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THE MICRO SPATIAL DIVERSITY OF THE LEVEL OF ENTREPRENEURSHIP IN A PERIPHERAL REGION

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Purpose: The aim of the paper is to identify the degree of diversity of entrepreneurship at the micro spatial level in a peripheral region.
Design/methodology/approach: The paper is based on a quantitative approach. Hellwig's linear ordering method was used to test the research hypotheses. The analysis is based on data from the Bank of Local Data of the Central Statistical Office for all of the 71 municipalities (NUTS-5) from the Opolskie Voivodeship, Poland, for the years 2015, 2020 and 2022.
Findings: The results of ranking municipalities on the basis of the Hellwig's aggregate measure, the classification of municipalities according to their level of entrepreneurship and the analysis of micro spatial distribution of this level in the region provide evidence that entrepreneurship varies in a peripheral region, with the level of entrepreneurship likely to shift between within a short time span.
Research limitations/implications: Although the paper provides an insight into the degree of diversity of entrepreneurship at the micro spatial level in a peripheral region, it is limited to data from certain years. Therefore, it may not allow to observe plausible changes in the level of entrepreneurship that may occur over time. In order to provide more comprehensive insights, further analysis should be done using a dynamic approach, based on data covering the entire period 2015-2022. In addition, the results of the ranking are likely to be sensitive to the variables used to construct the Hellwig's aggregate measure. It is therefore advisable to test the hypothesis with different sets of variables. It would also be interesting to examine the extent to which the level of entrepreneurship is determined by the regional micro-spatial distribution of factors affecting entrepreneurial activity.
Practical implications: The results for a peripheral region can provide a basis for practitioners and policy-makers to develop and implement solutions for a type-specific entrepreneurial policy across micro-spatial locations.
Originality/value: The article contributes to the recent literature on regional entrepreneurship by exploring the ways in which entrepreneurship is different in a micro-spatial peripheral environment.
Keywords: micro spatial diversity, level of entrepreneurship, peripheral region, Hellwig's linear ordering method.
Category of the paper: Research paper.

1. Introduction

Entrepreneurship has become an important driver of economic growth (Urbano et al., 2020) through its impact on innovation and job creation (Carree, Thurik, 2008). Thus, the development of countries and regions was found to be closely linked to their ability to foster entrepreneurship (Audretsch, Keilbach, 2004). The level of entrepreneurship depends strongly on a number of factors that facilitate entrepreneurship, with some regions being more conducive to the creation and growth of new businesses than others (Mueller et al., 2008; Malecki, 2009). Previous research argued that regional differences in entrepreneurial activity are remarkably persistent over time (Fritsch, Wyrwich, 2014; Pylak, Sosnovskikh, 2024), opening up a debate about the diversity of national and regional contexts and types of entrepreneurship to promote or not.

However, while most studies focus on developed regions and country-level data, there is a consensus that there is still a lack of comprehensive evidence on the extent to which entrepreneurship may differ in a peripheral region. In particular, little is known about how it varies at the micro spatial level. This seems particularly important for entrepreneurship and business support policies and the need to tailor such policies to the local business environment. Therefore, this paper aims to fill this gap by identifying the degree of diversity of entrepreneurship at the micro spatial level in a peripheral region. To achieve this goal, Hellwig's linear ordering method was applied to data from the Bank of Local Data of the Central Statistical Office for all of the 71 municipalities (NUTS-5) from the Opolskie Voivodeship, Poland, for the years 2015, 2020 and 2022.

The article contributes to the ongoing debate on regional entrepreneurship by examining how entrepreneurship differs in a micro spatial peripheral setting. The findings suggest that geographical location is important for the entrepreneurship at the micro spatial level. It also provides evidence that, over a relatively short time span, there are differences in the degree to which particular municipalities in a peripheral region have been entrepreneurial.

The remaining paper is organised as follows. The next section is a review of the literature and development of the research hypothesis. In the next sections the research methodology is described and the results and the discussion are presented. Concluding remarks and suggestions for future research are given in the last section.

2. Literature review

While there is an established literature on entrepreneurship in developed regions, with a strong focus on knowledge spillovers and innovation as drivers of new firm creation and

development (Acs et al., 2013), there is a smaller but growing focus on peripheral regions (Zygmunt, 2018; Urbano et al., 2020; Miłek, 2023). However, given that each region has specific characteristics regarding its innovative capacity (Zygmunt, 2022), which affect economic growth in different ways, this can significantly determine the level of entrepreneurship. This seems to be particularly relevant for peripheral regions, which often lack knowledge-generating organisations and well-developed networks of knowledge providers (García-Rodríguez et al., 2016) and need to seek resources and capabilities to stimulate entrepreneurship to support economic development. This may be especially important as the motivation for entrepreneurship in the periphery tends to be based on needs rather than opportunities, due to the lack of significant alternative employment (Meccheri, Pelloni, 2006). As necessity entrepreneurs are, as Bergmann and Sternberg (2007) emphasise, 'pushed into entrepreneurship' (p. 39), they often have access to fewer capital and knowledge-based resources, which is likely to reduce the success of the venture and consequently have less impact on the economic development of the region (Bergmann, Sternberg, 2007). It is also argued that when entrepreneurial advantages are created in such lagging regions, they tend to be short-lived (Benneworth, 2004), with most talented entrepreneurs vulnerable to out-migration to more developed regions (Kaufmann, Malul, 2014), which can lead to a deepening of peripherality.

