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Spatial typology of market services in Łódź

Pre-word

In the period of economic transformation an intensive development of market services in Łódź was conducive to creation of their new spatial arrangement. This arrangement, in case of the majority of basic features of market service firms, as well as their workers, stand out- in the cross section of the geodesic areas- by means of enormous spatial differentiation. As a result, the problem of synthetic depiction of different spatial arrangements of such type of variables gains a special meaning. Its solution is enabled by complex spatial typology of market services.

In the essential part of this study a detailed discussion has been made over the choice of the features of typological market services, the method of their spatial typology which was used, and the given types. The spatial typology of market services within the city was studied mainly on the basis of statistical source data (REGON, which was essentially contrasted according to January 2001state. Part of these basic data, however, has been verified and completed in the progress of fieldwork until the half of the same year. In order to picture the given spatial types of the collection of the people working in the market services in detail, a detailed division of the city into 215[1] geodesic areas in the map has been used. The chosen typological subject has been omitted in the geographical studies of economic activity of inhabitants of Łódź which have been made so far.

Typological features of market services

The choice of the typological variables determines in great measure the correctness of the outcomes of the carried out spatial typology of market services. Taking into consideration the model borrowed from the related research (T. Grabiński 1992),

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[1] Out of the general number of 215 geophysical areas, 3 areas have been omitted in calculation procedures and cartography compilations in which market service firms have not occurred.

three groups of criteria have been allowed for: content-related, formal and statistical. The main content-related criteria include:

- Grasping- comprehensively- the essential and not marginal features of the analysed services,
- Clear, unequivocal and strict definition of the variables,
- Logical connection of the variables with one another and enabling mutual control of the variables by means of understanding the relationships between them,
- The agreement of the proportions between the number of the variables representing given aspect of the examining services and their content-related meaning.

The formal criteria taken are the following:
- The ability to measure the features,
- The existence of credible and easily-accessible statistical information,
- Complete data for all the geodesic units,
- Continuity which enables mutual comparison of the geodesic units.

As for the statistical criteria, two of them have been taken into consideration:
- High ability to discriminate spatial units which is the result of high spatial variability of the diagnostic features,
- Lack of strong mutual correlation of diagnostic features.

A set of 12 diagnostic features has been used to compile the spatial typology of the people working in market services. Variables stating the potential of the people working in market service firms, their density, and structure according to the size of the firms, property sectors and kinds of activity have been introduced. This set also contained the measure of availability of market services in an urban area.

The compilation of the selected typological features is made up of the following variables ascribed to specific geodesic areas:
- The number of people working for 1 market service firm;
- The number of people working in market services;
- The number of people working in market services per 100 hectares;
- The participation of people working in public firms in the overall number of people working in market services (%);
- The participation of people working in trade and repairs in the overall number of people working in market services (%);
- The participation of people working in hotels and restaurants in the overall number of people working in market services (%);
- The participation of people working in transport and storing in the overall number of people working in market services (%);
- The participation of people working in financial mediation in the overall number of people working in market services (%);

Table 1

Statistical parameters of arrangement of diagnostic features of people working in market services according to geodesic areas in Łódź in 2001

