NEW TEXTS

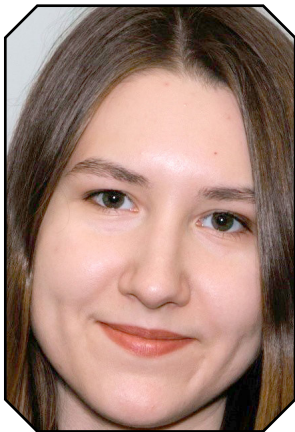**Valeriya Grinchenko**

Entrepreneurial Ecosystem: Comparative Analysis of Petrozavodsk and Pskov

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Abstract

The development of entrepreneurship is a crucial tool for achieving economic growth and enhancing the investment appeal of regions. Many small and medium-sized Russian cities display varied tendencies in economic development, which can be explained by both objective differences in their entrepreneurial ecosystems and how these ecosystems are portrayed in media narratives. This paper presents a comparative analysis of the media representation of entrepreneurial ecosystems in two Russian cities, Petrozavodsk and Pskov. It examines the manifestation and interaction of different types of entrepreneurial ecosystem attributes within these media narratives. The choice of cities for analysis aligns with the objectives of the research project by the ICSER "Leontief Centre": "Genius Loci and Zeitgeist," under which this study was conducted. Using corpus-assisted discourse analysis and thematic modeling with LDA, this research examines word frequencies and modeled topics—both common and unique to each locality—and analyzes topic co-occurrence in each city's discourse. The findings highlight differences and similarities in the media representation of entrepreneurial ecosystems, noting the prevalence of material attributes in both discourses, while also identifying unique interactions among different types of attributes in Petrozavodsk and Pskov. These insights offer a foundation for understanding factors that shape entrepreneurial activities in these regions and suggest directions for future research to empirically examine the relationship between these attributes and local entrepreneurial activity indicators.

Keywords: entrepreneurial ecosystem; attributes of the entrepreneurial ecosystem; regional development; entrepreneurship in media; corpus-assisted discourse analysis; LDA.

Acknowledgements

Introduction

Modern nations universally pursue economic development, yet not all adequately assess the importance of maintaining economic prosperity across all regions. Ascani et al. [Ascani, Crescenzi, Iammarino 2012] argue that due to internal and external trade dynamics, inequalities among localities have increased; while some regions thrive economically, others face decline. These imbalances at the regional

level can significantly impact national economic health, exacerbating uneven development patterns. Furthermore, regional economic conditions influence national knowledge generation and innovation creation because local institutions and networks contribute to a region's innovative potential, which, in turn, enhances the country's knowledge capital [Ascani, Crescenzi, Iammarino 2012].

Consequently, the regional economy has become a pivotal focus within governmental policy, and many scholars highlight the importance of local entrepreneurship as a central element. Entrepreneurs play a critical role in driving economic development through their risk-taking and pursuit of new market opportunities [Beugelsdijk 2007]. Moreover, entrepreneurial activity fosters innovation, contributing to the competitiveness of cities and regions [Hajikhani 2020].

A primary factor influencing entrepreneurial community development in a region is local entrepreneurial capital. From a macroeconomic perspective, entrepreneurial capital is defined as a "region's endowment with factors conducive to the creation of new businesses" [Audretsch, Keilbach 2004]. A region with rich entrepreneurial capital encourages high levels of economic participation in establishing new firms and promoting innovation within existing organizations [Audretsch, Keilbach 2004; Jaén, Liñán 2013]. Entrepreneurial capital is shaped by the environment and interactions among economic actors [Aggestam 2014], thus becoming part of a broader entrepreneurial ecosystem that creates conditions conducive to fostering local entrepreneurial communities.

Literature Review and Problem Statement

Definition of Entrepreneurial Ecosystem

There are various approaches to defining the entrepreneurial ecosystem. Many authors define it as a "dynamic, self-regulating network of many different types of actors" who may not even be entrepreneurs themselves [Isenberg 2014; Stam 2015] (as cited in: [De Brito, Leitão 2021]). An entrepreneurial ecosystem is localized, as it consists of an interconnected set of actors in a particular geographic community committed to development through the encouragement and support of new sustainable ventures [Cohen 2006]. Since resources, support structures, and networks are usually regionally bound, the region became a suitable level of analysis in studies of entrepreneurial ecosystems [Rinkinen, Konsti-Laakso 2023]. An entrepreneurial ecosystem provides a systematic view of entrepreneurship, assuming that the cultural, social, and economic environment can comprehensively influence the development of entrepreneurship in the region [Cavallo, Ghezzi, Balocco 2019]. It aims to stimulate the creation of new firms and startups, becoming a driver of regional economic and innovative development [Alvedalen, Boschma 2017]. Indeed, empirical research has confirmed that regulatory, normative, and cultural institutions moderate the relationship between entrepreneurial orientation and firms' performance by facilitating access to various types of resources [Wales, Shirokova, Beliaeva, Micelotta, Marino 2021].

Attributes of Entrepreneurial Ecosystem

The entrepreneurial ecosystem is a complex and multi-layered structure that plays a crucial role in promoting entrepreneurship, small-business growth, and innovation [Meshram, Rawani 2019]. This ecosystem is characterized by a set of attributes that provide entrepreneurs with advantages and resources for successful work. Different authors present various classifications of these attributes. For example, Theodoraki, Messeghem and Rice [Theodoraki et al. 2018] considered the dimensions of entrepreneurship as a set of interacting sub-ecosystems: actors who shape it and their formal/informal networks, physical infrastructure, and culture. Stam & Ven [Stam, Ven 2021] identified ten elements of the entrepreneurial ecosystem, such as formal/informal institutions, social networks, physical resources, financial resources, leadership, human capital, knowledge, means

of consumption, and producer services, all of which were distinguished into institutional arrangements and resource endowments. Moreover, the authors note causal interrelationships among these elements, indicating the interdependence of these attributes.

Spigel [Spigel 2017] presented one of the most detailed views on the dimensions of entrepreneurial ecosystems and argued that ecosystems are composed of ten attributes from the cultural, social, and material spheres. These attributes provide resources and an environment conducive to entrepreneurial activity, and the relationships between these dimensions help reproduce the local ecosystem. By cultural attributes, the author means underlying beliefs and perspectives about entrepreneurship within a region, including two main sub-attributes: cultural attitudes, which normalize entrepreneurship as a viable career path, and histories of entrepreneurship, which recount stories of local success, helping to create an image of entrepreneurship's accessibility and the benefits available to those who pursue it. Social attributes relate to resources from local social networks and include worker talent (experienced workers with applied skills, contributing to business development), investment capital (financial support from institutional investors), networks (which play crucial roles in gaining knowledge and integrating into local knowledge streams), and mentors and role models — successful entrepreneurs who provide advice and support to newcomers in entrepreneurship.

Material attributes are physically present in the region in the form of *universities*, which play a role in training aspiring entrepreneurs, support services and facilities, which provide specialized help for newcomers, policy and governance — state-run programs or regulations that finance startups and oversee their activities, and open markets, which reflect the availability of local opportunities and demand, enabling venture creation.