In peripheral regions, as in more developed ones, there may be a tendency for entrepreneurship to become spatially concentrated, leading to varying levels of entrepreneurship. This may be because regions are often not internally homogeneous, with varying rates of entrepreneurship determinants such as human capital, growth motivation, and locational conditions like the level of competition or the density of local industry (Huggins et al., 2017). Indeed, as Ortega-Argiles (2022) observed for several developed and developing European countries, all of them face interregional differences in entrepreneurship, albeit to varying degrees. It may depend on whether a region is urban, rural or urban-rural. Although it is argued that rurality does not necessarily imply peripherality (Baumgartner et al., 2013), there is some evidence that rural areas are often peripheral and that building rural entrepreneurial capacity is needed to positively influence entrepreneurship levels (North, Smallbone, 2006), as such regions frequently suffer from structural problems and are constrained by a weak socio-economic environment, distance from markets and knowledge, and an ageing population (Pato, Teixeira, 2016). On the other hand, there may be an 'agglomeration effect' associated with urban areas, related to the spatial concentration of richer network linkages, a wider range of business services and industrial density, and the diffusion of knowledge (Acs, Varga, 2005). Urban areas may therefore exhibit higher levels of entrepreneurship. Given that the regional spatial context can be a constraint or a facilitator of entrepreneurial activity, it can be argued that location plays an important role in entrepreneurship. This may indicate differences in the level of entrepreneurship within a peripheral region at the micro spatial level. Therefore, it can be hypothesised:

H1: The level of entrepreneurship varies at the micro spatial level in a peripheral region.

3. Methods

A quantitative approach was used to identify the degree of diversity of entrepreneurship at the micro spatial level in a peripheral region. This approach was widely used in previous studies on entrepreneurship in regions (Korber, McNaughton, 2018; Sternberg, 2022), as it allows to precisely capture the characteristics of individuals or groups and to describe the phenomenon numerically (Stockemer, 2019).

A key issue to be addressed in research on the level of entrepreneurship is the ambiguity of how it should be measured. This is due to the complexity of entrepreneurship and, consequently, the different ways in which it can be conceptualised (Ferreira et al., 2019). As the level of entrepreneurship can be represented by a number of heterogeneous variables, Hellwig's linear ordering method was used to test the research hypothesis in order to avoid undercoverage and self-selection bias. This method makes it possible to provide a single aggregate measure of the level of entrepreneurship as a synthetic representation of several features describing an object (Bąk, 2018) and orders the objects according to the phenomenon under study (Malina, 2020), and was used in previous research on entrepreneurship in regions (Jaśkiewicz, 2020). Such an aggregate measure is obtained by determining the distance between the reference object and the observed objects for data from each year separately, and is calculated as follows (Hellwig, 1968):

$$d_{i0} = \sqrt{\sum_{j}^{m} \left(z_{ij} - z_{0j}\right)^2} \tag{1}$$

where:

d_{i0} – the distances of the objects from the reference object $(i = 1, \dots, n)$,

z_{ij} – the standardised value of the j-th variable for the i-th object $(i = 1, \dots, n;\ j = 1, \dots, m)$,

z_{0j} – the coordinates of the reference object $(j = 1, \dots, m)$.

In order to calculate the standardised value of the j-th variable for the i-th object, the following formula was used:

$$z_{ij} = \frac{x_{ij} - \bar{x}_j}{s_j} \tag{2}$$

where:

x_{ij} – the value of the j-th variable for the i-th object,

$\bar{x}_j$ – arithmetic mean of the observations of the j-th variable,

s_j – standard deviation of observations of the j-th variable.

The coordinates of the reference object were determined on the basis of the following formula:

$$z_{0j} = \begin{cases} max_i\{z_{ij}\}\ for\ the\ stimulant\ variables \\ min_i\{z_{ij}\}\ for\ the\ destimulant\ variables \end{cases} \quad (3)$$

The aggregate measure was established using the following formula:

$$q_i = 1 - \frac{d_{i0}}{d_0} \quad (4)$$

where:

q_i – the aggregate measure,

$d_0 = \bar{d}_0 - 2s_d$, where: $\bar{d}_0$ – arithmetic mean of the distances of the objects from the reference object; s_d – standard deviation of the distance between the objects and the average distance from the reference object,

other as described above.

It is assumed that $q_i \in [0;1]$, where $max\{q_i\}$ indicates the highest similarity to the reference object and $min\{q_i\}$ indicates the lowest similarity to the reference object. If an object is very different from the others, q_i can be outside $[0;1]$ (Malina, 2020). On the basis of q_i, a ranking of the objects can be made, where the highest position indicates the best objects in terms of the phenomenon under study.

The aggregate measure can be used to group objects into classes of similar level, based on the following criteria (Nowak, 1990):

the highest level: $q_i \geq \bar{q}_i + s_{q_i}$,

high level: $\bar{q}_i \leq q_i < \bar{q}_i + s_{q_i}$,

moderate level: $\bar{q}_i - s_{q_i} \leq q_i < \bar{q}_i$,

low level: $\bar{q}_i < \bar{q}_i - s_{q_i}$

where:

$\bar{q}_i$ – arithmetic mean of q_i,

s_{q_i} – standard deviation of q_i,

other as described above.

The hypothesis was tested using data from the Polish Central Statistical Office's Local Data Bank for the years 2015, 2020 and 2022. The choice of years for the study was purposeful, in order to consider the most recent situation (2022), to include the period of the COVID-19 pandemic (2020), and to allow the assessment of changes in the studied population in the long term (2015). The focus on the Opolskie Voivoeship provides an interesting research context, as it is the smallest of the 16 voivodeships in Poland in terms of population and area. It is one of the voivodships with a low gross domestic product per capita and, according to the Polish

Central Statistical Office, one of the fastest depopulating regions in Poland. It covers 71 municipalities (NUTS-5), including 3 urban, 35 rural, and 32 urban-rural.

The following variables were used to construct the aggregate measure of the level of entrepreneurship (Table 1).