Statistical parameters	The number of people working per 1 market service firm	The number of people working in market services	The number of people working in market services per100 ha	The participation of people working in public firms in the overall number of people working in market services (%)	The participation of people working in trade and repairs in the overall number of people working in market services (%)	The participation of people working in hotels and restaurants in the overall number of people working in market services (%)	The participation of people working in transport and storing in the overall number of people working in the market services (%)	The participation of people working in financial mediation in the overall number of people working in market services (%)	The participation of people operating real estates and firms in the overall number of people working in market services (%)	The participation of people in other market services in the overall number of people working in market services (%)	The number of people per 1 working person in market services	The participation of people working in retail in the overall number of people working in market services (%)
The average	3,28	859,4	903,5	7,77	56,42	3,36	11,63	4,03	16,08	8,48	8,04	56,63
Median	2,11	286,5	225,7	0,00	54,50	1,79	7,88	1,82	13,59	6,09	5,95	58,01
First quartile	1,68	49,50	31,37	0,00	43,91	0,00	3,82	0,00	6,03	2,15	3,23	42,25
Third quartile	3,47	984,7	1214,7	8,25	72,30	3,76	12,54	4,35	23,05	11,03	9,31	73,37
Variability area	25,44	30099,0	22471,4	88,03	100,0	61,70	100,0	57,46	88,03	89,94	60,50	100,0
Standard deviation	3,24	2323,86	1967,8	15,80	21,01	6,51	14,46	7,96	14,57	10,45	9,12	23,67
Variability	98,57	270,4	217,8	203,2	37,25	193,9	124,3	197,4	90,59	123,3	113,4	41,80
Asymmetry	3,54	9,90	7,04	2,72	-0,25	5,57	3,01	4,15	1,95	3,68	3,28	-0,27
Kurtosis	16,43	120,2	69,51	7,70	0,01	40,57	11,09	20,23	6,16	20,79	13,08	-0,17

- The participation of people operating real estates and firms in the overall number of people working in market services (%);
- The participation of people working in other market services in the overall number of people working in market services (%);
- The number of people per 1 working person in market services;
- The participation of people working in retail in the overall number of people working in trade and repairs (%);

The shapes of spatial arrangements of the considered features differ from one another significantly because of their centrality, variability, asymmetry and kurtosis) [2].

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[2] The whole text uses the following symbols: V- classic coefficient of variability, A- classic coefficient of asymmetry, K- classic coefficient of kurtosis, r- coefficient of linear correlation. These measures, as well as other used in this study, have been mainly calculated with the professional statistical package SPSS 10.0 for Windows.

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The unimodal arrangement has got 11 variables altogether. Multimodality is marked only in the case of the number of working in market services for 100 hectares arrangement (feature 3).

The great majority of the considered features has got a very high level of differentiation which is measured with a classic coefficient of variability (V>60%). It is connected with poorly outlined central tendency, which, from a typological perspective, is a positive phenomenon. Taking into consideration spatial differentiation, three examined features of market services which outline the amount of work resources (feature 2), density of working people (feature 3) and the participation of people working in public firms (feature 4) reach the top. Standard deviation of these variables outnumbers their average values over twice. We have to add that none of the taken features shows moderate spatial differentiation (V<35%).

Spatial numbers of the analysed typological variables are, in majority of cases, characterised by strong right-sided asymmetry. Its extremely high level, which is a proof of prominent homogeneity of the given spatial structures, distinguishes such a feature as the number of people working in market services (feature 2: A= 9.90). At the same time the measurements done were able to prove that only two features have arrangements close to the symmetrical one. It concerns the variables which picture the importance of the people working in trade and repairs section (feature 6), as well as the participation of people working in retail in the whole trade and repairs section (feature 12).

The calculated coefficients of kurtosis of individual typological features get, as a general rule, a much higher level than the usual. The arrangements of potential measure and density of people working in market services (feature 2: K= 120.23; feature 3: K=69.51) and the participation of people working in hotels and restaurants (feature 6: K= 40.57) are extremely slender. One feature only (5), which shows the position of people working in trade and craft, has kurtosis little deviating from the normal. Similarly, only one variable, which defines the role of people working in retail (feature 12), is distinct by means of slightly flattened arrangement.

The interdependencies between the pairs of the taken diagnostic features are differentiated in regard to strength, direction and shape. Weak relationships or the ones showing moderate strength outweigh the others. Among the coefficients of linear correlation which have been calculated for all the pairs of these features only one reached the value of >0.7[3]. These conclusions have been also confirmed in the calculated for the same pairs of diagnostic features values of Kendall's coefficient (tau_b) which is not sensitive to the shape of definite interdependencies. The names of all the isolated types have been created on the basis of their most characteristic diagnostic features.

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[3] Such a strong correlation relationship has been marked between the number of people working in market services (feature 2) and their density (feature 3).

