the USA, Brazil, Argentina or India. The aspect of ecosystem that guarantees perceiving economy in global structure should also be conducive to establishment of these relations.

It is obvious that it is a long-term process. Its implementation in the context of rapidly changing economy that is based on new technologies that currently are not even perceived as an element that can be the subject of cooperation, cannot be achieved without participation of the countries currently taking the lead in world economy that realistically perceive the global economic structure.

Finally, it ought to be stated that achievement of «small» goals, including those indicated at the beginning of this paper is necessary for social and economic development within the framework of sustained global development. Its frameworks in this structure cannot be currently projected in further perspective that goes beyond decades of the 21st century.

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KNOWLEDGE-INTENSIVE SERVICES IN POST-SOCIALIST CITIES FROM THE PERSPECTIVE OF 20 YEARS OF A FREE MARKET ECONOMY – THE POLISH EXPERIENCE

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KIS are an important underpinning of the knowledge-based economy concept (KBE) that developed in early 1990s after more and more

attention started to be given to knowledge and technology as the drivers of economic growth in highly-developed countries. The increasing complexity of knowledge and technology in these countries gave more significance to relations between firms and other organizations as a vehicle allowing specialist knowledge to be acquired. With the expansion of knowledge-based economy in the highly-developed countries, greater numbers of innovations started to appear in their services sector. However, the primary focus of the early KBE studies was on high-tech industries, which were considered central to the development of innovations and competitiveness [1]. It was not until 1999 that the perception of KIS role in a knowledge-based economy changed markedly. That year, Windrum and Tomlinson published a study on KIS as a factor contributing to economic growth in Japan, Germany, the Netherlands and the UK [1]. The publication increased scientific interest in the meaning of KIS for learning and innovation activity in KBE [14]. Business organisations started to show more interest in KIS, realising that they need them to become more competitive in the global market [15].

Despite all these events, the scientific literature has not formulated an explicit definition of KIS. According to the OECD, the term KISA (knowledge-intensive services activity) refers «to production or integration of services activities, undertaken by firms and public sector actors – in the context of manufacturing or services, in combination with manufactured outputs or as stand-alone services» [2]. KIS utilise knowledge and can be its primary source. They can also be a factor that indirectly enhances production processes in other firms [13] and all types of innovation.

What enables the introduction of innovations is information and communication technologies that accumulate knowledge, facilitate its development by allowing free access to it and participate in the creation of KIS.

Knowledge intensive services in cities. Since the time they were established, great cities have played a special role as the drivers of world's socio-economic development. In the present age of globalisation, «cities become the living environment of increasing numbers of global populations, as well as the place where various human activities concentrate» [11,7]. A close correlation between increasing globalisation and the growing significance of great cities has been noted by researchers, for instance Scott [3]. This relationship is largely based on the dynamic growth of firms operating in large cities [8], which create international networks and partnerships (joint ventures, co-production). Firms located

in cities, particularly the providers of KIS, amplify the global impacts of the cities and attract new firms, thus bringing about a multiplier effect.

For the development of cities and regions, it is extremely important that new, highly innovative providers of KIS are established in their areas and that the existing ones are successful. The reason why KIS firms have expanded in number in recent years and concentrate in large cities [10] is that they are useful for a whole range of urban clients, including business clients and financial clients, as well as consumers in the public and private sectors. A KIS firm providing consultancy services can help various firms in strengthening and streamlining their innovation development processes. According to P. Wood [10, 995-996], the services can be the main catalyst of innovative technological and organisational changes in other companies, because consultancies can recruit the type of a specialists that the client needs, change methodologies and specialist sources of information and intelligence, offer flexible working hours and periods of employment, and cooperate with the client at the different levels of a project.

Other factors that make cities attractive locations for KIS firms are, according to Weterings [5], the proximity of clients, the availability of high-skilled employees, access to external information and the benefits of knowledge spill overs. The spatial distribution of KIS and their role in cities' economic development have been studied by many authors, mainly with respect to KIBS (knowledge-intensive business services) [9]. The authors have analysed single cities [6; 4], groups of cities [10; 7], as well as metropolitan areas [12; 9].

It is worth noting that compared with the highly developed countries where research on the development, location and significance of services, including KIS, is relatively advanced, other countries have a scarcity of studies providing insights into the evolution and development of the sector.

The classification approach, data and methods. This study analyses KIS firms that in 2010 operated in the largest Polish cities, i.e. in Bialystok, Bydgoszcz, Częstochowa, Gdańsk, Gdynia, Katowice, Kielce, Lublin, Łódź, Poznan, Radom, Sosnowiec, Szczecin, Torun, Warszawa and Wrocław. The cities are populated by a total of almost 8 million people (around 21% of Poland's population). Excluding Radom, Częstochowa and Sosnowiec, all the other cities in the sample are regional capitals.