Table 1.
Synthesis of variables describing the level of entrepreneurship

Variable	Description	Nature
X1	Enterprises registered in the REGON registry per 10 000 inhabitants	Stimulant
X2	Enterprises per 1 000 working age population	Stimulant
X3	Enterprises newly registered in the REGON registry per 10 000 inhabitants	Stimulant
X4	Newly registered enterprises in the private sector of the national economy per 10 000 inhabitants	Stimulant
X5	Newly registered enterprises per 10 000 working age population	Stimulant
X6	Enterprises deregistered from the REGON registry per 10 000 inhabitants	Destimulant
X7	Individuals with economic activity per 10 000 inhabitants	Stimulant
X8	Sole proprietors per 100 working age population	Stimulant
X9	Sole proprietors newly registered and deregistered from the REGON registry	Stimulant
X10	Share of deregistered enterprises in the total number of enterprises registered in the REGON registry	Destimulant
X11	Share of newly registered enterprises in the creative sector in the total number of newly registered enterprises	Stimulant

Source: Own elaboration based on Local Data Bank.

4. Results and Discussion

Descriptive statistics of the variables are presented in Table 2.

Table 2.
Descriptive statistics

Variable	Mean	St. dev.	Min	Max
X1	909.43	226.58	517	1849
X2	147.50	40.63	76.2	317.7
X3	58.22	16.27	24	122
X4	53.83	14.87	23	100
X5	94.53	27.91	37	211
X6	40.22	16.56	12	94
X7	690.69	159.84	375	1180
X8	11.19	2.86	5.77	20.28
X9	154.10	60.56	61.5	425
X10	4.53	1.80	1.6	11.2
X11	5.31	3.53	0	16.67

Source: Own calculation.

In order to confirm the discriminatory ability of the variables the coefficient of variation was used. For all variables, this was greater than 10%, indicating that the variables had adequate discriminatory ability. A correlation matrix between the variables was also calculated for each year analysed. This was done to check for strong collinearity between the variables. It was necessary to eliminate some of variables due to the strong correlation between them (Peason correlation coefficient > 0.7). Therefore, the following variables were considered for further analysis: X3 – enterprises newly registered in the REGON registry per 10 000 inhabitants, X6 – enterprises deregistered from the REGON registry per 10 000 inhabitants, X9 – sole proprietors newly registered and deregistered from the REGON registry, X10 – share of deregistered enterprises in the total number of enterprises registered in the REGON registry, X11 – share of newly registered enterprises in the creative sector in the total number of newly registered enterprises.

The results of the calculation of the aggregate measure and the categorisation of municipalities according to the level of entrepreneurship in the respective years are presented in Table 3.

Table 3.
Ranking of municipalities according to Hellwig's aggregate measure in 2015, 2020 and 2022

NUTS-5 code	Municipalities	2015		2020		2022	
		No.	q_i 2015	No.	q_i 2020	No.	q_i 2022
1611073	Opole	1	0.61	14	0.35	3	0.47
1609042	Komprachcice	2	0.46	40	0.24	24	0.32
1601011	Brzeg	3	0.44	45	0.22	26	0.31
1609032	Dobrzeń Wielki	4	0.42	46	0.22	33	0.26
1611063	Zawadzkie	5	0.42	65	0.05	55	0.16
1608023	Gorzów Śląski	6	0.42	27	0.30	62	0.12
1601022	Skarbimierz	7	0.39	18	0.34	50	0.20
1601052	Lubsza	8	0.36	13	0.35	21	0.33
1603062	Reńska Wieś	9	0.34	1	0.46	63	0.10
1608072	Zębowice	10	0.33	9	0.38	61	0.13
1603052	Polska Cerekiew	11	0.32	71	-0.05	54	0.17
1608013	Dobrodzień	12	0.31	3	0.41	38	0.23
1609073	Niemodlin	13	0.31	6	0.40	16	0.35
1604013	Byczyna	14	0.30	64	0.06	51	0.19
1610032	Prudnik	15	0.30	49	0.22	44	0.21
1605023	Krapkowice	16	0.30	25	0.30	22	0.33
1608033	Olesno	17	0.30	12	0.35	3	0.42
1609122	Tułowice	18	0.27	29	0.29	11	0.38
1611053	Ujazd	19	0.27	11	0.36	53	0.18
1606012	Domaszowice	20	0.27	48	0.22	56	0.16
1609112	Tarnów Opolski	21	0.26	5	0.40	43	0.21
1609103	Prószków	22	0.25	21	0.33	2	0.56
1602043	Kietrz	23	0.25	50	0.21	68	0.06
1609132	Biała	24	0.25	58	0.13	59	0.15
1608043	Praszka	25	0.25	17	0.34	49	0.20
1605013	Gogolin	26	0.24	38	0.24	30	0.27
1602033	Głubczyce	27	0.23	24	0.32	52	0.19
1609012	Chrząstowice	28	0.21	23	0.32	8	0.41

Cont. table 3.