Media Discourse and Entrepreneurial Ecosystem

Since the entrepreneurial ecosystem is, by definition, considered an inherently connected concept with a specific territory, it is most often studied through case studies in specific localities [Spigel 2017; Theodoraki et al. 2018]. One way to analyze the manifestation of entrepreneurial ecosystem attributes typical of a particular society is to examine media articles covering entrepreneurship in a city or region. Discourse analysis is regarded as an effective tool for generating new knowledge about a regional entrepreneurial ecosystem, since "language acts as a mediator for constructing reality," and the study of public discussions may help us understand social constructions, revealing sources of power, inequalities, and biases [Achtenhagen, Welter 2007].

According to the theory of social representation, mass media not only participates in representing reality but plays a key role in forming a common understanding and interpretation of social phenomena through the mechanisms of anchoring—rooting ideas in people's minds—and objectification, which is the materialization of ideas into external reality [Höijer 2011]. Knowledge presented in the media about behavioral patterns and values accepted in society can influence perceptions and the construction of reality even more than objective indicators of the environment, since individuals interact with media daily [Laguía, Moriano 2021].

Moreover, narratives about entrepreneurship in society can affect readers' beliefs about the benefits of entrepreneurial activity, influencing the ongoing formation of the entrepreneurial ecosystem [Radu, Redien-Collot 2008]. According to the entrepreneurial event model, entrepreneurial activity is more likely to occur in environments where it is perceived as desirable and feasible [Shapero, Sokol 1982], and these preferences are shaped by environmental factors, one of which is media discourse, which society encounters daily.

Entrepreneurial Ecosystems in Small Cities

Most research on entrepreneurial ecosystems has focused exclusively on large cities, primarily in developed countries [Roundy 2017]. Consequently, there is limited knowledge about small and medium-sized cities in

this field. However, in small towns, the development of an entrepreneurial ecosystem can play a key role in economic growth, through strategies for city development [Roundy 2017]. In a broader sense, discovering the entrepreneurial potential of small and medium-sized cities can transform the settlement structure of the country, increasing the economic and cultural attractiveness of these cities [Ilyina, Kulibanova, Teor 2023].

In modern Russia, many medium-sized cities (with populations of 50,000–250,000 inhabitants) have the potential for economic transformation and innovation, though some adapt to external challenges while others experience stagnation. To determine whether the discourse around entrepreneurship is unique to each medium-sized city or if it shares common traits, this paper will conduct a comparative analysis of the entrepreneurial ecosystems' representation in two regional centers in the Northwest: Petrozavodsk and Pskov.

This paper is part of a scientific research project by the CJSC ICSER "Leontief Centre": "*Genius Loci and Zeitgeist.*" This project focuses on the unique aspects of the local economic, social, and cultural environment, its capacity to perceive and implement technological and organizational innovations, and the potential of cities to adapt to external challenges and drive local economic transformation. The choice of cities for analysis aligns with the project's goals, as Petrozavodsk and Pskov are similar in geographic and demographic traits (the population of Petrozavodsk is 235,793 (2023) and of Pskov is 189,315 (2023), with comparable areas and geographical locations). However, they differ in economic indicators (in rankings of the socio-economic situation of Russian regions, the Republic of Karelia ranks 66th, while the Pskov region ranks 74th [RIA Rating 2023]) and in entrepreneurial activity: the relative increase in the number of organizations in Karelia is − 2.5, compared to − 3.8 in the Pskov region [Institute for Statistical Research… 2023]. By comparing these two cities with similar backgrounds but different local indicators, we aim to draw conclusions about attributes emphasized in each city's media, noting similarities and differences in local narratives and entrepreneurial trends based on word frequencies, and to identify characteristics of urban development that may explain these variations.

> *RQ 1:* How do discourses of entrepreneurship in the regional media of Petrozavodsk and Pskov differ?

> — Analyze the representation of the entrepreneurial ecosystems in Petrozavodsk and Pskov using computational text analysis;

> — Identify distinctive features through comparison of their thesaurus of anchor words and topic distribution.

As discussed earlier, media narratives may influence perceptions of outcomes from entrepreneurial activity [Radu, Redien-Collot 2008]. Based on the criteria for selecting these cities, it can be assumed that the entrepreneurial ecosystems of Petrozavodsk and Pskov will differ in terms of the social desirability of entrepreneurship. Since secondary data suggest that Petrozavodsk is more successful in local entrepreneurship, we expect that Pskov's narrative may emphasize the challenges of entrepreneurial activity more strongly than Petrozavodsk's. Differences in the entrepreneurial ecosystems presented in the media should be reflected in topic selection and keywords unique to each city.

> *H 1:* Pskov's discourse will include more language focused on entrepreneurial complexities, restrictions, and regulations than that of Petrozavodsk.

> *RQ 2*: How do material, social, and cultural attributes manifest in the media representation of Petrozavodsk's and Pskov's entrepreneurial ecosystems?

> — Identify which attributes of each city's entrepreneurial ecosystem are most reflected in media articles based on topic distribution;

— Analyze the co-occurrence of attributes in each city's discourse to observe their interaction.

The attributes of the entrepreneurial ecosystem are interdependent and may interact uniquely within each ecosystem [Neck, Meyer, Cohen, Corbett 2004]. Furthermore, different entrepreneurial ecosystems, comprised of distinct attributes, may produce various outcomes. For instance, Neumeyer et al. [Neumeyer, Santos, Morris 2019] argue that ecosystems may contain social clusters that include actors with different social characteristics who pursue diverse types of entrepreneurship. Institutional settings also influence the development of an entrepreneurial ecosystem, determining which startup formats are likely to emerge [Dosi 1988] (as cited in: [Wurth, Stam, Spigel 2022]). Thus, we propose that the interaction of attributes in the entrepreneurial ecosystems of two similar small cities will nonetheless display a unique structure.

H 2: Each of the two cities will exhibit a unique network of interactions among entrepreneurial ecosystem attributes.

Methodology

This thesis employs a cross-disciplinary approach using corpus-assisted discourse analysis [Baker 2006]. Unlike classical discourse analysis, corpus-based research relies on both qualitative and quantitative techniques, which helps reduce research bias and allows for the analysis of large text volumes. In this context, the frequencies and associative patterns of words provide quantitative insights, while qualitative interpretations allow us to explain these patterns by examining word meanings and usage context.

