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Influence of Agglomerations on the Development of Tourism in the Lviv Region

Abstract. The author proposes a method of studying the influence of agglomerations on the development of tourism. The influence of agglomerations on the development of tourism is illustrated by the case of the Lviv region and the use of correlation analysis. In addition, official statistics about the main indicator of the tourism industry by region and city are subjected to centrographic analysis. The coincidence of weight centers confirms the exceptional influence of the Lviv agglomeration on the development of tourism in the region, which is illustrated with a cartographic visualization.

Keywords: agglomeration, tourism, research methodology

1. Introduction

Urbanization, as a complex social process, affects all aspects of society. The role of cities, especially large cities, in the life of Ukraine and its regions will only grow. The growing influence of cities on people's lives and their activities was noted in the early 20th century by the professor V. Kubiyovych [1927].

Mochnachuk and Shypovych identified three stages of urbanization in Ukraine during the second half of the 20th century: 1) urbanization as a process of urban growth; 2) suburbanization – erosion of urban nuclei, formation of agglomerations; 3) rurbanization – urbanization of rural settlements within urbanized areas [Mochnachuk, Shypovych 1972: 41-48]. The stage of rurbanization is

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consistent with the classic definition of "agglomeration" in the context of European urbanism: a system that includes the city and its environs (Pierre Merlen and Francoise Shoe).

As a rule, an agglomeration in the form of an integral territorial socio-economic formation arises in the course of a functional and spatial transformation of a large city-nucleus into a significant urbanization zone as a result of absorbing adjacent settlements. Agglomerations have a high level of production diversification, significant concentration of capital and skilled labor, high efficiency of all systems and infrastructures.

These components all contribute to the emergence of the so-called agglomeration effect, which is the result of improved efficiency achieved by saving commuting time and transportation cost.

Agglomerations differ in population size, population density, number of constituent settlements, number of nuclei or centers.

In the resolution of Ukraine's Cabinet of Ministers an agglomeration is defined as "a compact territorial collection of urban settlements, which are united by intensive economic, labor and cultural-everyday ties" [Osnovni napriamy zabezpechennia… 2000].

In most studies conducted in Ukraine, a group of interconnected settlements is treated as an agglomeration, if the population of the largest cities that are part of it is at least 100,000, and if at least 2 urban settlements are located within the area of influence, transport distance between both agglomeration settlements should not exceed 2 hours.

In Ukraine, for example, up to 30 million people (¾ Ukraine's population) live in agglomerations and conurbations; agglomerations account for 10% of the territory of Ukraine and generate 75% of the country's GDP [Terytorialnyi rozvytok v Ukraini… 2012].

There are no clear criteria for delimiting agglomerations in Ukraine. The administrative boundaries of major cities in Ukraine are not fully consistent with the system of Territorial Units for Statistics (NUTS) and local administrative units (LAU). For example, an agglomeration (or a group of districts) in Ukraine could correspond to NUTS-3 level.

The tourism sector plays an increasingly important role in Ukrainian cities at the present stage. Large cities attract tourists, and tourism, with its multiplier effect, stimulates the overall development of the region.

The purpose of the article is to trace the impact of agglomerations on the development of tourism in the Lviv region using the research methodology proposed by the author. The method involves the use of mathematical methods, available statistics and a special program for mapping tourist indicators.

The article consists of three parts and a conclusion. The first part is devoted to a description of agglomerations in the Lviv region. The hospitality industry is

analyzed in terms of the indicator showing the changing number and distribution of tourists in the cities of the region. The second part presents results of the study. The third part is devoted to the interpretation of the research results.

2. Characteristics of agglomerations of Lviv region

The urbanization level of the Lviv region[1] is equal to 61%. A large part of the urban population lives in the city of Lviv (756 thousand people as of 1.01.2019) [HUSLO]. In terms of the urbanization indicator, the region is below the national average of 69%, but ahead of other oblasts in western Ukraine [Derzavna sluzba statystyky Ukrainy].