1603042	Pawłowiczki	29	0.21	66	0.03	67	0.06
1609052	Łubniany	30	0.21	15	0.35	12	0.37
1607063	Otmuchów	31	0.21	32	0.28	18	0.33
1602022	Branice	32	0.21	59	0.11	17	0.34
1609092	Popielów	33	0.21	41	0.24	28	0.29
1604023	Kluczbork	34	0.20	19	0.33	9	0.39
1609062	Murów	35	0.20	70	-0.02	31	0.26
1606052	Wilków	36	0.20	53	0.17	69	0.01
1606023	Namysłów	37	0.20	34	0.27	45	0.20
1607073	Paczków	38	0.20	42	0.23	48	0.20
1604043	Wołczyn	39	0.20	44	0.23	34	0.25
1609022	Dąbrowa	40	0.20	57	0.14	25	0.31
1608062	Rudniki	41	0.20	26	0.30	1	0.57
1603011	Kędzierzyn-Koźle	42	0.19	39	0.24	37	0.24
1609123	Turawa	43	0.19	52	0.19	4	0.46
1610043	Izbicko	44	0.19	60	0.11	71	-0.06
1607053	Nysa	45	0.19	20	0.33	19	0.33
1603032	Cisek	46	0.18	55	0.15	20	0.33
1605053	Zdzieszowice	47	0.18	54	0.17	47	0.20
1601062	Olszanka	48	0.18	2	0.44	36	0.24
1608052	Radłów	49	0.17	33	0.27	65	0.07
1611043	Strzelce Opolskie	50	0.17	30	0.28	42	0.22
1611012	Jemielnica	51	0.17	37	0.25	32	0.26
1604032	Lasowice Wielkie	52	0.16	56	0.14	70	-0.02
1601043	Lewin Brzeski	53	0.16	10	0.37	41	0.22
1605032	Strzeleczki	54	0.16	31	0.28	27	0.29
1601033	Grodków	55	0.16	47	0.22	29	0.28
1607042	Łambinowice	56	0.15	63	0.06	40	0.22
1603022	Bierawa	57	0.14	22	0.32	66	0.07
1609083	Ozimek	58	0.14	16	0.34	35	0.25
1610023	Lubrza	59	0.13	61	0.10	60	0.14
1611022	Kolonowskie	60	0.13	28	0.29	64	0.09
1610013	Głogówek	61	0.11	51	0.21	7	0.41
1611033	Leśnica	62	0.11	7	0.39	10	0.38
1605042	Walce	63	0.10	8	0.38	14	0.36
1607092	Skoroszyce	64	0.09	43	0.23	23	0.32
1607033	Korfantów	65	0.09	69	-0.02	15	0.35
1607082	Pakosławice	66	0.07	35	0.27	13	0.36
1606042	Świerczów	67	0.07	68	0.00	6	0.42
1602013	Baborów	68	0.07	67	0.03	57	0.15
1607013	Głuchołazy	69	0.03	36	0.25	46	0.20
1607022	Kamiennik	70	0.00	4	0.41	47	0.15
1606032	Pokój	71	-0.01	62	0.09	39	0.22

Note: No. - number of municipality in the ranking.

Source: Own calculation.

Based on the results, it can be concluded that there is a high degree of spatial diversity in the level of entrepreneurship in Opolskie municipalities in the years considered. Moreover, the results allow to conclude that a significant number of municipalities were characterised by a large variability in maintaining similar positions in the ranking in relation to other years considered in the study. This is particularly noticeable in the case of Grodków, Leśnica and Walce, for which the changes were the most significant. For a number of municipalities, including Zawadzkie and Skarbimierz, a worsening position was observed in terms of the level

of entrepreneurship. On the other hand, a positive change, which is expressed in a rising position in the ranking, was observed in the municipalities of Skoroszyce and Pakosławice. Based on the research, it was also observed that, despite the significant fluctuations in the rankings in given years, a few municipalities maintain a stable position regarding the level of entrepreneurship compared to other municipalities in the Opolskie Voivodeship. These include, above all, Kędzierzyn-Koźle, Zdzieszowice and Lubrza. The results of the research also allow an interesting observation to be made about the voivodeship capital (Opole), which as an agglomeration brings together academic centres, business incubators and technology park. More specifically, it was observed that this municipality ranked high in terms of entrepreneurship in each of the years analysed, but interestingly, during the pandemic, its position dropped significantly in favour of other municipalities, even those with less developed infrastructure to support entrepreneurship.

The above classification of municipalities for the respective years allows to derive how entrepreneurship changed at the micro level in the peripheral region. However, it does not provide a direct indication of the exact level of entrepreneurship. For this reason, municipalities were classified into four groups with similar levels of entrepreneurship: highest, high, moderate and low (Table 4).

Table 4.
Classification of the municipalities according to the level of entrepreneurship

Group	2015	2020	2022
the highest level of entrepreneurship	Opole, Komprachcice, Brzeg, Dobrzeń Wielki, Zawadzkie, Gorzów Śląski, Skarbimierz, Lubsza, Reńska Wieś, Zębowice	Reńska Wieś, Olszanka, Dobrodzień, Kamiennik, Tarnów Opolski, Niemodlin, Leśnica, Walce, Zębowice, Lewin Brzeski	Rudniki, Prószków, Opole, Turawa, Olesno, Świerczów, Głogówek, Chrząstowice, Kluczbork, Leśnica, Tułowice
high level of entrepreneurship	Polska Cerekiew, Dobrodzień, Niemodlin, Byczyna, Prudnik, Krapkowice, Olesno, Tułowice, Ujazd, Domaszowice, Tarnów Opolski, Prószków, Kietrz, Biała, Praszka, Gogolin, Głubczyce	Ujazd, Olesno, Lubsza, Opole, Łubniany, Ozimek, Praszka, Skarbimierz, Kluczbork, Nysa, Prószków, Bierawa, Chrząstowice, Głubczyce, Krapkowice, Rudniki, Gorzów Śląski, Kolonowskie, Tułowice, Strzelce Opolskie, Strzeleczki, Otmuchów, Radłów, Namysłów, Pakosławice, Głuchołazy, Jemielnica, Gogolin, Kędzierzyn-Koźle	Łubniany, Pakosławice, Walce, Korfantów, Niemodlin, Branice, Otmuchów, Nysa, Cisek, Lubsza, Krapkowice, Skoroszyce, Komprachcice, Dąbrowa, Brzeg, Strzeleczki, Popielów, Grodków, Gogolin, Murów, Jemielnica, Dobrzeń Wielki, Wołczyn

Cont. table 4.