Article Search

The Medialogy service was used to select media articles for analysis. When formulating a search query, it was necessary to examine relevant literature to identify keywords commonly used in media content analysis studies of entrepreneurial ecosystems. To capture the social representation of the entrepreneurial ecosystem in local media, articles were filtered using keywords like "entrepreneur" or "entrepreneurship" in the title [Radu, Redien-Collot 2008], as well as terms such as "opening a new business," "business development," "business opportunities," and "entrepreneurial process" in either the title or article content [Rinkinen, Konsti-Laakso 2023]. Given the limited Russian-language research on entrepreneurial ecosystems in regional media, which results in few Russian keyword analogs, I focused on English-language keywords and selected the closest Russian alternatives to create the Medialogy query:

1. (предприниматель* | стартап | "открытие нового бизнеса" | "бизнес возможности") /20 Петрозаводск*
2. (предприниматель* | стартап | "открытие нового бизнеса" | "бизнес возможности") /20 Псков*

Sample of Articles and Data Collection

To assess the current state of the cities' entrepreneurial ecosystems, I filtered articles from January 1, 2023, onward. The database of collected articles was then refined to remove duplicate and irrelevant content. The data revealed that from January 1, 2023, to February 1, 2024, 1,576 unique articles on entrepreneurship were published in Petrozavodsk and 2,656 in Pskov. Thus, for this timeframe, there were more articles about entrepreneurship in Pskov than in Petrozavodsk.

During text preprocessing, string operations, tokenization with UDPipe, and lemmatization were performed. For further analysis, only nouns and adjectives were selected. A stopword list was compiled to remove insignificant words from the set of lemmas, yielding a final word set containing 606,025 tokens (words), with 35,579 unique.

Methods of Text Analysis

For comparative computational text analysis, the Log-odds ratio algorithm was applied. In addition to a comparative analysis of word frequency, I conducted thematic modeling using the LDA (Latent Dirichlet Allocation) method. Based on the entire corpus of articles about Petrozavodsk and Pskov, topics common to both cities were modeled, providing objective criteria for comparing topic distribution within each city's discourse.

The optimal number of LDA topics can vary, and it is crucial to determine the ideal number of topics, as this influences feature quality for classification [Arun, Suresh, Veni Madhavan, Narasimha Murthy 2010]. Using two algorithms for topic count minimization [Cao, Xia, Li, Zhang, Tang 2009; Arun, Suresh, Veni Madhavan, Narasimha Murthy 2010] and two for maximization [Griffiths, Steyvers 2004; Deveaud, Sanjuan, Bellot 2014], I identified an optimal number of topics, n = 29 (see Figure 1). A commonly accepted cutoff of 0.05 for topic proportions was applied to determine each topic's presence in an article.
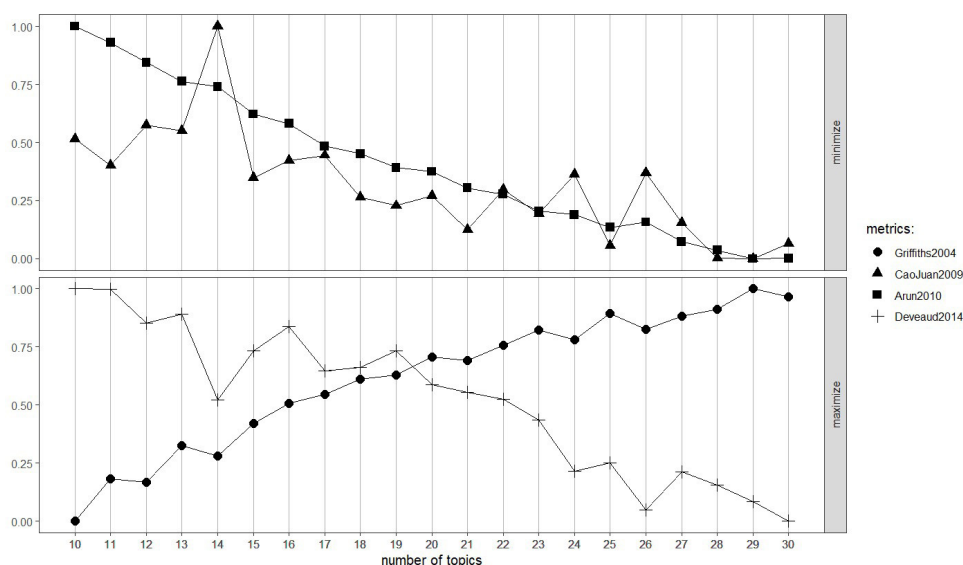

Figure 1. Selecting Number of Topics for LDA Model

After examining the words associated with each topic, conclusions could be drawn about which entrepreneurial ecosystem attribute each topic represented. To date, no studies have examined entrepreneurial ecosystem attributes and their interactions by analyzing resulting cluster relationships. Consequently, I relied on heuristic methods grounded in the theoretical framework above. For analyzing attribute interactions, social network theory was applied. Metrics such as centralization and density were used to evaluate attribute co-occurrence characteristics in each city's discourse.

Results

Contrastive Analysis of Words

The word clouds for Petrozavodsk and Pskov reveal many high-frequency words in common, suggesting similarities in the discourses of both cities. The Petrozavodsk word cloud, however, includes terms related to educational components (see Figure 2.1), indicating a notable role of educational institutions in promoting entrepreneurial ideas. In examining the representation of government entities, terms related to local authorities dominate in Petrozavodsk (see Figure 2.1), while Pskov's discourse more frequently references federal and regional government bodies (see Figure 2.2).
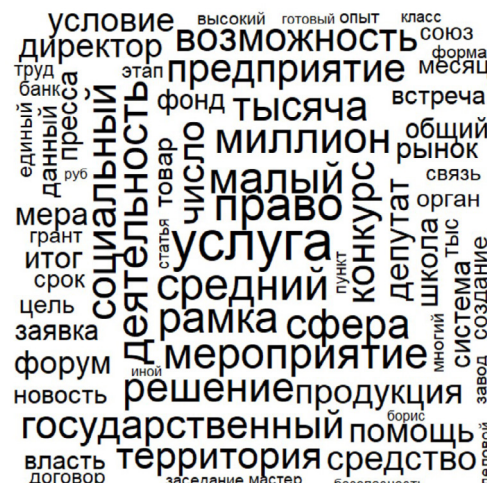
Figure 2.1. Word Cloud for Petrozavodsk

Figure 2.2. Word Cloud for Pskov

The Log-odds ratio analysis identified certain names and surnames of prominent political figures and local entrepreneurs, underscoring the importance of specific individuals in each city's entrepreneurial narrative (see Figure 3). This finding suggests that media coverage of entrepreneurship in both cities revolves around two primary actor groups: government officials and local business leaders.

Both cities' word clouds mention business areas tied to local production, highlighting regional industries. Media discourse reflects that these entrepreneurial projects often receive governmental support, utilizing local ecological resources for business purposes.

