enriches scholarly discourse and lays the groundwork for further exploration.

Furthermore, the practical implications of our research are profound, particularly in highlighting the substantial disparity between the Central Federal District, Moscow, and other regions. This insight underscores the imperative for targeted interventions aimed at bridging this gap and fostering more inclusive and sustainable development across all regions.

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