moderate level of entrepreneurship	Chrząstowice, Pawłowiczki, Łubniany, Otmuchów, Branice, Popielów, Kluczbork, Murów, Wilków, Namysłów, Paczków, Wołczyn, Dąbrowa, Rudniki, Kędzierzyn-Koźle, Turawa, Izbicko, Nysa, Cisek, Zdzieszowice, Olszanka, Radłów, Strzelce Opolskie, Jemielnica, Lasowice Wielkie, Lewin Brzeski, Strzeleczki, Grodków, Łambinowice, Bierawa, Ozimek, Lubrza, Kolonowskie	Komprachcice, Popielów, Paczków, Skoroszyce, Wołczyn, Brzeg, Dobrzeń Wielki, Grodków, Domaszowice, Prudnik, Kietrz, Głogówek, Turawa, Wilków, Zdzieszowice, Cisek, Lasowice Wielkie, Dąbrowa, Biała	Ozimek, Olszanka, Kędzierzyn-Koźle, Dobrodzień, Pokój, Łambinowice, Lewin Brzeski, Strzelce Opolskie, Tarnów Opolski, Prudnik, Namysłów, Głuchołazy, Zdzieszowice, Paczków, Praszka, Skarbimierz, Byczyna, Głubczyce, Ujazd, Polska Cerekiew, Zawadzkie, Baborów, Domaszowice, Kamiennik, Biała, Lubrza, Zębowice
low level of entrepreneurship	Głogówek, Leśnica, Walce, Skoroszyce, Korfantów, Pakosławice, Świerczów, Baborów, Głuchołazy, Kamiennik, Pokój	Branice, Izbicko, Lubrza, Pokój, Łambinowice, Byczyna, Zawadzkie, Pawłowiczki, Baborów, Świerczów, Korfantów, Murów, Polska Cerekiew	Gorzów Śląski, Reńska Wieś, Kolonowskie, Radłów, Bierawa, Pawłowiczki, Kietrz, Wilków, Lasowice Wielkie, Izbicko

Source: Own elaboration.

The classification of municipalities according to their level of entrepreneurship confirms earlier observations about its variability in the respective years. However, only a few of the municipalities remained at the same level of entrepreneurship. The results also suggest that the size of the groups of municipalities with a very high level of entrepreneurship and those with a low level of entrepreneurship is relatively stable in each year analysed, with considerable intra-group diversity. Interestingly, based on the results of the study, it can be noted that during the pandemic, a greater number of municipalities met the high level of entrepreneurship criterion than in the pre- and post-pandemic periods, which may indicate a strong persistence or resilience of entrepreneurial activity, although the generalisability of this conclusion requires further studies.

In terms of municipality type (urban, rural, urban-rural), the results show that in 2015 most urban had the highest level of entrepreneurship, while the largest group of rural municipalities (56%) was moderately entrepreneurial. It was also observed that a similar number of rural and urban-rural municipalities (17% and 16% respectively) exhibited the lowest level of entrepreneurship in Opolskie Voivodeship. For 2020, a decrease in the level of entrepreneurship in urban municipalities was observed, while the share of rural municipalities in the group of municipalities with a high level of entrepreneurship increased significantly (from 11% in 2015 to 31%). At the same time, however, a quarter of these municipalities were characterised by a low level of entrepreneurial activity. The upward trend in the level of entrepreneurship in rural municipalities continued in 2022, while the level of entrepreneurship in urban-rural municipalities decreased (from 50% in 2020 to 25%). Nevertheless, the share of these

municipalities in the group of least entrepreneurial municipalities continues to decrease (from 16% in 2015 to 9% in 2022).

A spatial illustration of the levels of entrepreneurship for the respective years is shown in Figures 1-3.

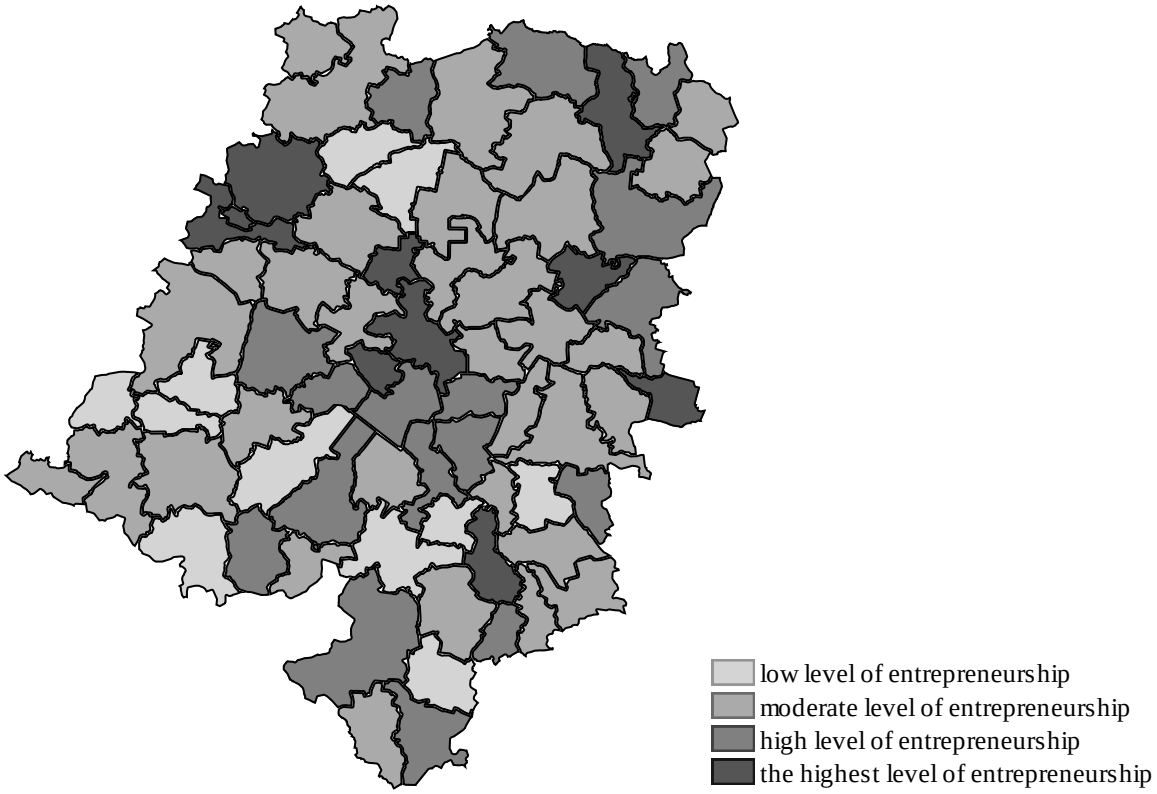

Figure 1. Spatial structure of the level of entrepreneurship in the Opole Voivodeship in 2015.
Source: own elaboration.

