



Geographia Polonica
2015, Volume 88, Issue 1, pp. 123-141
<http://dx.doi.org/10.7163/GPol.0009>



INSTITUTE OF GEOGRAPHY AND SPATIAL ORGANIZATION
POLISH ACADEMY OF SCIENCES
www.igipz.pan.pl

www.geographiapolonica.pl

SETTLEMENT CONCENTRATION OF ECONOMIC POTENTIAL REPRESENTED BY IT CORPORATIONS

Wioletta Kilar

Pedagogical University of Krakow
Department of Entrepreneurship and Spatial Management
Podchorążych 2, 30-084 Krakow: Poland
e-mail: W.Kilar@up.krakow.pl

Abstract

The paper attempts to discuss research on spatial variation in the distribution of the headquarters of 100 leading IT corporations by city in the years 2003-2011. The research shows that the global space offers powerful opportunities for differentiating the headquarters of leading IT corporations. This is emphasised by the number of headquarters per city and their spatial concentration. Predominantly, they can be found in six areas: the Japanese-Korean area, eastern China, the West Coast of the USA, the East Coast of the USA, the central part of the USA, and north-western Europe. Tokyo, Kyoto, Hsinchu, Paris, Santa Clara, San Jose, Sunnyvale and Taipei offer the best conditions for locating headquarters of IT corporations and house the highest number of headquarters.

Key words

IT corporation • economic potential • settlement concentration

Introduction

The differentiation of spatial and economic space in cities, as well as their importance in the global economic system and the differentiation of their function, together with the place they occupy in the spatial organisational network of corporations, influence the degree of business concentration, including the locations of headquarters of international corporations. This stems from the fact that, in the spatial system, depending

on regional conditions, the intensity of globalisation processes varies. In turn, these processes trigger polarisation processes, which result in the differentiation of areas and impact on the growing civilisation and the economic and social distance between them, while increasing barriers to information and knowledge resources. The importance of large international industrial corporations grows continuously. These corporations pursue their own development policies with the aim to enhance their competitive position

through R&D, the launch of new products, market domination, and the flow of information, products, technologies, etc. In consequence, many economic policy-related decisions, which used to be the state domain, are now made outside state borders. International holdings follow their own logic, which nowadays would be difficult to link to the business interest of any state or region. As a result, state authorities change their position on the economic policy and their policy of influencing these companies (Zioła 2001: 29-30; Kilar 2009a,b).

We assume after Śleszyński (2002b: 89-90) that "(...) the choice made on the location of enterprise headquarters, apart from its logistic aspects, is very important for the prestige of such enterprises. The concentration of headquarters creates management space, which is an important component and factor in the development of city centres. This is why it is so significant to analyse the location of enterprises in order to determine where the borders of central areas are".

Owing to the fact that, in the market economy, the location of corporate headquarters is very important, the following roles are generally distinguished, which result from having the headquarters (head offices) in a given location:

- an economic role, which is the most complex and largely involves differing levels of participation in generating local GDP and paying taxes, depending on the ownership of external branches, subbranches, etc. It is assumed that the location of the headquarters is, first and foremost, dependent on the type of business: the more advanced the economic sector, the more the location of the headquarters is connected with higher degrees of administrative hierarchy, typically combined with a large number of external branches. The economic role also involves a growing share in investment projects and a multiplier effect which, in this case, is represented by the trend to concentrate business in the region of impact of the headquarters of large enterprises (including

financial, legal and logistic services, business consulting, etc.);

- a social role involving business-related aspects (the impact on the unemployment rate, attracting highly qualified staff) and a role involving image creation by increasing the prestige of a location (city) and region;
- a political role – it is often that representatives of the business sector become involved in the work of the local authorities; in consequence, the business/enterprise may have a real impact on the local administration and management of the region (Śleszyński 2002a,b).

Theoretical background

The issue of locating headquarters of large corporations in countries with a well-grounded market economy history and their organisation can be found in literature in this field, chiefly in economic geography and economics.