There is no consensus among scientists regarding the number of agglomerations in the Lviv region, except for the monocentric *Lviv agglomeration* [Shabliy et al. 1996; Lozynskiy, Kostiuk, 2011; Malska, Hataliak 2018], which includes the city of Lviv, Vynnyky, Dubliany, Pustomyty, Zhovkva, Gorodok, Novoyavorivsk, Kamianka-Buzka, Mykolaiv; the towns of Briuchovychi, Rudne, Kulykiv, Zapytiv, Novy Jarychiv, Ivano-Frankove, Shchyrets, Velykiy Liubin; districts Gorodotsky, Zhovkivsky, Kamianka-Buzky, Pustomytivsky, Yavorivsky. The agglomeration covers an area of 5 390 км². The population is 1,230 thousand, with a population density of 228 persons/km².

According to some researchers three other agglomerations can be distinguished in the Lviv region: Drohobych, Chervonograd and Stryi. The *Drohobych polycentric agglomeration* includes the towns of Drohobych, Boryslav, Truskavets, Stebnyk, Skhidnytsya and neighboring settlements of the Drohobych district. The agglomeration covers an area of 1365 km² and has a population of 163 thousand, with a density of 174 persons/km². The *Chervonograd agglomeration* includes the towns of Chervonograd, Sosnivka, Girnyk, Sokal, Velyki Mosty, Belz, some settlements of the Radekhiv and Zhovkva districts. It covers an area of 2296 km². Its population is 212 thousand; with a density of 92 persons/km². The *Stryi agglomeration* includes the towns of Stryi, Morshyn, Dashava and neighboring settlements of the Stryi district. It covers an area of 844 km² and has a population of 136 thousand, with a density of 160 persons/km². Some scientists also distinguish the Drohobych-Stryi conurbation.

The influence of the region's major cities on the life of the region's inhabitants is obvious. In particular, tourism activity, which is intensively developing in the region, is mostly confined to the largest cities. In 2017 the distribution of tourist activity across the cities in the Lviv region looked as follows: Lviv – 61%, Truska-

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[1] It is one of 24 oblasts (provinces) of Ukraine.

vets – 14%, Drohobych – 5%, Chervonograd – 3% and others – 17% [HUSLO].
As can be seen, tourism in the region is concentrated in the Lviv agglomeration
[Malska, Hataliak 2018].

On the other hand, the development of tourism is transforming the region's
economy, fosters innovative activity, facilitates the emergence of new territorial
centers of tourism, and is helping to alleviate problems experienced by under-
developed peripheral areas [Kotyk 2013; Programa rozvytku turyzmu… 2017].

Incidentally, the Soviet principle of counting foreigners is still used in Ukraine.
According to V. Tsaruk, the director of the Tourism Development Center, the
number of foreigners in Ukraine is calculated using data provided by the State
Border Service. In Poland, for example, all hotels, hostels, etc. report the number
of foreign visitors staying for at least one night. This approach usually yields more
accurate statistics [Horban 2020].

The tourism industry is directly associated with the activities of accommoda-
tion establishments. Costs of hotel services account for approximately 30% to
50% of the total cost of a typical tour. Statistics for 2017 and 2018 indicate that
the share of the cost of accommodation in total costs of Ukrainian tourism enter-
prises increased to 75%. In 2017, 97% of tourist in Ukraine stayed in hotels and
similar establishments, and in 2018, only 75% (the share of the private sector
increased) [Turystychna diialnist v Ukraini u 2018 r.].