KIS statistics, selected data on entrepreneurial activity in the cities and the determinants of KIS development were obtained from the Local

Data Bank of the Polish Central Statistical Office (GUS). The numbers of tertiary education institutions were established from their websites and the official websites of the sampled cities; the shares of people with tertiary education in the city population were taken from the National Census of Population of 2011.

KIS firms analysed in this study were recorded in the REGON system (the National Official Business Register) kept by the GUS. The system holds data on business activities carried on by corporate persons, non-corporate persons, natural persons, etc.

To find out which cities have higher-than-average concentrations of KIS firms, a location quotient (LQ) and an establishment rate of KIS firms are calculated. LQ is a ratio between the share of an economic sector in the regional economy and in the national economy. Its formula is the following:

$$LQ = (X_k / X) / (Y_k / Y),$$

where X_k- the number of sector's firms in the region,
X – the number of all sectors' firms in the region,
Y_k – the number of sector's firms in the reference area,
Y – the number of all sectors' firms in the reference area.

Depending on its value, the LQ can be interpreted as follows:

1) LQ > 1 – higher concentration of sector's firms in the region than in the reference area;

2) LQ = 1 – equal concentrations of sector's firms in the region and in the reference area;

3) LQ < 1 – lower concentration of sector's firms in the region than in the reference area.

An area with LQ >1,25 is usually assumed to have a regional specialisation in the sector. In this study, the establishment rate of KIS firms is understood as their number per 10,000 population. The impact of the selected socio-economic factors determining the establishment of KIS firms in the largest Polish cities is determined from the Pearson's linear correlation coefficient. The levels of the cities' economic development and of KIS establishment are illustrated with a system of XY coordinates. The first factor is shown graphically by linear ordering of cities along a line formed by the arithmetic means of normalised data on characteristics such as unemployment rate, workers in the services sector as a share of total employment, the number of firms in the REGON database per 10,000 population, the numbers of firms recorded in REGON sections J

and K per 10,000 population, per-capita revenues of the municipalities; firms' gross fixed assets per capita and their investment outlays per capita.

Further, to determine the numbers of KIS providers by selected city, the cities are divided into three groups according to their populations: 200,000–299,000, 300,000–499,000, and 500,000–1,000,000. Warsaw with a population of 1.7 million people is considered separately.

Research outcomes. According to the research results, the 17 largest Polish cities accounted in 2010 for 273,441 KIS firms (35,2% of 775,863 KIS firms in the REGON database). Of the four types of KIS firms (HTKIS, KIFS, KIMS and OKIS; tab. 1), the concentration of HTKIS providers in the largest cities was the highest in relation to the whole country (50,9% of their total number in Poland). Somewhat smaller concentrations were calculated for KIFS (37,2%), KIMS (35,4%), and OKIS (31,7%).

The concentrations of KIS firms in large Polish cities in relation to the whole country were determined from location quotients (LQ) calculated for all KIS firms and by KIS category. The LQ values showed that 13 out of 17 largest cities in Poland had higher concentrations of KIS firms than the rest of the country. The only cities to have regional specialisation in KIS were Wrocław and Gdańsk (LQs of 1,32 and 1,30, respectively). In the other cities, the LQ values ranged between 1,00 and 1,25, with the exception of Częstochowa, Kielce, Radom and Sosnowiec, where they were below 1,0. Seven cities (Gdańsk, Gdynia, Katowice, Krakow, Poznan, Warsaw and Wrocław) were found to have regional specialisation in HTKIS (LQ > 1,25). In Bialystok, Bydgoszcz, Lublin, Łódź, Szczecin and Torun, the LQ values for the HTKIS firms ranged between 1.0 and 1,25 (see fig. 1).

As regards the KIMS firms, the highest values of the location quotient were calculated for Szczecin (1,40), Wrocław (1,65) and Gdańsk (1,73). In the next five cities they ranged from 1,0 to 1,25 (Warsaw (1,14), Krakow (1,15), Katowice (1,22), Gdynia (1,22), and Torun (1,07)). In the remaining seven cities they were below 1,00. Five cities were shown to have regional specialisation in KIFS (Sosnowiec (1,35), Lublin (1,30), Bydgoszcz (1,40), Torun (1,37), and Gdynia (1,37). In the other twelve cities, LQ values for KIFS were higher than 1,00 but lower than 1,25, pointing to greater concentrations of KIFS in all large cities than in the country.In the case of OKIS, only three cities had LQ values above 1,25 (Bydgoszcz (1,26), Lublin (1.37) and Bialystok (1,32)); in the next 11 cities they ranged from 1,25 to 1,00, and in the

last three they were below 1.00 (Warsaw (0,87), Sosnowiec (0,88), and Radom (0,93)).