For Petrozavodsk, the Log-odds ratio analysis emphasized names of local educational institutions and enterprises (see Figure 3), underscoring a strong focus on promoting entrepreneurship within schools, universities, and colleges. Activities like competitions, master classes, and accelerators, as well as specialized training programs and new institutions aimed at fostering future entrepreneurs, are frequently covered by the media.
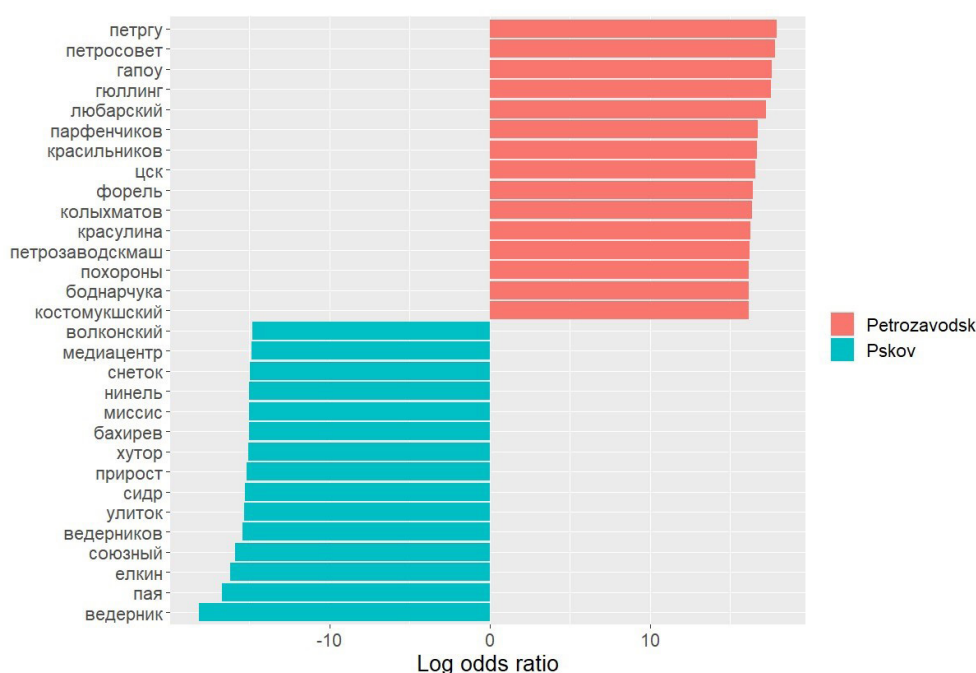

Figure 3. The Most Frequently Used Words in the Petrozavodsk/Pskov Discourse, as Determined by the Log-Odds Ratio Method

In summary, Hypothesis 1 (H 1)—which proposed that Pskov's discourse would include more terms related to restrictions and negative experiences in entrepreneurship—was not supported by comparative word frequency analysis. However, the results of topic modeling may present different insights.

Topic Modeling: Material Attributes Representation

Out of the 26 relevant topics modeled (three were excluded due to irrelevance), 18 relate to material attributes of the entrepreneurial ecosystem, covering all subfields of these attributes.

Legal Regulation of Entrepreneurship

The representation of legal regulations appears in five aspects (see Table 1). First, topics address regulations on working conditions, including minimum wage requirements, illustrating entrepreneurs' obligations towards their employees. Second, coverage of legal actions against entrepreneurs who violate agreements or laws portrays the potential legal consequences of non-compliance. Third, product quality control is highlighted, with articles focusing on the legality of businesses whose goods were confiscated due to missing documentation or markings. Fourth, articles emphasize legal restrictions on certain types of entrepreneurial activities, such as new laws regulating short-term housing rentals, as exemplified by recent regulations in Pskov. Lastly, topics cover tax incentives for entrepreneurs, which, although highlighting favorable tax policies, also encourage timely compliance with tax obligations.

Overall, topics surrounding legal regulations highlight restrictions for startups and the negative consequences of non-compliance. According to Radu & Redien-Collot [Radu, Redien-Collot 2008], such portrayals may reduce the perceived desirability of entrepreneurship by emphasizing negative consequences for rule violations, potentially discouraging engagement in entrepreneurial careers.

Governmental Support Beyond Regulations

The government's role in the entrepreneurial ecosystem extends beyond regulation, as illustrated by a topic focused on subsidized loans and funding guarantees from the RGS (see Table 1). National programs supporting small and medium-sized businesses are presented as accessible opportunities for new entrepreneurs to secure capital with minimal risk, thus framing entrepreneurship as a favorable and approachable endeavor.

Table 1

Top 10 Keywords of Topics Connected to Policy and Governance in Material Attributes

Control over Working Conditions	Criminal Prosecution of Entrepreneurs	Quality Control of Goods	Restrictions on the Implementation of Entrepreneurial Activity	Tax Control	Preferential Lending
соглашение	миллион	продукция	квартира	налоговый	миллиард
профсоюз	уголовный	нарушение	гостиничный	государственный	средний
объединение	размер	проверка	услуга	налог	малый
работодатель	судебный	продажа	помещение	документ	финансовый
союз	взятка	управление	жилой	индивидуальный	миллион
край	решение	индивидуальный	аренда	муниципальный	кредит
федерация	свобода	товар	конституционный	участок	льготный
мрота	руб	требование	право	федерация	банк
плата	тысяча	прокуратура	жилье	орган	субъект
постановление	лишение	роспотребнадзор	краткосрочный	служба	поручительство

Role of Educational Institutions

Universities and other educational institutions play a prominent role in the media representation of material attributes of the entrepreneurial ecosystem (see Table 2). This is visible in two ways: First, events like accelerators and student startup competitions aim to engage students in entrepreneurship and build practical skills. Second, universities offer new professional training programs designed to develop skills essential for entrepreneurial success, with one of the most notable being the "Professionalitet" project.

Educational institutions, therefore, contribute to the media discourse by highlighting the opportunities they provide to students and by concentrating streams of entrepreneurial knowledge within their centers.

Table 2

Top 10 Keywords of Topics Connected to Universities in Material Attributes

Entrepreneurial Events Organized by Universities	Professional Training Programs
университет	школа
студент	образование
государственный	образовательный
наука	колледж
школа	профессиональный
стартап	студент
технология	техникум
технологический	технология
научный	класс
образовательный	средний

Support Programs for Beginners in Entrepreneurship

Regarding support programs for novice entrepreneurs, two main providers stand out in the media narratives: governmental and non-governmental organizations (see Table **3**). Articles on governmental support highlight national initiatives aimed at providing benefits for small and medium-sized businesses, which are both implemented and overseen by regional government entities. Such coverage emphasizes the authorities' vested interest in nurturing this sector. In contrast, non-governmental programs, often spearheaded by non-profit organizations, focus on promoting entrepreneurship within society and offering both consulting and financial support to new business owners. These articles showcase how start-ups that demonstrate potential within various programs receive funding to bring their business ideas to fruition. Both forms of support portray entrepreneurship as widely accessible, with entrepreneurs encouraged to seek out these free resources.

Contests and Awards for Aspiring Start-Ups

Beyond direct support programs, contests and awards also play a significant role in fostering startups that aim to implement new business projects. Media coverage of these events fosters a sense of security and support for those considering entrepreneurship, providing real examples of winning projects to inspire new participants. Additionally, articles stress that support is not always event- or competition-based; individuals can apply independently to receive assistance, which may include co-financing, accounting support, legal aid, or other services critical to business development. These articles help demystify the process, clarifying the types of support various organizations offer to entrepreneurs.