The spatial typology of market services method used

As has been indicated before, over 200 geodesic areas (212) have been used in spatial typology of market services' employees. In respect to such a big number of territorial units, a method of K-average, as the most effective iterative-optimization method used in numeric taxonomy, has been chosen to group them. It has been worked out by J. MacQueen (T. Grabiński 1992). A variety of this method proposed by D.N. Sparks (M.R. Anderberg 1973) which realises a statistical programme SPSS, has been used. This method demands the diagnostic features to be measured in the interval or quotient scale.

Similarly to other iterative- optimization taxonometric methods, it allows separating relatively homogenised groups of objects, taking into consideration chosen features while fulfilling the condition of minimization of differentiation of objects in the group, and maximization of this differentiation between the groups. The given object is allocated to the class, whose centre of gravity is located in the nearest Euclidean distance. This sort of grouping takes place in three phases, which embrace:

1. Determination of (K) objects which form initial concentrations
2. Allocation of consecutive objects to this concentration, which is the nearest,
3. Moving the objects between the concentrations in such a way to improve the quality of the division.

The function of the criterion of the quality of the division of a given set of objects (f) is expressed as the general sum of the distances of the objects from the middle of the classes, to which they have been allocated[4]. Getting the optimal grouping demands minimization of the value of the function. The initial activity in the very method is to establish the initial number of concentrations, as well as a number of iterations and the liminal value of the function of the criterion of the quality of the division. The grouping of objects itself in this work has been based on the option of dynamic change of structure of concentrations while using moving average. It means that the values of the centres of gravity of the classes have been calculated after each allocation of the object to the class. In the next steps it was indispensable for the simulation to examine what assumed number of the concentrations ensures their best divisibility. The use of the discussed method has demanded a previous standardization of the empiric values of the assumed diagnostic features[5].

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[4] Such a function is described by the formula: $f = \Sigma j \Sigma\ k\ (x_{ik} - c_k)^2$, where x_{ik} – the value of the standardized feature of the j unit in the k group, c_k – the centre of gravity of the k group.

[5] The standardization has been done with the formula: $x_{ij}^{\ t} = (x_{ij} - m_{lj})/S_{xi}$, where x_{ij} – the empiric value of the feature and in the j unit, m_{li} – arithmetic mean of the feature and, S_{xi} – standard deviation of the feature i.

Fig. 1
Spatial typology of people working in market services in Łódź
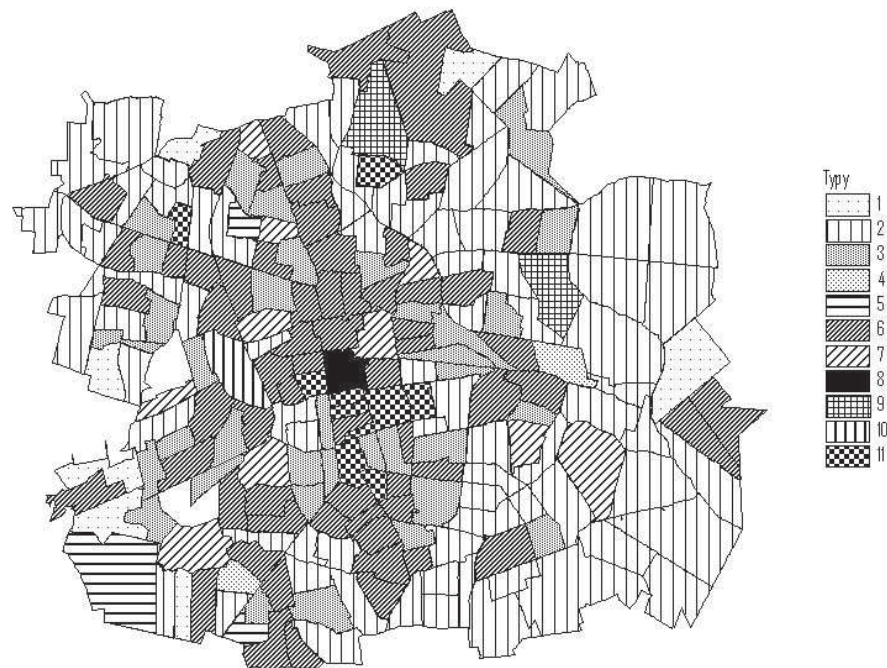
The distinguished spatial types of people working in market services.