Fig. 1. Changes in the number of tourists in the Lviv region in the period 2000-2017
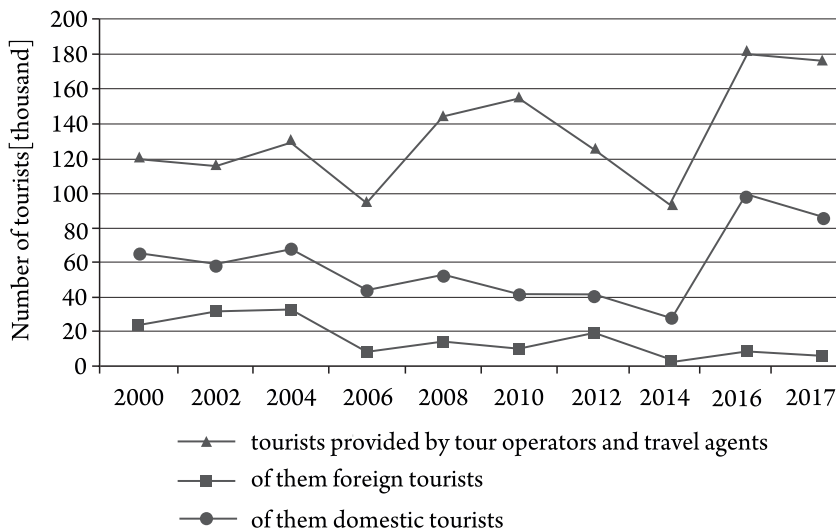
Source: Turystychna diialnist ta kolectyvni zaklady rozmishchuvannia u Lvivskiy oblasti u 2017 r.

Fig. 2. The number of accommodation establishments in the Lviv region
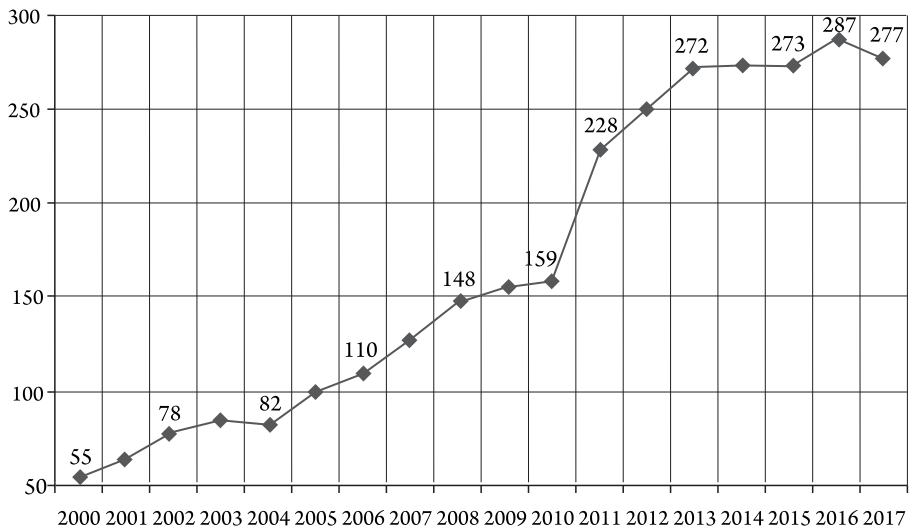
Source: Turystychna diialnist ta kolectyvni zaklady rozmishchuvannia u Lvivskiy oblasti u 2017 r.

Studies show that tourists rate the quality of service at a hotel 4 times as high as the price, and 1.2 times as high as the quality of the tourist product itself.

The growing share of the urban population in Ukraine, which is mainly due to migration from villages to cities and interregional migration, is likely to boost the demand for accommodation services. Given the increasing migration activity of Ukrainians (Fig. 1) (partly necessitated by hostilities in eastern Ukraine) [Derzavna sluzba statystyky Ukrainy], the number of potential hotel guests is increasing. Given income levels of most Ukrainian tourists, even the demand for cheap hotel rooms is relatively low and only a small percentage of Ukrainians use expensive accommodation facilities.

The demand can be expected to rise in the large cities and in developed recreational and tourist areas. Some urban dwellers are employed in accommodation establishments, while others are potential consumers of accommodation services.