Table 3

Top 10 Keywords of Topics Connected to Support Services in Material Attributes

GO support programs	NGO Support programs	Contests and awards	Co-financing and services
экономика	мероприятие	конкурс	социальный
сфера	рамка	номинация	услуга
экономический	форум	победитель	заявка
возможность	креативный	лучший	грант
губернатор	эксперт	премия	малый
уровень	возможность	этап	субъект
решение	обучение	всероссийский	средний
реализация	идея	команда	отбор
направление	малый	фестиваль	муниципальный
число	индустрия	итог	комплексный

Open Market Opportunities and Macroeconomic Factors

A substantial portion of the entrepreneurial narrative in both cities focuses on the Open Market and macro-economic trends (see Table 4). Articles outline different sectors in which entrepreneurs are active, thereby illustrating the market demand within these areas. For example, one topic area is dedicated to entrepreneurial initiatives within the military sector, responding to increased demand for essential goods, equipment, and technologies. Another highlights food market activities, including articles that cover open markets in the city, suggesting an opportunity-rich environment for entrepreneurs interested in selling agricultural products.

The urban market is another sector emphasized in partnership with local authorities, which signals to potential entrepreneurs a steady demand for urban environment improvements. Finally, tourism is prominently featured as an emerging business field. Articles discuss the economic benefits of tourism for the regions, noting significant investments directed toward the sector. Numerous operational agrotourism complexes and businesses are cited as successful examples, supported by government grants and development plans. This portrayal creates a compelling picture of tourism as a lucrative and supported sector, potentially enticing entrepreneurs to pursue ventures within this field.

The articles also paid attention to the macroeconomic situation in the region. They included reports on developments in both the domestic and international economies, covering changes in the key interest rate, as well as new sanctions and restrictions on exports and imports. This economic context is an important component of the entrepreneurial ecosystem, as it can influence entrepreneurs' motivation to either launch new ventures or expand into international markets under such conditions.

Table 4

Top 10 Keywords of Topics Connected to Open Market in Material Attributes

Military Market	Food Market	Urban Market	Tourism Market	Regional Economy
помощь	ярмарка	администрация	туризм	ситуация
семья	продукция	городской	туристический	мнение
военный	гость	территория	турист	проблема
боец	сувенир	объект	маршрут	власть
акция	продукт	вывеска	объект	владимир
единый	ярмарка	торговый	гость	эксперт
фонд	товар	дизайн	отель	рост
сво	производитель	здание	отдых	государство
партия	ягода	благоустройство	сельский	начало
отделение	мороженый	площадка	гостиница	президент

Digital Services to Help Entrepreneurs

The final topic connected to the material attributes of the entrepreneurial ecosystem focuses on digital services available to entrepreneurs (see Table 5). Some articles describe an electronic supplier portal where entrepreneurs can secure contracts on a competitive basis, allowing new business owners to effectively organize their work and connect with potential customers.

Table 5

Top 10 Keywords of Topics Connected to Physical Infrastructure in Material Attributes

Digital Services
сервис
банк
платформа
поставщик
клиент
тысяча
электронный
цифровой
товар
закупка

In sum, all dimensions of the material attributes of the entrepreneurial ecosystem, as highlighted by Spigel [Spigel 2017], were represented in media coverage from Petrozavodsk and Pskov. Some topics emphasized positive aspects of the ecosystem that may stimulate local business growth, while others highlighted restrictive measures that could constrain or even suppress it.

Topic Modeling: Social Attributes Representation

The social attributes of the entrepreneurial ecosystem manifested through two dimensions: the availability of skilled workers and the presence of networks among various business actors (see Table 6). It is important to note that the discourse in these cities lacked references to entrepreneurs as role models. Specifically, the media did not feature stories of experienced businessmen organizing mentoring sessions with aspiring entrepreneurs to share insights and advice. Nor were there articles about investors interested in funding new projects or narratives where novice entrepreneurs received financial backing from family, friends, or independent investors. This absence likely reflects not the unique characteristics of the entrepreneurial ecosystems in the analyzed cities, but rather the broader entrepreneurial culture in Russia as a whole.

The first topic among the social attributes concerns the job market and highlights the high demand for employment through job fairs specifically organized for graduates and the unemployed, aimed at helping job seekers plan their career paths (see Table 6). From these articles, aspiring entrepreneurs can see that qualified professionals are actively seeking work in various fields, suggesting that it would be relatively easy to recruit skilled labor to support their business ideas.

Regarding the representation of social networks within the article narratives, this aspect appeared across three topics (see Table 6). The first group of articles described prominent local figures from the economic, political, and cultural elite. Local entrepreneurs were also included in this category, underscoring their integration into local dynamics and defining their entrepreneurial role as a status symbol. The second group of articles covered forums and networking events where members of diverse social groups could meet, build new connections, and establish partnership agreements. The final topic illustrated the dialogue between government agencies and the business community through the organization of an Open Day for entrepreneurs, during which government representatives were available to answer questions relevant to the business community.

Top 10 Keywords of Topics Connected to Social Attributes

Job Fairs	Influential Personalities	Forums and Meetings	GO and Entrepreneurs
занятость	депутат	представитель	право
труд	областной	мероприятие	защита
гражданин	собрание	председатель	деятельность
обучение	партия	встреча	аркадий
работодатель	ведерник	форум	орган
возможность	александр	совет	правовой
работник	председатель	директор	заседание
служба	губернатор	молодежь	уполномоченный
трудоустройство	кандидат	руководитель	обращение
специалист	борис	сотрудничество	управление

In sum, the topics illustrating the presence of networks demonstrate to readers the availability of platforms for open communication between entrepreneurs and various influential groups, fostering the active exchange of knowledge and facilitating partnership agreements.

Topic Modeling: Cultural Attributes Representation

The manifestation of cultural attributes in the discourse of the cities was expressed through descriptions of success stories from entrepreneurs in various fields of activity (see Table 7). To identify topics with cultural attributes, the presence of real names and specific details about the entrepreneurs' paths and experiences was essential. This attribute encompassed four topics, with narratives revolving around particular areas of entrepreneurship that are widespread in the regions.

One prominent area was the field of art: these news articles described how entrepreneurs organize museums, curate exhibitions, and create new art installations for the city. Another topic focused on design, featuring articles about fashion shows for local brands, exhibitions of aspiring designer-entrepreneurs selling their own clothing, and stories of local manufacturers crafting unique interior design items. A third area of discourse centered on manufacturing. Here, the articles detailed the histories of companies engaged in production involving large and expensive equipment, such as furniture and food production. The final topic in cultural attributes highlighted success stories of major local entrepreneurs who have grown from small, local businesses to operate on a federal scale, including expanding into export markets.