Many studies focus particularly on the issue of relocating corporate headquarters (Borchert 1978; Rees 1978; Kamp 2007), in particular on spatial changes in this area (Semple 1973; Burns 1977; Dicken 1977; Aung 2001; Kim 2006), including locating enterprises within cities and metropolises and their regionalisation (Pred 1977; Taylor & Thrift 1981; Semple & Phipps 1982; Wheeler 1986; Wheeler 1991; Hino 1995; Takahashi 2001; Holloway & Klier 2006; Beugelsdijk 2007; Drucker 2011; Wall 2011; Ó hUallacháin 2012). Furthermore, research also covers analysing the location of management headquarters in highly developed countries (Westaway 1974; Sheppard et al. 1990; Hino 1995; Kilar 2014a,b), as well as analysing differentiation in technologically advanced branches of industry (Zeller 2000; Karimi & Hammad 2004; Liu & Yang 2011), and other issues related to the location of enterprises (Evans 1973; Hayter & Watts 1984; Wheeler & Park 1984; McCann 2002; Browen & Leinbach 2006; Aoyama & Ratick 2007; Arauzo-Carod & Manjón-Antolín 2007; Stutz & Warf 2007; Kilar 2014c).

The research shows that relocation interpreted as movement of capital and business (goods and services), in whole or in part, domestically and internationally (Gierańczyk 2008) may be permanent or ephemeral and take the form of delocation and outsourcing. Note that relocation is a part of a more complex and continuous process of structural changes at the global scale. For international corporations, it is often a part of their business strategy and growth in various spatial scales.

Publications point out that "(...) the location of headquarters is chiefly related to large agglomerations because of access to administration, offices and institutions, easy communication with the world (transport, ICT), access to specialist services (law firms, banks, business consulting, etc.), as well as management staff available for hire. The location of a company's headquarters and its actual area of operation do not always overlap. This is particularly important in the case of enterprises with an extended network of branches and sub-branches. Such networks are typical of financial sector enterprises (banking, insurance) and of service and commercial sector enterprises and, to a slightly smaller extent, to production/manufacturing enterprises" (Śleszyński 2002b).

Nowadays, areas related to developing the information economy and information society are of particular importance when deciding on the location of corporate headquarters. Strykiewicz (2009: 21-22) claims that "(...) development of the information sector is followed by changes in traditional factors important for choosing the location of a business, changes in regional development paths, and changes in regional and location-related policy". This sector occupies a prominent position in the process of developing the creative knowledge sector – business with extensive knowledge absorption.

Apart from traditional factors, the process of locating IT corporations (both their headquarters and branches) is influenced by factors specific to high-tech sectors, i.e. accessibility typical for the outskirts of large

cities and agglomerations, in particular those located in the vicinity of traffic intersections (motorways and railway lines) and airports; the ICT infrastructure which hitherto disqualified many countries and regions due to their gaps in ICT infrastructure; access to huge resources of highly-skilled employees; free flow of knowledge and its correlation with the R&D efforts of both private and state centres and entities; an innovative environment, e.g. special economic zones or business incubators; and clusters of (local, regional) businesses with a strong specialisation and extensive application of some advanced technologies, i.e. location-based defined as a specialisation of resources and skills, as well as specialised organisational units of a corporation typical for the global business.

Subject and aim of the research: Methodology applied

Further to the above-presented premises, research focuses on leading global IT corporations.

The aim of this paper is to present the spatial diversification of headquarters of leading IT corporations and indicate the areas of their highest concentration. Further to the above, the degree of economic potential concentration and settlement concentration of the analysed corporations in the areas of their headquarter locations will be presented, accompanied by changes in this area occurring in the years 2003 to 2011.