From 2000 to 2017, the number of accommodation establishments in the Lviv region increased fivefold (Fig. 2). The most rapid growth was recorded in 2010-2011 before the Euro 2012 *Championship*. In 2017, hotels were the largest group (58%), youth hostels and mountain shelters accounted for 22%, and motels – 14% [Turystychna diialnist ta kolectyvni zaklady rozmishchuvannia u Lvivskiy oblasti u 2017 r.].

3. Research methodology and results

The intensity of the relationship between the indicators is calculated using formula (1) for the Pearson correlation coefficient. For $r_{kL} > 0$, the ratio between the indicators is directly proportional; when $r_{kL} < 0$ – the ratio is inversely proportional; at $r_{kL} = 0$ – there is no correlation. The value the coefficient can range from -1 to 1. The closer to "1" (-1) it is, the greater the correlation (positive or negative) [Hrytsevych 2013; Shabliy 1994].

Two indicators were selected to track the impact of agglomerations on the development of tourism in the region: the number of visitors/tourists in the Lviv region and the number of people employed in the economy of the Lviv region (Table 1).

$$r_{kL} = \frac{\sum_{i-1}^{n} \left(x_{ik} - \overline{x_k} \right)\left(x_{iL} - \overline{x_L} \right)}{\sqrt{\sum_{i-1}^{n} \left(x_{ik} - \overline{x_k} \right)^2 \left(x_{iL} - \overline{x_L} \right)^2}} \tag{1}$$

where:

r_{kL} – Pearson correlation coefficient,
x_{ik} – the value of the first indicator, which varies across cities,
x_{iL} – the value of the second indicator, which varies across cities,
x_k i x_L – arithmetic means of the indicators.

Table 1. Correlation coefficient between the indicators

Big cities of Lviv region	Number of visitors/ tourists in the Lviv region in 2017	Number of employees in the economy in the Lviv region in 2017
Lviv	446,044	232,067
Boryslav	142,452	5,293
Drohobych	8,536	16,350
Morshyn	7,238	2,885
Sambir	1,984	6,919
Stryi	8,002	11,708
Truskavets	75,141	8,091
Chervonograd	6,130	13,552
Correlation coefficient	0.9375 – very high dependency	

Source: Rynok praci u Lvivskiy oblasti u 2017 r.: 46; Turystychna diialnist ta kolectyvni zaklady rozmishchuvannia u Lvivskiy oblasti u 2017 r.: 32.

The value of the correlation coefficient in the Lviv region as a whole (not only in big cities) is also very high – 0.9312. It can be interpreted as evidence of the high mutual influence of both indicators: an increase in the number of visitors is associated with an increase in the level of employment in the regional economy and vice versa: tourists tend to choose areas where the services are better developed.

The use of centrographic analysis makes it possible to identify and interpret the centers of gravity of socio-economic phenomena. A center of gravity is characterized by geographical coordinates. If the phenomenon is uniformly distributed, its center of gravity coincides with the territory's center of gravity. When gravity centers of two phenomena are located in close proximity, it can be assumed that the two phenomena are linked [Hrytsevych 2013; Shabliy 1994].

The following indicators were used in the analysis: the number of tourist accommodation establishments (including legal entities and individuals) and population size (including urban, rural).

The formulas for calculating the center of gravity coordinates:

$$X = \frac{\sum_{i=1}^{M} p_i x_i}{P} , Y = \frac{\sum_{i=1}^{M} p_i y_i}{P} \tag{2},$$

where, in the first case:

$P = \sum_{i=1}^{M} p_i$, M – number of administrative units, p_i – number of legal entities/ individuals of accommodation establishments in the i-th administrative unit, (x_i, y_i) – the coordinates of the i-th administrative unit.

in the second case:

$P = \sum_{i=1}^{M} p_i$, M – number of administrative units, p_i – urban/rural population of the i-th administrative unit, (x_i, y_i) – the coordinates of the i-th administrative unit.