Spatial typology of the people working in market services has been based on 12 above mentioned diagnostic features. On the basis of the standardized values of these features, using the method of K-average in the previously discussed way, 11 relatively homogeneous types of geodesic areas have been identified. Each of them is described by means of specific combination of distinguishing features (tab. 2, fig. 1).

Type 1- very low accessibility of market services connected with specialization in the area of trade and repairs. The most characteristic feature of this rare type (7 geodesic areas) is very low accessibility of market services, which is measured by the number of people per 1 person working in this sphere of economy. This type appears in the low- populated marginal sphere areas. Taking into consideration the participation of working people, which is comparable citywide, the best developed sphere of market services is trade and craft, especially retail. It is worth mentioning that firms which are numbered among other spheres of market services appear there only sporadically. In the structure of the size of the market service firms, which is characterised by a number of employees, small business has a privileged position. The division of the working people according to the market services sections, with a citywide reference, shows underdevelopment, especially of operating real estate and firms. The majority of

the remaining diagnostic features (7) in this type also take values lower than the average in the whole city.

Type 2- of a relative domination of trade and repairs, accompanying low general density of people working in market services. Among all the distinguished types, this one is the most spread in the city areas, encompassing 78 geodesic areas altogether. They take vast, agricultural peripheral areas, as well as industrial and storehouse- storing areas in the central and intermediate zones. Only two diagnostic variables make this type possible to be recognised as privileged, though the degree of this privilege is not high. These features are: the participation of people working in trade and repairs, and the average number of people per 1 market service firm. At the same time, it is noticeable that there is a higher than average citywide participation of people working in wholesale trade rather than retail (including crafts). Relatively worst developed sections of market services are operating real estate and firms along with the remaining municipal, social and individual services.

Type 3- quite high density of people working in market services, convergent with high specialisation in operating real estate and firms. This type appears quite often (36 geodesic areas), but only in the areas densely-populated of the central and intermediate zone. It is distinguished by slightly higher than the average in the city density of people working in market services. Even more characteristic, however, is the high specialisation in the area of operating real estate and firms. In the quite poorly developed section of trade and repairs one can notice a relative domination of retail. Transportation and communication are, apart from trade and repairs, profoundly underdeveloped spheres of market services. The same, but to a less extent, is represented by section of the remaining municipal, social and individual services. It is worth mentioning that in this type, the majority of diagnostic features, (7), show underdevelopment of market services in relation to their citywide level.

Type 4- low accessibility of market services, connected with very high relative domination of people working in transportation and communication. This type includes only two geodesic areas located in the near distance of Łódź-Widzew railway station and Lublinek airport. The location of these two areas was conducive to high relative domination of people working in transportation and communication, as well as generally low accessibility of market services, which was characterised by the number of people per 1 person working in market services. In the division of people working according to sections of market services, financial mediation plays a relatively big part. At the same time a characteristic phenomenon is underdevelopment of trade and repairs sections, especially the retail one. A little less underdeveloped area of market services is operating real estate and firms. The great majority of the diagnostic features taken, (9), show underdevelopment of the sphere of market services.

Type 5- high relative domination of people working in the public sector of market services with specialisation in operating real estate and firms. This type, similarly to the previous one, has spread very poorly in the city area, and it

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Table 2

The average of the values of standardised diagnostic features of people working in market service firms in the given types of geodesic areas in Łódź in 2001