The research covered 100 leading IT corporations selected from 2,000 of the largest global corporations. To determine changes in the economic potential of the 100 leading IT companies and corporations selected for empirical analysis, a number of reports published by the corporations and international institutions were used. These reports, in turn, had been based on annual reports published by corporations. In particular, *The Global 2000* reports published by Forbes were the source of the following information: market value, sales, assets, profits, type of business and location of the company's headquarters. Data acquired from these reports was

revised and supplemented on the basis of financial reports published by the analysed corporations. Due to the availability of comparable data on the leading IT corporations, the analysis covers the years from 2003 to 2011, i.e. the period of their most intense growth and changes brought about by technological progress and changing global conditions, for example during the global economic crisis.

Due to the research topic discussed in this paper, which is the location of the analysed corporations, the exact locations of their headquarters indicated in their corporate documents were analysed, i.e. specific cities and locations (not metropolitan areas). It was the author's intention to avoid presenting their general geographic distribution by metropolitan areas, which is often the case in literature in the field when discussing corporations operating in other business sectors, as not all corporate headquarters are located in such areas. Such approach would lead to marking the dominant metropolitan areas; however, it would blur the analysed picture. As IT corporations are advanced technology enterprises and, as already mentioned, factors determining their location differ slightly from the factors determining the location of companies having traditional business profiles, in some cases corporate headquarters are located outside urbanised areas. Typically, other corporations and enterprises of smaller size and similar business profile are located in the area in addition to favourable natural environment conditions, which is of particular importance for such companies.

Empirical results

Between 2003 and 2011, the number of cities housing the headquarters of the analysed IT corporations ranged from 60 in 2008 to 65 in 2004. US cities dominated the statistics with 54 locations, i.e. 58.1% of all management headquarters. Cities in Japan (7 cities – 7.5% of the total) and Taiwan (5 cities – 5.4% of the total) were homes to fewer global holdings and their headquarters.

In 2003, the highest number of IT corporation headquarters was located in Tokyo, with 14 headquarters, followed by Kyoto and San Jose (5 headquarters each), Hsinchu and Santa Clara (4 headquarters each) (Tab. 1, 2; Fig. 1). In total, these 5 cities hosted 32.0% of all headquarters of IT sector corporations. Two to three corporations had headquarters in Taipei, Sunnyvale, Paris, Redwood City, Osaka, Mountain View, Milpitas, Dallas and Cupertino, totalling 21.0% of the total, while 47 cities were headquarters of one corporation.

The concentration of the analysed corporations in these cities had an impact on the concentration of their sales and asset value. Sales ranged from USD 2.2 billion in Norwalk to USD 333.9 billion in Tokyo, representing from 0.2% to 25.2% of total sales, respectively, while the value of assets ranged from USD 2.2 billion in Seattle to USD 326.8 billion in Tokyo, corresponding to a share of 0.1% to 2.1%.

Such spatial structure of IT corporation headquarters did not translate into the concentration of their profits in the cities. The highest profit was generated by the corporation based in Redmond (Microsoft), amounting to USD 8.9 billion, while the highest losses of USD -5.4 billion were generated by corporations having headquarters in Paris. Furthermore, Redmond reported the highest market value of USD 287 billion, corresponding to 10.8% of the total and the lowest market value in Santa Ana, of USD 2.5 billion, i.e. 0.1% of the share.

The years 2003 to 2011 saw some changes in the spatial concentration of IT corporation headquarters. The year 2011 continued with the leading position of Tokyo, demonstrating the highest concentration of IT corporations, with 14 of the discussed corporations present (Tab. 3; Fig. 2). Two to 4 corporations were headquartered in Paris, San Jose, Hsinchu, Kyoto, Santa Clara, Seoul, Sunnyvale, Taipei, Bangalore, Cupertino, Mountain View, Osaka, Palo Alto, Shenzhen and Taoyuan. In total, 40.0% of all corporations were located in these 15 cities, while 46 cities housed the headquarters of one corporation each.