Explanation for Fig. 3:

– Geographic center of gravity for accommodation establishments: **49°36´, 23°47´**, corresponds to the coordinates of Grimne village in the Gorodok district (**marker 1**),

– Geographic center of gravity for accommodation establishments – legal entities: **49°39´, 23°50´**, corresponds to the coordinates of Shchyrets town in the Pustomyty district (**marker 2**),

– Geographic center of gravity for accommodation establishments – individuals: **49°33´, 23°44´** near Grimne village in the Gorodok district (**marker 3**),

– Geographic center of gravity for the population of Lviv region: **49°45´, 23°55´**, corresponds to the coordinates of Navaria village in the Pustomyty district (**marker 4**),
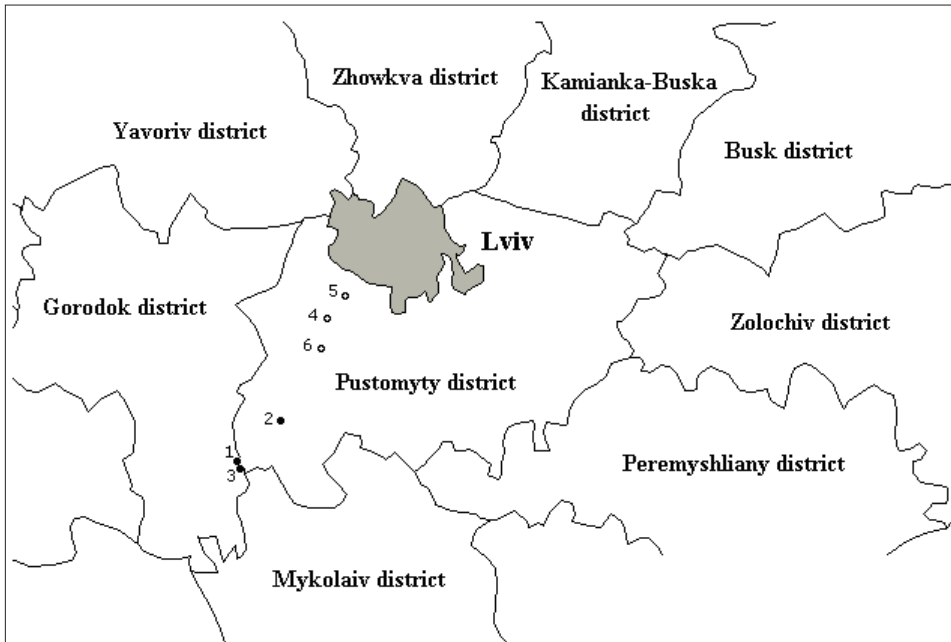
Fig. 3. The result of the centrographic analysis

Source: Author's map.

– Geographic center of gravity for the urban population: **49°46´, 23°57´**, corresponds to the coordinates of Sokilnyky village in the Pustomyty district (**marker 5**),

– Geographic center of gravity for the rural population: **49°42´, 23°52´**, corresponds to the coordinates of Pustomyty city (**marker 6**).

Conclusions from the centrographic analysis:

1. The geographic center of gravity for the establishment indicator is located southwest of the geographical center of gravity for the population indicator.

2. There are two reasons for this: the shape of the area extending from the northeast to the southwest; there are more establishments in the Carpathian region than in the northeastern regions, where tourism is much less developed.

3. However, within the region, the centers of gravity for both indicators are characterized by territorial proximity. Therefore, there is an obvious interaction between the geography of the population and the distribution of establishments.

The distribution of accommodation establishments by city and district across the Lviv region is consistent with the results of the centrographic analysis: 32% of establishments (every third) are located within the area of influence of the Lviv agglomeration; 23% of accommodation establishments are concentrated in cities

of the Drohobych agglomeration: Truskavets and Boryslav; 7% of accommodation establishments are located in the Skole district and 33% are spread in the rest of the territory [Turystychna diialnist ta kolectyvni zaklady rozmishchuvannia u Lvivskiy oblasti u 2017 r.]. Most specialized accommodation facilities (sanatoriums and others) are concentrated in the town of Truskavets (33%), which is a well-known balneological resort. The resort experienced a considerable development in 2000-2010, when the growth in the number of establishments was at the level of 1700% [Hanych, Labinska 2013]. In addition to Truskavets, specialized accommodation establishments in the Lviv region are mainly located in the districts of Skole district (13%), Drohobych (12%), and in the town of Morshyn (8%) [Turystychna diialnist ta kolectyvni zaklady rozmishchuvannia u Lvivskiy oblasti u 2017 r.].