Top 10 Keywords of Topics Connected to Cultural Attributes

Stories: Art	Stories: Design	Stories: Manufacture	Stories: Major Entrepreneurs
музей	мастер	сельский	производство
история	изделие	хозяйство	предприятие
памятник	производство	технопарк	продукция
исторический	одежда	производство	рынок
праздник	магазин	артура	завод
выставка	заказ	знак	экспорт
александр	бренд	парфенчик	экспортер
художник	мастерский	владимир	объем
искусство	клиент	инициатива	промышленный
храм	оборудование	нацпроект	оборудование

Comparison of Topic Distribution in Petrozavodsk and Pskov

Using the Log-odds ratio method, we can analyze the distribution of topics across the documents from both cities to determine which topics were more prevalent in one city's discourse compared to the other, and which were equally common in both (see Figure 4). A log-odds benchmark of ± 0.25 was applied to identify topics that are typical for one city or are equally common in both.

The first difference lies in the distribution of topics that describe the cultural attributes of the entrepreneurial ecosystem (see Figure 4). Half of these topics—two out of four—are characteristic of the Petrozavodsk discourse, while the remaining two are equally common in the narratives of both cities. The manufacturing sector is equally prominent in both cities (see Appendix, Table A.1), so the frequent mention of this topic in Petrozavodsk does not necessarily relate to its prevalence in the region. This suggests that Petrozavodsk's discourse more frequently includes real-life examples of successfully implemented projects, potentially motivating and encouraging newcomers to take action.

In terms of social attributes, the representation differs across the two cities (see Figure 4). Petrozavodsk narratives emphasize job fairs and demand in the labor market, whereas Pskov's discourse centers on the social networks supporting local entrepreneurship. In both cities, the dialogue between government agencies and the business community is equally prominent, according to the log-odds ratio. Thus, Pskov demonstrates the presence of established networks within the local economic space, while Petrozavodsk highlights the potential for building new networks by attracting qualified professionals. This finding aligns with the employment rate, which is lower in Petrozavodsk than in Pskov (see Appendix, Table A.1).

The majority of topics related to the legal regulation of entrepreneurship—three out of five—appear more frequently in Pskov's discourse, supporting Hypothesis 1 (H 1) (see Figure 4). In Pskov, there is more frequent mention of rules that restrict certain types of entrepreneurial activity, including tax enforcement and the regulation of workplace conditions. These laws, which impact business operations daily, are more frequently highlighted. Meanwhile, a topic on consumer rights monitoring appears with equal frequency in both cities. Petrozavodsk, however, features a topic on the criminal prosecution of entrepreneurs who breach agreements or business regulations, suggesting that its coverage of legal issues tends to focus on extreme cases of violations.

In terms of material attributes, Pskov's discourse includes more articles focused on support and financing for start-up enterprises (see Figure 4). Here, the emphasis is on creating an image of accessible entrepreneurship through national projects, support services, special contests, co-funding programs, and preferential lending options. The media in Pskov thus plays an essential role in highlighting initiatives that simplify business activities, serving as a primary information source for entrepreneurs. By contrast, Petrozavodsk's discourse more frequently discusses topics related to the openness of specific markets for entrepreneurial ventures (see Figure 4). Both cities' narratives equally cover entrepreneurship in the food and tourism sectors, with particular attention on agriculture. The media in both regions clearly articulates the role of local producers in agriculture and emphasizes the ongoing demand for their products.

The economic situation of the regions is equally represented in the discourse of both cities (see Figure 4), underscoring the importance of macroeconomic indicators in shaping perceptions of each entrepreneurial ecosystem. Additionally, articles on digital services appear with similar frequency in both Petrozavodsk and Pskov, perhaps reflecting the centralization of digital services in the capital and the limited availability of local alternatives.

Universities, as training grounds for new entrepreneurs and as hosts of accelerators and competitions that promote entrepreneurship, are also equally prominent in articles from both cities (see Figure 4). However,

Petrozavodsk's narrative more frequently mentions training programs and courses, consistent with the word frequency analysis showing that Petrozavodsk is characterized by terms related to education and educational institutions.
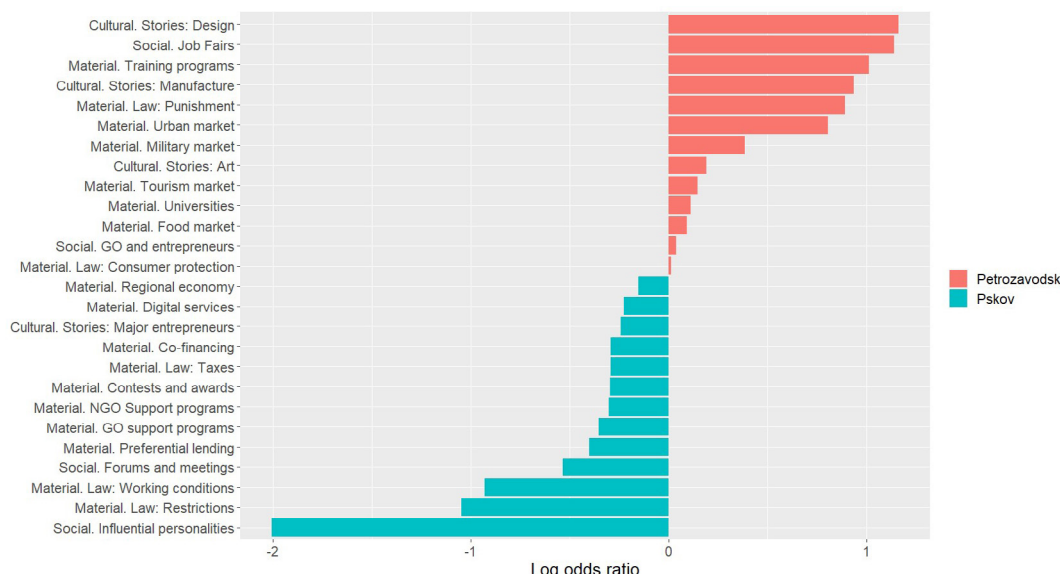

Figure 4. The Most Frequently Used Topics in the Petrozavodsk/Pskov Discourse, as Determined by the Log-Odds Ratio Method

Topic Interactions in Petrozavodsk and Pskov

The interaction of topics is understood as the co-occurrence of topics within the same media articles. Since, in our case, topics represent one or another attribute of the entrepreneurial ecosystem, their interaction can reveal insights into how the entire entrepreneurial ecosystem is represented in local media. This analysis allows us to identify which topics are more frequently discussed together and which attributes overlap more frequently within narratives.

Two social networks were constructed for Petrozavodsk (see Figure 5.1) and Pskov (see Figure 5.2) to illustrate the interactions of topics—or attributes—in local media discourse. In these networks, the nodes represent individual topics, while the thickness of the lines connecting them corresponds to the normalized frequency of co-occurrence in shared articles; the thicker the line, the more often the attributes are mentioned together.

The social network of attributes in Petrozavodsk has a higher centralization score (0.018 for Petrozavodsk and 0 for Pskov), indicating that Petrozavodsk is more likely to structure its news discourse around a single, cohesive set of attributes. Since most topics in this network exhibit the maximum degree centrality value (connections to all 25 available topics), it is challenging to identify central topics. However, an examination of the topics at the network's periphery in Petrozavodsk (see Figure 5.1) reveals that many of these peripheral topics are connected to law coverage in news articles. This observation suggests that Petrozavodsk's narrative is not centered on the legal regulation of entrepreneurship; rather, legal topics are somewhat removed from the general discourse of overlapping topics.