The research revealed that five cities had regional specialization in more than one type of KIS. These were Lublin and Bydgoszcz (KIFS + OKIS), Wrocław and Gdańsk (HTKIS + KIMS) and Gdynia (HTKIS + KIFS). The next eight cities specialised in only one category of KIS: Warsaw, Krakow, Katowice, Poznan (HTKIS), Szczecin (KIMS), Sosnowiec and Torun (KIFS) and Bialystok (OKIS). In the last four cities – Częstochowa, Kielce, Łódź and Radom – the LQ values calculated for particular categories of KIS were below 1,25.

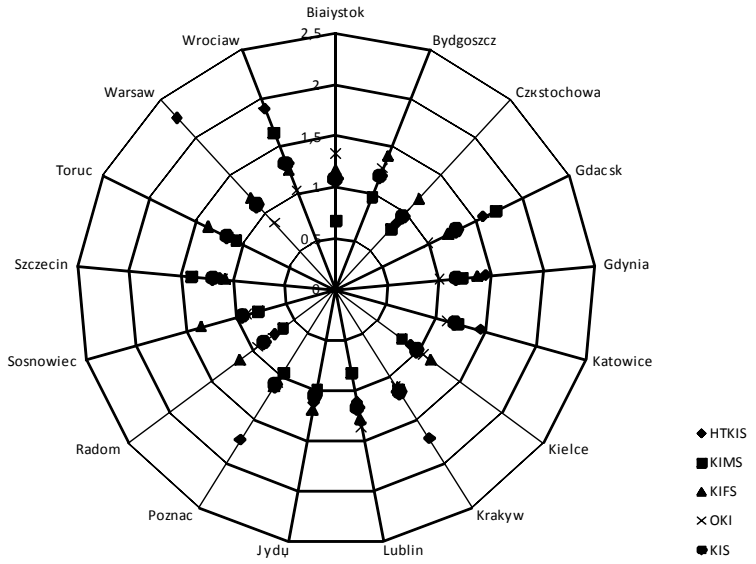

Fig. 1. **LQ values for KIS firms based in the largest cities in Poland**

Note: HTKIS – high-tech KIS; KIMS – knowledge-intensive market services; KIFS – knowledge-intensive financial services; OKI – other knowledge-based services; KIS – knowledge intensive services

Source: developed by the author based on the Local Data Bank (GUS) data.

An analysis of factors likely to encourage a person to establish a KIS firm showed a marked influence of the level of individual entrepreneurship (expressed through the establishment rate of KIS). This correlation was found to be the highest for HTKIS and KIFS firms – see tab. 1.

Table 1

Coefficients of correlation between the establishment of KIS firms and selected socio-economic indicators for the largest cities in Poland

	Establishment rate				
	KIS	**HTKIS**	**KIMS**	**KIFS**	**OKIS**
Total establishment rate	0,935	0,943	0,816	0,924	0,812
City size	0,651	0,836	0,528	0,704	0,488
Human capital	0,736	0,916	0,547	0,696	0,770
No. of tertiary education institutions	0,687	0,817	0,514	0,684	0,501
Level of economic development	0,916	0,973	0,781	0,921	0,783

Source: developed by the author based on the Local Data Bank (GUS) data, data from the websites of cities and tertiary education institutions, and from the National Census of Population, 2011.

One of the most important factors in the establishment of KIS firms is city size. In the case of the largest Polish cities, the correlation between the two characteristics was relatively strong (the strongest for HTKIS (q = 0,836).

The availability of human capital also has a significant effect on the establishment of KIS firms. In order to determine how human capital quality relates to KIS firms, the numbers of KIS firms were juxtaposed with the numbers of people with tertiary education among all city residents. The resulting correlations showed a strong link between this group of residents and the establishment of HTKIS firms. KIS firms need colleges and universities to develop. However, in large Polish cities, the correlation between the establishment of KIS firms and the numbers of the institutions was moderately strong (see tab. 1). The correlation was the highest for HTKIS. As regards the KIMS firms, the highest values of the location quotient were calculated for Szczecin (1.40), Wrocław (1,65) and Gdańsk (1,73). In the next five cities they ranged from 1.0 to 1.25 (Warsaw (1,14), Krakow (1,15), Katowice (1,22), Gdynia (1,22), and Torun (1,07)). In the remaining seven cities they were below 1,00. Five cities were shown to have regional specialisation in KIFS (Sosnowiec (1,35), Lublin (1,30), Bydgoszcz (1,40), Torun (1,37), and Gdynia (1,37). In the other twelve cities, LQ values for KIFS were higher than 1.00 but lower than 1,25, pointing to greater concentrations of KIFS in all large cities than in the country.In the case of OKIS, only three cities had LQ values above 1,25 (Bydgoszcz (1,26), Lublin (1,37) and Bialystok (1,32)); in the