Diagnostic features	Spatial types of people working in market services										
The number of people working per 1 market service firm	-0,649	0,095	-0,175	-0,705	3,767	-0,351	0,982	1,585	0,224	1,291	0,282
The number of people working in market services	-0,367	-0,262	0,002	-0,369	-0,167	0,045	0,473	12,583	-0,348	-0,293	0,554
The number of people working in market services per100 ha	-0,457	-0,342	0,033	-0,458	-0,193	0,098	0,217	10,961	-0,451	-0,4237	1,350
The participation of people working in public firms in the overall number of people working in market services (%)	-0,492	-0,363	-0,140	-0,492	4,024	-0,043	1,546	2,113	0,114	3,397	0,803
The participation of people working in trade and repairs in the overall number of people working in market services (%)	0,494	0,934	-0,537	-2,685	-1,801	-0,274	-1,198	-1,922	-1,461	-2,472	-1,068
The participation of people working in hotels and restaurants in the overall number of people working in market services (%)	-0,516	-0,121	0,030	-0,516	-0,328	0,039	-0,234	0,306	7,843	0,257	-0,263
The participation of people working in transport and storing in the overall number of people working in the market services (%)	0,223	-0,197	-0,295	4,959	-0,392	-0,119	2,776	1,190	-0,739	-0,766	-0,393
The participation of people working in financial mediation in the overall number of people working in market services (%)	0,348	-0,388	-0,139	1,588	-0,490	0,037	-0,389	2,965	-0,507	-0,507	3,474
The participation of people operating real estates and firms in the overall number of people working in market services (%)	-0,599	-0,566	1,293	-1,104	3,932	0,020	-0,668	-0,102	-1,104	-1,104	0,118
The participation of people in other market services in the overall number of people working in market services (%)	-0,412	-0,446	-0,225	-0,811	-0,739	0,636	-0,058	-0,087	0,998	7,795	0,047
The number of people per 1 working person in market services	3,674	-0,274	-0,014	4,720	-0,763	0,024	-0,645	-0,821	-0,497	-0,777	-0,388
The participation of (people) working in retail in the overall number of (people) working in market services (%)	1,370	-0,419	0,561	-2,393	0,387	0,128	-0,153	-0,154	-1,210	1,304	0,140

only appears in three peripheral geodesic areas located in Ruda, Łaskowice and Żabieniec areas. In there, one can notice a profound relative domination of people working in public sector of market services, and this domination is convergent with privilege of the section of operating real estate and firms.

At the same time we face a relative shortage of people working in trade and repairs section, as well as other market services. The relatively high level of accessibility of the whole sphere of market services should be emphasized. Among the assumed diagnostic features, the variables (8) have a great in number advantage, which shows insufficient, in relation to the conditions in the whole city, development of market services.

Type 6- quite a big density of people working in market services and their complex branch structure, which is connected with exceptionally high domination of small firms. This type is on the second position after type 2 in respect of spatial range; it appears in 63 geodesic areas. They are located mainly in the central zone or in its near surrounding, in the better developed areas. All the normalised typological features got, in this case, values similar to the average in the whole city. The division of the people working according to the section is highly differentiated. However, there is not too high relative domination of people working in the section which is grouping the remaining municipal, social and individual services. In trade and repairs people working only in retail and crafts institutions have an above average participation. This type is specific to densely-populated areas, thus the general potential and the density of people working in market services outnumber the citywide level. The number of people working per 1 market service firm, in turn, shows an especially high relative advantage of small service institutions. It is also worth mentioning that the underdeveloped sections of market services include, in this case, trade and repairs along with transportation and communication.

Type 7- exceptionally high participation of people working in transportation and communication, with a relative domination of people working in the public sector. Not many geodesic areas (10) belong to this type. They are scattered in the peripheral and intermediate zone, in the areas of quite low housing intensity. Taking into consideration working people, according to the section, the key position- in comparison to the situation citywide- take transportation and communication. At the same time, the privileged group are the employees of the public sector and the ones, who represent relatively big service firms. It is accompanied by underdevelopment of people working in trade and crafts, as well as operating real estates and firms. The relatively high accessibility of the whole zone of market services is its advantage, but it is mainly connected with a very low density of population.

Type 8- exceptionally high potential and high density of market services, as well as a relative domination of financial mediation …. This type is represented by only 1 geodesic area, which constitutes a citywide trade service centre. Its main attributes are very high potential and high density of people working in market services, as well as strong specialisation in the field of financial mediation. This,

accompanied by relatively high accessibility of market services, which can be measured by number of people per 1 working person in this field of economy. At the same time, one can notice underdevelopment of trade and repairs section, especially the retail one. It should be also stressed that majority of typological features, (7), take values for this type which considerably outnumber the average level in the whole city, and in this way they stress the exceptionally high position of the sphere of market services.