Moreover, the density of the Pskov attributes network is higher than that of Petrozavodsk (1 for Pskov and 0.98 for Petrozavodsk). This indicates that the attributes of Pskov's entrepreneurial ecosystem are fully interconnected, appearing together in news in all possible combinations, whereas some attributes in Petrozavodsk's discourse do not co-occur with certain other attributes. These different statistical measures of the attribute interaction networks confirm Hypothesis 2 (H 2), underscoring the uniqueness of each entrepreneurial ecosystem's representation pattern.

When examining the strength of the attribute relationships, the graphs for both cities reveal that the material attribute emphasizing state support programs for entrepreneurship is most often mentioned alongside other topics; it has the highest number of shared articles with other ecosystem attributes, which is why its edges in both networks are the thickest (see Figures 5.1, 5.2). This prominence reflects the fact that the topic of state support is the most common theme in both Petrozavodsk and Pskov narratives.

Additionally, in Petrozavodsk, cultural attributes have the highest average node weight (0.3447252 for cultural, 0.2748538 for social, and 0.317986 for material). This finding suggests that business stories of various types are frequently mentioned in conjunction with numerous other attributes, while some social and material attributes are located on the periphery and are not actively covered. Conversely, in Pskov, social attributes hold a similar role in the discourse, with news articles more frequently combining them with other types of attributes (0.283024 for cultural, 0.3149461 for social, and 0.3042524 for material).
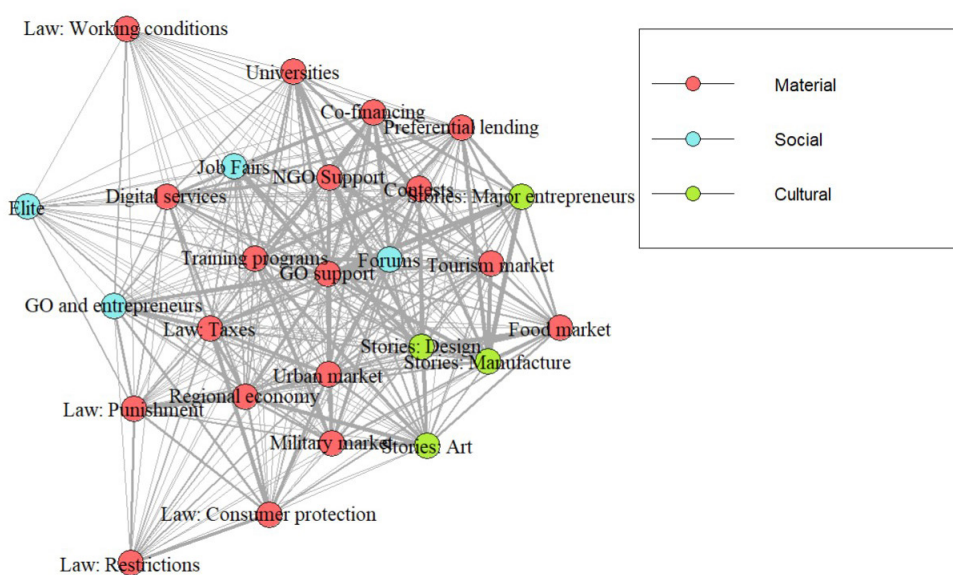

Figure 5.1. Social Network of Interaction of Entrepreneurial Ecosystems' Attributes, Petrozavodsk
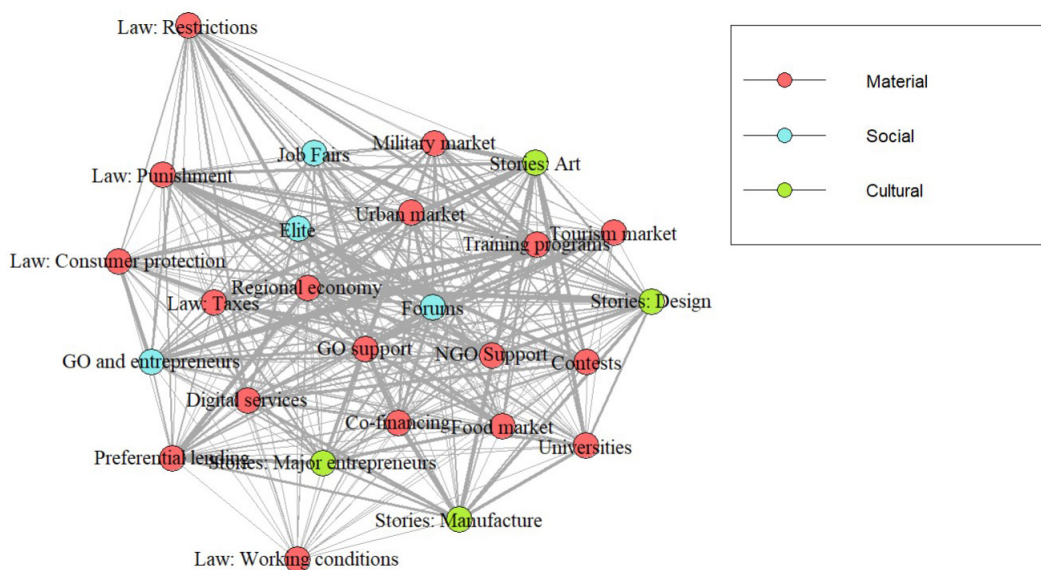

Figure 5.2. Social Network of Interaction of Entrepreneurial Ecosystems' Attributes, Pskov

Discussion

This paper explored differences and similarities in the media representation of the entrepreneurial ecosystems in Petrozavodsk and Pskov, identifying how attributes of these ecosystems, as manifested in modeled topics, interact within city discourses. It sheds light on the application of corpus-assisted discourse analysis to study the features of the entrepreneurial ecosystem and identify its attributes through thematic modeling with LDA.

Representation of Entrepreneurial Ecosystems

Analysis of word frequencies shows that, in both cities, discourse is concentrated around certain actors within the entrepreneurial ecosystem and specific fields of activity. Actors can include any individuals who participate in interactions within this ecosystem: enterprises, educational institutions, committees, politicians, and local entrepreneurs. These actors are expressed in all three attribute types, while fields of activity are emphasized in articles by concepts specific to certain areas of entrepreneurship, boosting the representation of material attributes by highlighting open markets and of cultural attributes by recounting the stories of entrepreneurs from diverse fields. By mentioning specific entrepreneurs and their interactions with important economic and political figures, the articles establish a high status for entrepreneurs as one of the cultural services of the entrepreneurial ecosystem [Rinkinen, Konsti-Laakso 2023].