The above-presented spatial distribution of corporations affected the concentration of their economic potential. In 2011, in terms of sales and asset value, corporations headquartered in Tokyo dominated, totalling USD 539.1 billion in sales, i.e. 20.4% of the sales value and USD 615.3 billion, i.e. 21.5% of assets. A corporation based in Beijing (Baidu), with 0.1% of sales and USD 3.7 billion, i.e. 0.1% of assets, presented the lowest value.

On the other hand, financial results of corporations ranged from USD -1.5 billion in loss in Espoo to USD 33.8 billion in Cupertino, and the market value ranged from USD 3.8 billion to USD 559.3 billion, representing 0.1% to 14.9% of the total.

The above analysis indicates that headquarters of leading corporations tend to concentrate in cities in the USA, Japan and Taiwan, i.e. in developed countries. Note that the importance of European cities, e.g. French cities, is rather low, indicating the marginalisation of this part of the world when it comes to creating favourable conditions for setting up and growing modern corporations of such type. On the other hand, the importance of countries characterised by rapid economic growth is increasing, to name only China or India. In such countries, 'technopolis', i.e. areas with a high concentration of technologically advanced companies, hitherto known only from the developed countries, are being created. As it is, countries demonstrating concentrations of headquarters of dominant IT corporations offer the most favourable conditions for their location, in particular because of the environment supporting the creation of new knowledge and technology, and the development of those that already exist. Other factors affecting the concentration of headquarters of the analysed corporations chiefly in the USA, Japan and Taiwan, include: significant employment in the R&D business in these states, access to a large pool of highly qualified personnel, and the socio-economic development of these countries. In addition, other factors that influenced the location of corporate headquarters in these three countries included:

a well-developed ICT infrastructure, access by different means of transport, an innovative environment (possibly including special economic zones or enterprise incubators), development of sector-specialised clusters of companies operating with the broad employment of specific advanced technology, e.g. microelectronics.

In 2003, in the global space, the analysed corporations were concentrated in several areas (Tab. 2, Fig. 1):

- the western part of the USA, with 28 corporate headquarters;
- Japan and Korea, with 26 headquarters;
- the eastern part of the USA, with 17 corporate headquarters;
- north-western Europe, with 10 corporate seats;
- the central part of the USA, with 9 corporate headquarters;
- eastern China, with 8 headquarters of analysed corporations.

The year 2003 saw the domination of corporations headquartered in Japan and Korea in terms of sales value, totalling USD 517.8 billion in sales, i.e. 39.1% of the total sales; while corporations active in the eastern China area, with no more than USD 28.1 billion, i.e. 2.1% of the total sales, were of least significance. The highest profits were generated by corporations headquartered in the western USA (USD 19.1 billion of profit), while corporations in north-western Europe showed the poorest performance (USD -1.6 billion in loss). In terms of asset and sales value, corporations headquartered in Japan and Korea dominated with USD 537.7 billion, i.e. 34.7% of the total), while corporations from eastern China reported the lowest share (USD 36.9 billion, i.e. 2.4% of the total). The highest market value was reported by corporations from the West Coast of the USA (1,182.5, i.e. 44.5% of the total), while corporations from eastern China had the lowest value (USD 94.7 billion, i.e. 3.6% of the total).

Over the subsequent years, insignificant concentration trends emerged with new concentration poles attracting the headquarters of leading IT corporations.

Table 1. Differentiation of the spatial concentration of IT corporations by the number of corporations per city, 2003-2011