Type 9- very high participation of people working in hotels and restaurants with a relative domination of big firms. It plays a slight part in the urban area because of a low service potential, and the fact that it appears only in 2 geodesic areas, which are located in the peripheral areas of Łagiewniki and Sikawa. Due to a low density of population in these areas, the level of accessibility of market services turned out to be relatively high. An especially characteristic feature of the discussed type is the exceptionally high participation of people working in hotels and restaurants. The participation of people working in the section of the remaining market services outnumbers the citywide level only slightly. The above- average values of the marker of the size of market service firms and the participation of people working in firms in the public sector are also a characteristic phenomenon. What is more, quite a strong underdevelopment- in the citywide sphere – of the category of people working in trade and repairs, retail and crafts, and operating real estates and firms is noticeable.

Type 10- relatively high participation of people working in the section of the remaining market services, with a relative domination of the public sector. It is an isolated type, which is ascribed to only 1 geodesic area located near Łódź Kaliska railway station. Within the borders of this area, there is the biggest Łódź park of Marszałek Józef Piłsudski. The exceptionally high participation of people working in the section of the remaining market services is worth being stressed here. The main factor in this case has been the location of the amusement park in the area of the discussed park. The next specific feature of the analysed type is also the relative domination of people working in the public sector. Because of a low density of population, in the group of poorly developed sections of market services- due to the participation of working people in relation to the citywide level – the first position takes trade and crafts, with a relatively high participation of retail and repairs. Operating real estates and firms is also an underdeveloped activity. The overall market services, at the same time, are characterised by the accessibility which outnumber the average in the whole city.

Type 11- strong relative domination of people working in financial mediation, which is connected with very high density of people working in market services. In this case we have to deal with the type which appears mainly in the central and southern part of the central zone, (9 geodesic areas). Above all, it is distinguished by quite a strong domination of people working in financial mediation, and to a little less scale, operating real estates and firms. The high density of people working in market services is accompanied by high accessibility of these services. What is also noticeable, is the above- average participation of

people working in the public sector. From the structure of people working according to the sections point of view, trade and repairs belong to the underdeveloped activities, and are followed by transportation and communication.

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Summary

TYPOLOGIA PRZESTRZENNA USŁUG RYNKOWYCH W ŁODZI

W okresie transformacji gospodarczej intensywny rozwój usług rynkowych w Łodzi, sprzyjał kształtowaniu się ich nowego układu przestrzennego. Układ ten w przypadku większości podstawowych cech rynkowych firm usługowych a także ich pracowników wyróżnia się – w przekroju obrębów geodezyjnych – ogromnym zróżnicowaniem przestrzennym. W związku z tym szczególnego znaczenia nabiera problem syntetycznego ujęcia różnorodnych rozkładów przestrzennych tego typu zmiennych. Jego rozwiązanie umożliwia kompleksowa typologia przestrzenna usług rynkowych.

W zasadniczej części tego opracowania omówiono szczegółowo dobór cech typologicznych usług rynkowych, zastosowaną metodę ich typologii przestrzennej oraz wydzielone typy. Typologię przestrzenną usług rynkowych wewnątrz miasta opracowano w oparciu o dane źródłowe, pochodzące głównie z Krajowego Rejestru Urzędowego Podmiotów Gospodarki Narodowej (REGON), zestawione zasadniczo według stanu w styczniu 2001 roku. Część tych podstawowych danych została jednak później zweryfikowana i uzupełniona w toku badań terenowych. W celu dokładnego zobrazowania wydzielonych typów przestrzennych badanej zbiorowości pracujących w usługach rynkowych na odpowiedniej mapie został wykorzystany szczegółowy podział miasta na 215 obrębów geodezyjnych. Podjęta problematyka typologiczna była pomijaną w dotychczasowych studiach geograficznych nad aktywnością ekonomiczną mieszkańców Łodzi.