Both cities are characterized by coverage of state-entrepreneur communication, though with notable differences. The Petrozavodsk discourse frequently references local state bodies, emphasizing entrepreneurship's embeddedness in addressing urban issues. The Pskov narrative, however, often mentions national government bodies and external partnerships with both other regions and other countries. Thus, novice entrepreneurs in the Petrozavodsk discourse encounter more familiar government organizations with which they may have opportunities to communicate, possibly influencing the perceived accessibility and feasibility of entrepreneurship. Such differences may also relate to the territorial entity in which each city is located: Petrozavodsk, as the capital of its republic, possesses greater autonomy and strong ties with republican authorities, enabling it to implement diverse social and economic programs. In contrast, Pskov, as a regional administrative center, interacts more with federal authorities, which broadcast support programs.

It is also noteworthy that all modeled topics related to start-up financing in both cities refer to state support or to non-profit organizations specializing in funding aspiring entrepreneurs. The narratives lack stories of project financing from independent investors, thereby excluding investors and mentors from the representation of the social system in regional entrepreneurship. This omission may impact the entrepreneurial intentions of high-risk innovative projects, which generally rely on independent investors willing to take such risks, in contrast to government agencies [Spigel 2017]. However, this phenomenon is typical across Russia, as independent investors account for only 3% of the total financing market for small and medium-sized businesses in the country [Finexpert n. d.].

Beyond these commonalities, each city's discourse is marked by distinct themes. Petrozavodsk discourse more frequently emphasizes the role of educational institutions in promoting entrepreneurship and training aspiring entrepreneurs, thereby building human capital with entrepreneurship-specific skills [Roundy 2017]. The city is home to several higher education institutions, including Petrozavodsk State University, while Pskov has fewer institutions and a narrower range of programs. Petrozavodsk discourse also features coverage of new markets with growing demand, describing their current status, measures to create favorable conditions for business start-ups, and future prospects—all illustrated by real stories of entrepreneurs active in these areas. Thus, Petrozavodsk discourse is more individual-centric, focusing on cultural attributes that normalize entrepreneurship as a realistic career path.

Conversely, Pskov's discourse more frequently addresses various forms of state and non-governmental support, both financial and informational, as well as assistance in navigating legal and organizational challenges. This emphasis may foster beliefs in the feasibility of entrepreneurship by showing media consumers how readily such support is available. On the other hand, Pskov discourse frequently builds a narrative around the enforcement of legal regulations for entrepreneurs, reminding readers of continuous monitoring and stressing the consequences for violating legal standards. This portrayal may negatively impact perceptions of the desirability of entrepreneurship, as potential risks could make the outcomes of this activity seem less appealing [Radu, Radien-Collot 2008]. Thus, Pskov discourse reflects contrasting orientations toward two concepts fundamental to fostering entrepreneurial intentions.

In applying the multidimensional model of institutional mechanisms for entrepreneurial development in small towns [Audretsch, Belitski, Cherkas 2021], we observe that Petrozavodsk discourse demonstrates a cognitive component—characterized by a focus on education and experience-sharing through success stories—while Pskov's narrative emphasizes a regulatory component, highlighting government programs and legal norms. Both cognitive and regulatory components are essential to productive entrepreneurship, but an emphasis on restrictive laws may lead to the formation of unproductive entrepreneurship, which could explain Pskov's lower entrepreneurial activity compared to Petrozavodsk.

Attributes Manifestation and Interactions

This study successfully applied the theory of entrepreneurial ecosystem attributes to city discourses, identifying the presence of all three attribute types in the narratives of Petrozavodsk and Pskov. The analysis also traced key pillars that distinguish small-city entrepreneurial ecosystems from those in larger cities, observing attributes through their distribution patterns [Roundy 2017]. In both cities, material attributes were the most prominently represented, creating narratives that emphasized benefits available to entrepreneurs.

Regarding attribute interactions, in both cities, narratives tended to integrate other attribute types with material ones due to their prevalence. In Petrozavodsk, however, media often paired material attributes with cultural attributes rather than with social network descriptions, thus normalizing knowledge and experience-sharing practices by featuring real-life stories of entrepreneurship. In Pskov, by contrast, media coverage leaned more towards combining material with social attributes rather than cultural ones, highlighting established channels for knowledge flow and underscoring the outward focus of partnerships in Pskov's entrepreneurial ecosystem. These differences illustrate the embedding of distinct pillars within each city's small-town entrepreneurial ecosystem: community and social capital in Pskov, and cultural value in Petrozavodsk [Roundy 2017].

The co-occurrence of ecosystem attributes in the two cities reveals distinct interaction patterns, confirmed by their different social network centralization and density values. The interweaving of attributes can amplify the positive impact of each, forming a foundation for developing new dimensions [Spigel 2017]. Although Pskov's entrepreneurial ecosystem network demonstrates maximum density, Petrozavodsk's network features lower-degree connections specifically related to restrictive laws, meaning that attributes deterring entrepreneurship hold less influence in the city's general discourse. Nevertheless, the narratives in both cities are characterized by the dynamic interplay of various attributes, without reliance on any single central attribute dominating the discourse.

Limitations and Future Research

A limitation of this study is that the article sample included media from both local and federal sources that cover these cities. Future studies could examine how local and federal articles might differently represent the entrepreneurial ecosystem, revealing which attributes are more pronounced in internal versus external narratives.

The keywords associated with modeled topics within each attribute dimension could be used to develop a dictionary of terms linked to specific entrepreneurial ecosystem attributes. Such a dictionary could facilitate identifying attribute presence in the portrayal of entrepreneurship across other regions.

Future research may also explore the influence of media representations of various attributes on entrepreneurial activity levels, helping to determine which discourse topics might drive regional entrepreneurship. In particular, future studies should investigate the relationship between regulatory constraint representation and entrepreneurial activity, while also assessing the impact of cultural and social attribute representation. This could help clarify whether the economic differences between Petrozavodsk and Pskov relate to disparities in their entrepreneurial ecosystems' representations.

Appendix

Table A.1

Economic Characteristics and Entrepreneurial Activity in the Republic of Karelia and the Pskov Region in 2023

Region	The number of legal entities of small and medium-sized enterprises and individual entrepreneurs	Income from entrepreneurial activity, million rubles	Employment rate, %	The average monthly nominal accrued salary of employees of organizations, rubles	Turnover of microenterprises by type of economic activity, million rubles
Republic of Karelia	25,378	16,506.2	54.8	56458.4	Wholesale and retail trade; repair of motor vehicles and motorcycles—47,007.7 Construction—16,953.7 Manufacturing industries—13,457.8 Transportation and storage—6,375.8 Agriculture, forestry, hunting, fishing and fish farming—5,683.2
Pskov region	20,169	12,824.3	56.5	38,966	Wholesale and retail trade; repair of motor vehicles and motorcycles—33,068.8 Manufacturing industries—13,274.1 Construction—9,574.6 Transportation and storage—5,818.5 Real estate transactions—4,951.2

Source: [Federal Tax Service 2023a; 2023b; Rosstat 2023a; 2023b; 2023c; 2023d].

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