Number of corporations per city	Number of corporations	Sales [billion USD]	Profit/loss [billion USD]	Asset value [billion USD]	Market value [billion USD]	Number of corporations	Sales [billion USD]	Profit/loss [billion USD]	Asset value [billion USD]	Market value [billion USD]	Number of corporations	Sales [billion USD]	Profit/loss [billion USD]	Asset value [billion USD]	Market value [billion USD]
	2003					2008					2011				
1	47	707.0	36.2	843.6	1448.7	46	1041.85	84.25	1015.32	916.26	46	999.8	110.5	1100.7	1785.5
2	12	113.4	2.6	125.0	251.2	14	224.40	13.28	229.55	323.65	14	520.2	60.3	542.6	1042.4
3	9	49.3	-4.0	58.8	106.4	3	51.70	10.14	82.77	107.75	18	453.1	26.4	399.4	461.1
4	8	61.8	3.6	100.8	336.6	16	267.81	7.29	265.18	180.59	8	126.9	14.7	210.3	218.8
5	10	59.5	6.9	95.4	298.8	5	47.41	5.21	62.63	68.80	0	0.0	0.0	0.0	0.0
>5	14	333.9	1.9	326.8	216.4	16	569.33	16.55	563.88	141.31	14	539.1	10.9	615.3	253.2
Total	100	1324.9	47.1	1550.5	2658.0	100	2202.50	136.70	2219.30	1738.40	100	2639.1	222.8	2868.3	3761.0

Table 2. IT corporate headquarters, concentration by city, 2003

No.	City	Country (code)	Number of corporations	Total sales (value)	Total profit	Total assets	Total market value	Structure				
				[USD billion]				number of corporations	sales value	profit	asset value	market value
1	Abeno-ku	JPN	1	17.0	0.3	16.7	18.2	1.0	1.3	0.6	1.1	0.7
2	Armonk	USA	1	89.1	7.6	104.5	171.5	1.0	6.7	16.1	6.7	6.5
3	Atlanta	USA	1	8.3	1.4	26.3	29.1	1.0	0.6	2.9	1.7	1.1
4	Basking Ridge	USA	1	4.2	0.0	4.1	7.4	1.0	0.3	0.1	0.3	0.3
5	Blue Bell	USA	1	5.9	0.3	5.5	4.8	1.0	0.4	0.6	0.4	0.2
6	Boise	USA	1	3.5	-1.0	7.6	9.6	1.0	0.3	-2.0	0.5	0.4
7	Brookfield	USA	1	2.7	0.3	7.2	7.5	1.0	0.2	0.7	0.5	0.3

8	Corning	USA	1	3.1	-0.2	10.8	16.7	1.0	0.2	-0.5	0.7	0.6
9	Dayton	USA	1	5.6	0.1	5.5	4.3	1.0	0.4	0.1	0.4	0.2
10	Englewood	USA	1	2.5	-1.0	55.9	32.7	1.0	0.2	-2.1	3.6	1.2
11	Espoo	FIN	1	37.1	4.5	29.2	104.3	1.0	2.8	9.6	1.9	3.9
12	Falls Church	USA	1	13.9	0.5	11.1	8.0	1.0	1.0	1.0	0.7	0.3
13	Geneva	CHE	1	8.0	0.3	12.0	24.1	1.0	0.6	0.6	0.8	0.9
14	George Town	CYM	1	6.7	0.7	4.0	7.9	1.0	0.5	1.6	0.3	0.3
15	Hamilton	BMU	1	13.6	0.6	6.7	22.0	1.0	1.0	1.2	0.4	0.8
16	Herts	GBR	1	9.2	0.3	6.5	5.5	1.0	0.7	0.7	0.4	0.2
17	Hopkinton	USA	1	6.2	0.5	14.1	33.5	1.0	0.5	1.1	0.9	1.3
18	Icheon City	KOR	1	4.0	-1.7	9.4	3.3	1.0	0.3	-3.5	0.6	0.1
19	Islandia	USA	1	3.2	-0.2	10.2	15.9	1.0	0.2	-0.3	0.7	0.6
20	Issy les Moulineaux	FRA	1	10.6	0.0	10.2	5.7	1.0	0.8	0.1	0.7	0.2
21	Kansas City	USA	1	2.4	0.2	3.4	5.0	1.0	0.2	0.4	0.2	0.2
22	Kawasaki-shi	JPN	1	6.0	0.1	5.2	5.2	1.0	0.5	0.3	0.3	0.2
23	Moriguchi City	JPN	1	19.2	-0.6	21.7	9.4	1.0	1.5	-1.3	1.4	0.4
24	Murray Hill	USA	1	8.7	-0.2	15.4	18.4	1.0	0.7	-0.4	1.0	0.7
25	Neublberg	DEU	1	7.2	-0.5	11.8	10.7	1.0	0.5	-1.1	0.8	0.4
26	Norwalk	USA	1	15.7	0.4	24.6	12.0	1.0	1.2	0.8	1.6	0.4
27	Norwood	USA	1	2.2	0.4	4.3	18.8	1.0	0.2	0.8	0.3	0.7
28	Palo Alto	USA	1	73.1	2.5	74.7	70.2	1.0	5.5	5.4	4.8	2.6
29	Phoenix	USA	1	9.5	0.0	4.8	3.0	1.0	0.7	0.0	0.3	0.1
30	Plano	USA	1	21.5	-0.3	18.3	10.0	1.0	1.6	-0.6	1.2	0.4
31	Redmond	USA	1	34.3	8.9	85.9	287.0	1.0	2.6	18.9	5.5	10.8
32	Richfield	USA	1	23.1	0.6	10.1	17.4	1.0	1.7	1.2	0.7	0.7
33	Rochester	USA	1	13.3	0.3	14.8	8.3	1.0	1.0	0.6	1.0	0.3
34	Round Rock	USA	1	41.4	2.7	19.3	88.5	1.0	3.1	5.6	1.2	3.3
35	San Diego	USA	1	4.1	0.9	9.0	46.5	1.0	0.3	2.0	0.6	1.7
36	Santa Ana	USA	1	21.7	0.1	4.9	2.5	1.0	1.6	0.2	0.3	0.1
37	Schaumburg	USA	1	27.1	0.9	32.1	40.1	1.0	2.0	1.9	2.1	1.5