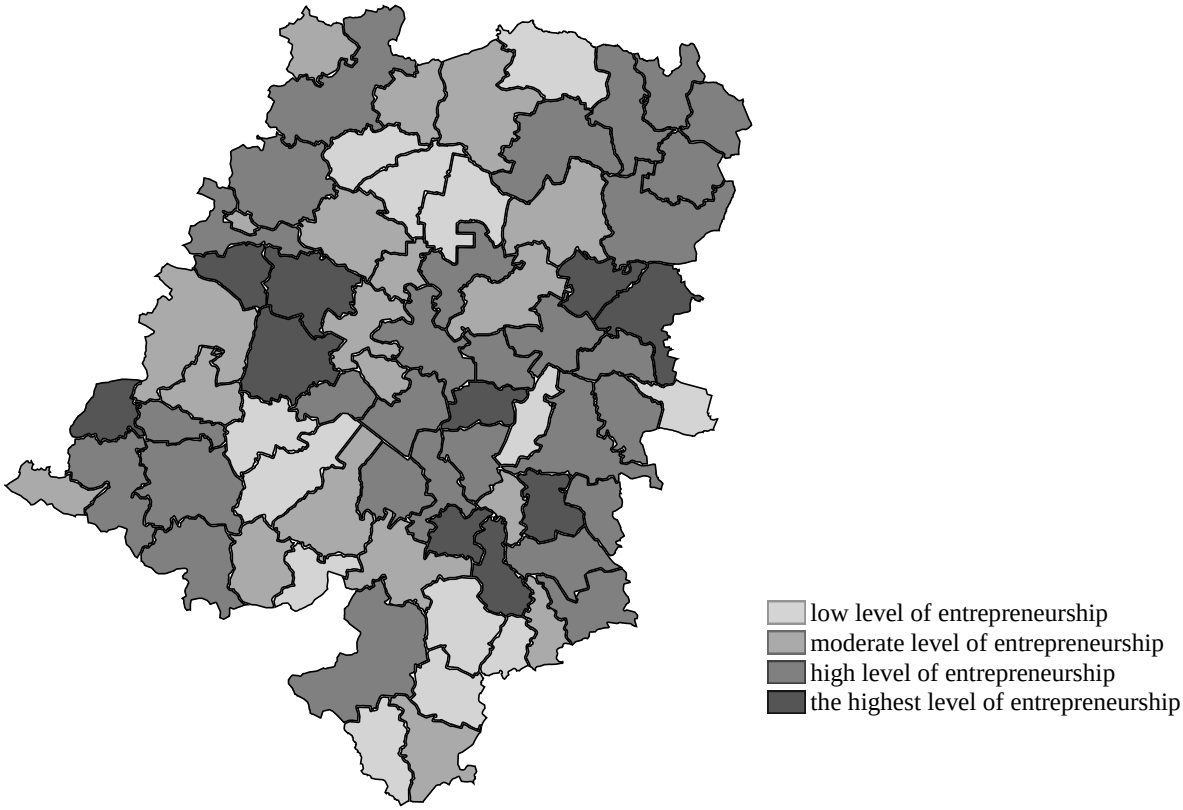

Figure 2. Spatial structure of the level of entrepreneurship in the Opole Voivodeship in 2020.

Source: own elaboration.

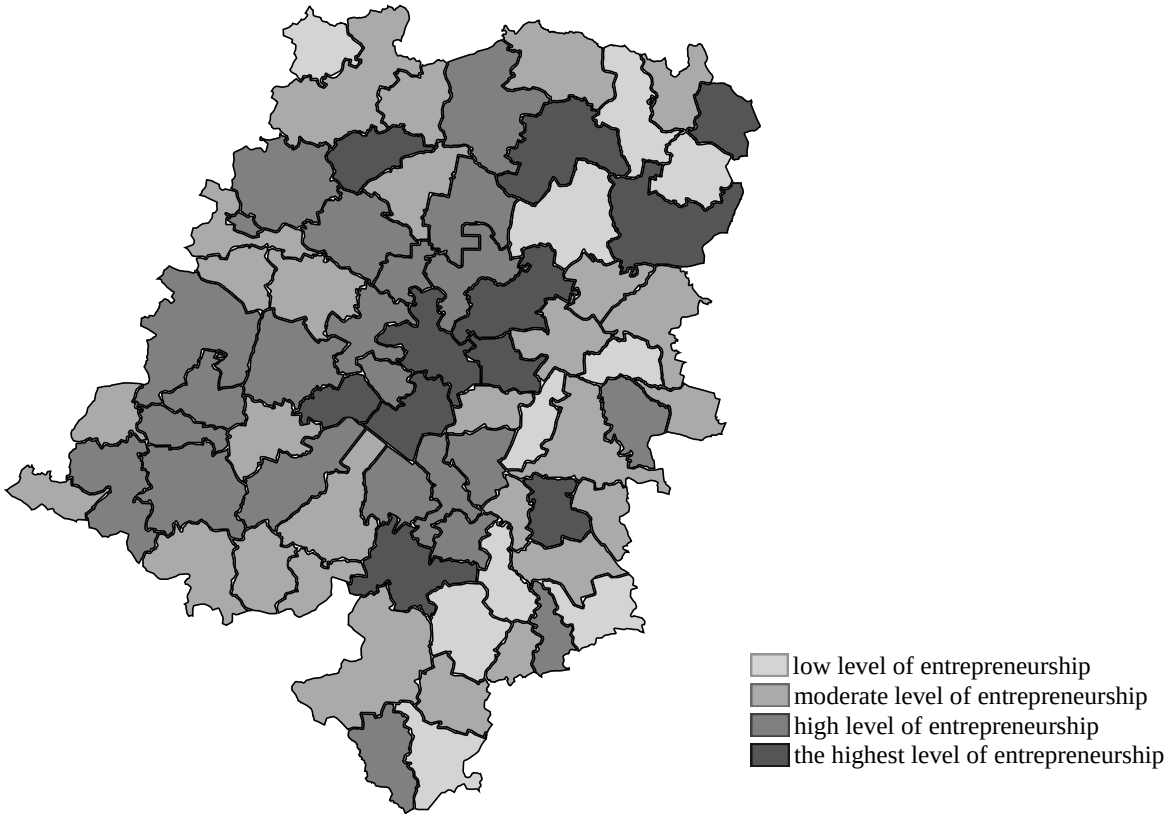

Figure 3. Spatial structure of the level of entrepreneurship in the Opole Voivodeship in 2022.