Hotels often serve as supporting elements of the city's planning structure. Town-planning considerations are often associated with restrictions on the number of floors in hotels, which affect their amount of available space. Other factors that limit the construction of hotels in city centers include the constant growing land prices, the difficulty of organizing construction (difficult access, lack of parking spaces for transport, etc.). The location of hotels within the city space has an important effect on their operation.

The most desirable location for a hotel is in the city center, which means convenient access to all areas of the city. The historical center of a city is the place where its main architectural and historical monuments are usually located, which is convenient for tourists, since all tourist attractions are within walking distance.

Increasingly, hotels are located in areas near the city center. There is a lot more land available for construction, the price of land is lower, there is less congestion and less noise pollution. This type of accommodation is quite common. However, transport accessibility is somewhat worse.

Staying in hotels located in residential areas has its advantages, too: there are free parking spaces for passenger and sightseeing buses and for cars.

Hotels located on the outskirts of the city are intended mainly for motorized tourists. As a rule, such hotels are located at the entrance to the city along highways. Convenient access to the thoroughfares and good visibility of the building are the key features. It is more difficult to get to the city center from hotels located on the outskirts of the city. When one analyses the map in Fig. 4, one can conclude that the distribution of tourists in the Lviv region is consistent with this type hotel localization.

There is one general principle: the closer to the center a hotel is located, the more expensive it is. This is reflected by the indicator "average length of stay in hotels and similar establishments in 2017" (Fig. 4), which was created using the Surfer *software* package. As can be seen, tourists tended to stay in hotels located in the eastern districts of the Lviv region.
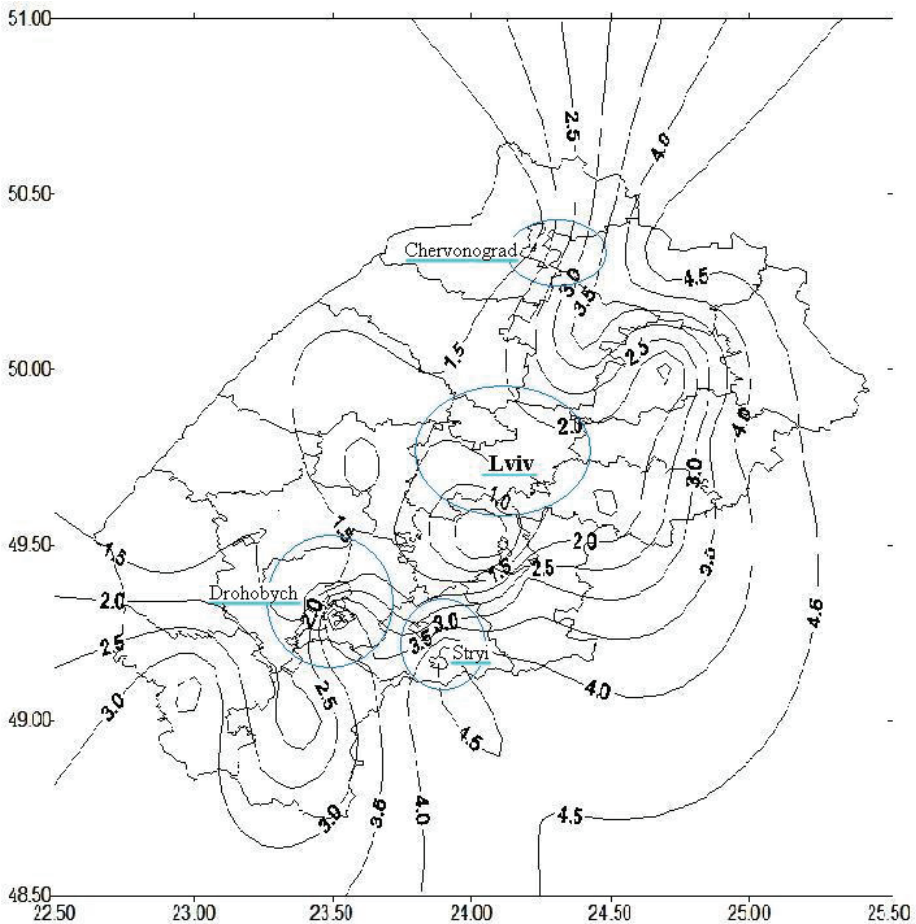
Fig. 4. A contour map showing isolines connect areas with the same average length of stay in hotels and similar establishments in 2017. The axes represent geographic coordinates: X – degrees of latitude, Y – degrees of longitude