next 11 cities they ranged from 1,25 to 1,00, and in the last three they were below 1,00 (Warsaw (0.87), Sosnowiec (0,88), and Radom (0,93)).

According to the KBE concept, in cities that have more KIS firms the rates of economic development are also higher. The research showed that in the largest Polish cities this relationship is substantial.

When the establishment rates of KIS firms and economic development are compared on a city-by-city basis, two smaller cities with populations below 400,000 (Gdynia and Katowice) are found to have the indicators at levels that are relatively similar to those calculated for larger cities. In contrast, in Łódź populated by over 700,000 people the indicators' values are close to those obtained for Torun and Kielce that are smaller than Łódź. After the establishment rates of KIS firms and the levels of economic development were juxtaposed, the cities formed three groups. Group 1 consisted of only one city, Warsaw, that had the highest values of both indicators (671,0 and 1,6), surpassing all other cities in the sample. In group 2, the first indicator ranged from 495,6 and 619,1 and the second oscillated around 1.0. This group consisted of Gdańsk, Gdynia, Katowice, Krakow, Poznan, Szczecin, and Wrocław. With the exception of Gdynia and Katowice populated, respectively, by 247,300 and 306,800 people, all other cities in the group have populations in excess of 400,000. In group 3 with the remaining nine cities (Bialystok, Bydgoszcz, Częstochowa, Kielce, Lublin, Łódź, Radom Sosnowiec, Torun), the establishment rate of KIS firms was between 276,2 and 425,4, and the rate of economic development was below 1,0. All the cities, except for Łódź, have populations of less than 400,000.

As regards the structure of KIS firms by service type (HTKIS, KIMS, KIFS, and OKIS), the share of the HTKIS providers was found to increase with city size. The smallest shares of KIMS firms were found for cities populated by 200,000–300,000 people; in the other cities they accounted for around 30,0%.

The shares of the KIFS firms were even smaller. In cities with populations ranging from 200,000 to 300,000, these firms accounted for an average of slightly more than 20,0% of all KIS providers. In the other cities, their average rate did not exceed 17,8%.

The greatest shares were established for the providers of OKIS. In the smallest cities (200,000–300,000), they constituted an average of almost 50,0% of all KIS firms. Interestingly, their proportion decreased as the city size increased.

Conclusions. The research has showed that only 13 of the 17 largest Polish cities have relatively higher concentrations of KIS firms than the rest of the country.

The correlation between the establishment rates of KIS firms and the city size is not high. Large cities have more providers of KIS, but their number does not automatically increase with city size. A definitely stronger correlation between the establishment of KIS firms and city size has been determined for HTKIS. It is interesting to note that the largest cities account for 1/3 of all KIS firms in Poland and for over half of HTKIS firms.

An analysis of KIS providers in the largest Polish cities by their type (HTKIS, KIFS, KIMS and OKIS) has showed that most of them are in the HTKIS business. The establishment rate of HTKIS firms is significantly correlated with city size, showing also the strongest correlation with the general level of economic development in the city and the quality of human capital among all four categories of KIS firms.

The main factor underlying the establishment of all KIS firms in the largest Polish cities is individual entrepreneurship. This implies that measures stimulating and supporting any type of business activity directly contribute to the establishment of KIS.

The proportion of people with tertiary education in the total city population (a determinant of human capital quality) quite clearly contributes to the establishment of KIS firms that need employees with the best qualifications and appropriate education to develop. Higher concentrations of KIS firms in the largest cities are related to the availability of adequately large numbers of competent employees. This relationship is also confirmed to some extent by the correlation between tertiary education institutions and KIS firms.

The main conclusion arising from the research is that the main type of KIS firms concentrating in large cities is the providers of HTKIS. The rate of their establishment shows the strongest correlation with the indicators of cities' economic development and human capital quality. In other words, in the 20 years from the collapse of the communist system in Poland the structure of the KIS sector has been changing in line with the main trends occurring in the world economy and KIS firms show a tendency to locate in the largest cities.

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