Source: own elaboration.

The results confirm previous evidence of significant micro-level spatial diversity of entrepreneurship in Opolskie Voivodeship. It was observed that entrepreneurial activity in 2015 was concentrated around large cities. However, the highest levels of entrepreneurship were also found in selected municipalities that were not close to these cities. This was particularly the case in the eastern part of the voivodeship, where most of the municipalities with high levels of entrepreneurship were located. The results for 2020 show a change in the spatial structure, with the centre of gravity in terms of the level of entrepreneurial activity shifting towards municipalities in the eastern and southern part of the region. The results for 2022 are in line with this trend, with a significant decrease in the level of entrepreneurship in municipalities from the eastern part of the province. There is also an increase in entrepreneurship in the municipalities around the region's capital.

Basised on the results of the ranking of municipalities according to Hellwig's aggregate measure, the classification of the municipalities according to the level of entrepreneurship analysis, and the analysis of the spatial structure of this level in the Opole Voivodeship, it can be argued that the location plays a role in the level of entrepreneurship at the micro spatial level in the periphery. It was also observed that this level is likely to change to varying extents (i.e. rising/declining entrepreneurship in a given municipality). Hypothesis 1 is therefore confirmed. The findings are in line with Huggins et al. (2017), who examined entrepreneurship in peripheral areas in the case of Wales in the UK and provided evidence of its heterogeneous nature. However, given the relatively short time span between years considered in the study, the results are difficult to compare with those that look at much longer periods and claim that regional differences in entrepreneurial activity are remarkably persistent over time (Fritsch, Wyrwich, 2014; Pylak, Sosnovskikh, 2024). In addition, the lack of an apparent link between the level of entrepreneurship and the type of location (urban, rural, urban-rural) in the peripheral region may indicate the minor importance of the supporting role of industrial density or agglomeration. At the same time, it provides evidence that less developed areas in peripheral regions, such as rural areas, have the capacity to develop entrepreneurial activity, confirming the observations of North and Smallbone (2006) that rural areas, including peripheral ones, can have a significant tradition of entrepreneurship.

5. Summary

The aim of the paper was to identify the degree of diversity of entrepreneurship at the micro spatial level in a peripheral region. Based on data for municipalities from the Opole Voivodeship, Poland for the years: 2015, 2020 and 2022, it has been demonstrated that, as hypothesised, geographical location matters in terms of the level of entrepreneurship at the micro spatial level. However, it was found that the degree to which particular municipalities in

a peripheral region were entrepreneurial varied, with a number of municipalities experiencing a sharp decline in the level of entrepreneurship in some years.

By exploring the ways in which entrepreneurship differs in a micro-spatial peripheral setting, the paper adds to the recent literature on regional entrepreneurship. It may also provide a basis for practice and policy for the development and implementation of type-specific regional entrepreneurial policy at the micro spatial level.

The paper has some limitations. Although it allows to identify the position of municipalities in terms of their level of entrepreneurship in each year considered, it has the character of a static approach, looking at data from each year separately and not taking into account data from other years. Further analysis should be carried out using a dynamic approach, considering data from all years over the period considered, in order to gain more comprehensive insights. It should also be acknowledged that the results of the ranking may be highly sensitive to the variables used to construct the aggregate measure. Further hypothesis testing with different sets of variables is therefore recommended. It would also be interesting to examine the extent to which the level of entrepreneurship is determined by the regional distribution of the factors which influence entrepreneurial activity in the municipalities analysed.

References

1. Acs, Z.J., Audretsch, D.B., Lehmann, E.E. (2013). The knowledge spillover theory of entrepreneurship. *Small Business Economics, Vol., 41*, pp. 757-774, doi: 10.1007/s11187-013-9505-9
2. Acs, Z.J., Varga, A. (2005). Entrepreneurship, agglomeration and technological change. *Small Business Economics, Vol. 24*, pp. 323-334, doi: 10.1007/s11187-005-1998-4
3. Audretsch, D.B., Keilbach, M. (2004). Does entrepreneurship capital matter? *Entrepreneurship Theory and Practice, Vol. 28, No. 5,* pp. 419-430, doi: 10.1111/j.1540-6520.2004.00055.x
4. Bąk, A. (2018). Zastosowanie metod wielowymiarowej analizy porównawczej do oceny stanu środowiska w województwie dolnośląskim. *Wiadomości Statystyczne, No. 1*, pp. 7-20.
5. Baumgartner, D., Pütz, M., Seidl, I. (2013). What kind of entrepreneurship drives regional development in European non-core regions? A literature review on empirical entrepreneurship research. *European Planning Studies, Vol. 21, No. 8,* pp. 1095-1127, doi: 10.1080/09654313.2012.722937
6. Benneworth, P. (2004). In what sense 'regional development?': Entrepreneurship, underdevelopment and strong tradition in the periphery. *Entrepreneurship & Regional Development, Vol. 16, No. 6,* pp. 439-458, doi: 10.1080/0898562042000249786