Source: Author's map.

This pattern can even be observed in places where health tourism is located. In such areas, there is a dominance of private forms of accommodation (rented rooms), where the pricing is more flexible.

4. Conclusions

1. The task of developing a methodology for the study of the impact of agglomerations on the development of tourism remains relevant. The methods used in this study included methods from human geography: correlation analysis, cen-

trographic analysis, visualization of the distribution of indicators in space, beyond the level of administrative units.

2. When available statistics are not sufficient for an in-depth analysis, interdisciplinary research methods should be used: mathematical, cartographic, sociological, used in combination as the case may require.

3. Urbanization and agglomeration growth in Ukraine, particularly in the Lviv region, is consistent with global trends. In the case of international comparisons, one is faced with the problem of non-equivalence of administrative units and the lack of correspondence between Ukrainian and international statistics.

4. Agglomerations clearly influence the development of tourism and tourism determines changes in agglomerations, which is confirmed by the correlation results. It is estimated that the arrival of every 1,000 tourists leads to the creation of 40 stable job (such estimates are based on official Ukrainian standards for tourist services).

5. Within the Lviv region, the Lviv agglomeration is the main center of influence, as evidenced by the results of centrographic analysis. The Drohobych polycentric agglomeration, which specializes in wellness tourism, or the Sokal and Stryi agglomerations, affect the development of tourism to a much smaller extent than the agglomeration of Lviv. A slight shift of the center of gravity southwest of Lviv indicates an increasing role of tourism in the southern part of the region.

6. The location of agglomerations has an obvious influence on the development of tourism – "*genius loci*", the size of agglomerations, the availability of natural and tourist resources, the development of infrastructure and the availability of skilled labor.

7. Other relevant aspects include the condition, structure, geography, problems and prospects of accommodation establishments, since these are the features of accommodation that tourists pay most attention. Based on the analysis of the maps, there is a need for more accommodation services in the eastern part of the region, which is less economically developed compared to the western and central most urbanized parts. The most notable factor in this caser is the lower price.

8. In general, the development of tourism in Ukrainian agglomerations follows international patterns, but has its territorial peculiarities.

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Wpływ aglomeracji na rozwój turystyki w obwodzie lwowskim

Streszczenie. Artykuł przedstawia metodę badania wpływu aglomeracji na rozwój turystyki na przykładzie obwodu lwowskiego i na podstawie analizy korelacyjnej. Autorka wykorzystuje oficjalne statystyki na temat głównego wskaźnika działalności turystycznej na poziomie obwodów i miast i poddaje je analizie centrograficznej. Zbieżność ośrodków ciężkości potwierdza wyjątkowy wpływ aglomeracji Lwowa na rozwój turystyki w całym obwodzie, co ilustruje wizualizacja kartograficzna.

Słowa kluczowe: aglomeracja, turystyka, metodologia badań