7. Bergmann, H., Sternberg, R. (2007). The changing face of entrepreneurship in Germany. *Small Business Economics, Vol. 28*, pp. 205-221, doi: 10.1007/s11187-006-9016-z
8. Carree, M., Thurik, A. (2008). The lag structure of the impact of business ownership on economic performance in OECD countries. *Small Business Economics, Vol. 30*, pp. 101-110, doi: 10.1007/s11187-006-9007-0
9. Ferreira, J.J.M., Fernandes, C.I., Kraus, S. (2019). Entrepreneurship research: mapping intellectual structures and research trends. *Review of Managerial Science, Vol. 13*, pp. 181-205, doi: 10.1007/s11846-017-0242-3
10. Fritsch, M., Wyrwich, M. (2014). The long persistence of regional levels of entrepreneurship: Germany, 1925-2005. *Regional Studies, Vol. 48, No. 6*, pp. 955-973, doi: 10.1080/00343404.2013.816414
11. García-Rodríguez, F.J., Gil-Soto, E., Ruiz-Rosa, I., Gutiérrez-Taño, D. (2016). Entrepreneurial process in peripheral regions: the role of motivation and culture. *European Planning Studies, Vol. 25, No. 11*, pp. 2037-2056, doi: 10.1080/09654313.2016.1262827
12. Hellwig, Z. (1968). Zastosowanie metody taksonomicznej do typologicznego podziału krajów ze względu na poziom ich rozwoju oraz zasoby i strukturę wykwalifikowanych kadr. *Przegląd Statystyczny, Vol. 15, No. 4*, pp. 307-327.
13. Huggins, R., Prokop, D., Thompson, P. (2017). Entrepreneurship and the determinants of firm survival within regions: human capital, growth motivation and locational conditions. *Entrepreneurship & Regional Development, Vol. 29, No. 3-4*, pp. 357-389, doi: 10.1080/08985626.2016.1271830
14. Jaśkiewicz, N. (2020). Rozwój przedsiębiorczości polskich województw – podejście statyczne i dynamiczne w latach 2014-2018. *Studia Ekonomiczne. Gospodarka. Społeczeństwo. Środowisko, Vol. 2, No. 6*, pp. 54-71.
15. Kaufmann, D., Malul, M. (2014). The dynamic brain drain of entrepreneurs in peripheral regions. *European Planning Studies, Vol. 23, No. 7*, pp. 1345-1356, doi: 10.1080/09654313.2014.929639
16. Korber, S., McNaughton, R.B. (2018). Resilience and entrepreneurship: a systematic literature review. *International Journal of Entrepreneurial Behavior & Research, Vol. 24, No. 7*, pp. 1129–1154, doi: 10.1108/IJEBR-10-2016-0356
17. Malecki, E.J. (2009). Geographical environments for entrepreneurship. *International Journal of Entrepreneurship and Small Business, Vol. 7, No. 2*, pp. 175-190, doi: 10.1504/IJESB.2009.022805
18. Malina, A. (2020). Analiza przestrzennego zróżnicowania poziomu rozwoju społeczno-gospodarczego województw Polski w latach 2005-2017. *Nierówności Społeczne a Wzrost Gospodarczy, No. 61*, pp. 138-155, doi: 10.15584/nsawg.2020.1.10
19. Meccheri, N., Pelloni, G. (2006). Rural entrepreneurs and institutional assistance: an empirical study from mountainous Italy. *Entrepreneurship & Regional Development, Vol. 18, No. 5*, pp. 371-392, doi: 10.1080/08985620600842113

20. Miłek, D. (2023). Spatial variations in the level of entrepreneurship in European Union countries. *Zeszyty Naukowe. Organizacja i Zarządzanie, z. 179*, pp. 329-353, doi: 10.29119/1641-3466.2023.179.17
21. Mueller, P., van Stel, A., Storey, D.J. (2008). The effects of new firm formation on regional development over time: The case of Great Britain. *Small Business Economics, Vol. 30,* pp. 59-71, doi: 10.1007/s11187-007-9056-z
22. North, D., Smallbone, D. (2006). Developing entrepreneurship and enterprise in Europe's peripheral rural areas: some issues facing policy-makers. *European Planning Studies, Vol. 14, No. 1,* pp. 41-60, doi: 10.1080/09654310500339125
23. Nowak, E. (1990). *Metody taksonomiczne w klasyfikacji obiektów społeczno-gospodarczych*. Warszawa: PWE, pp. 1-201.
24. Ortega-Argilés, R. (2022). The evolution of regional entrepreneurship policies: "no one size fits all". *The Annals of Regional Science, Vol. 69*, pp. 585-610, doi: org/10.1007/s00168-022-01128-8
25. Pato, M.L., Teixeira, A.C. (2016). Twenty years of rural entrepreneurship: A bibliometric survey. *Sociologia Ruralis, Vol. 56, No. 1*, pp. 3-28, doi: 10.1111/soru.12058
26. Pylak, K., Sosnovskikh, S. (2024). Old habits die hard: pushing the frontiers of entrepreneurship persistence since 1926. *Regional Studies*, pp. 1-17, doi: 10.1080/00343404.2024.2355986
27. Sternberg, R. (2022). Entrepreneurship and geography – some thoughts about a complex relationship. *The Annals of Regional Science, Vol. 69*, pp. 559-584, doi: 10.1007/s00168-021-01091-w
28. Stockemer, D. (2019). *Quantitative methods for the social sciences.* Springer, pp. 1-185.
29. Urbano, D., Audretsch, D., Aparicio, S., Noguera, M. (2020). Does entrepreneurial activity matter for economic growth in developing countries? The role of the institutional environment. *International Entrepreneurship and Management Journal, Vol. 16,* pp. 1065-1099, doi: 10.1007/s11365-019-00621-5
30. Zygmunt, A. (2022). The effect of research and development personnel on innovation activities of firms: Evidence from small and medium-sized enterprises from the Visegrad Group countries. *Entrepreneurial Business and Economics Review, Vol. 10, No. 3,* pp. 105-121, doi: 10.15678/EBER.2022.100307
31. Zygmunt, J. (2018). *Does level of economic growth matter in spatial diversity in entrepreneurial activity in a transition economy? A case of Poland*. Proceedings of the 32nd International Business Information Management Association Conference (IBIMA), Seville, Spain, 15-16 November 2018, pp. 6999-7006.