No.	City	Country (code)	Number of corporations	Total sales (value)	Total profit	Total assets	Total market value	Structure				
				[USD billion]				number of corporations	sales value	profit	asset value	market value
38	Seattle	USA	1	5.3	0.0	2.2	18.7	1.0	0.4	0.1	0.1	0.7
39	Seoul	KOR	1	50.2	6.0	54.6	72.7	1.0	3.8	12.6	3.5	2.7
40	Singapur	SGP	1	13.8	-0.4	9.5	9.7	1.0	1.0	-0.7	0.6	0.4
41	St. Petersburg	USA	1	5.2	0.1	3.5	5.7	1.0	0.4	0.2	0.2	0.2
42	Stamford	USA	1	4.6	0.5	8.9	9.6	1.0	0.3	1.1	0.6	0.4
43	Stockholm	SWE	1	16.8	-2.2	21.2	44.1	1.0	1.3	-4.7	1.4	1.7
44	Tao Yuan Shien	TWN	1	4.1	0.3	2.9	6.5	1.0	0.3	0.7	0.2	0.2
45	Toronto	CAN	1	10.5	0.4	13.7	34.1	1.0	0.8	0.9	0.9	1.3
46	Walldorf	DEU	1	8.8	1.4	5.6	54.1	1.0	0.7	2.9	0.4	2.0
47	Wayne	USA	1	2.9	0.4	4.0	8.5	1.0	0.2	0.8	0.3	0.3
48	Cupertino	USA	2	8.4	0.5	11.2	21.0	2.0	0.6	1.0	0.7	0.8
49	Dallas	USA	2	13.9	1.7	19.4	60.0	2.0	1.0	3.6	1.2	2.3
50	Milpitas	USA	2	11.7	-3.2	8.8	18.7	2.0	0.9	-6.9	0.6	0.7
51	Mountain View	USA	2	3.5	0.6	8.0	23.6	2.0	0.3	1.3	0.5	0.9
52	Osaka	JPN	2	63.4	0.0	62.5	42.5	2.0	4.8	0.1	4.0	1.6
53	Redwood City	USA	2	12.5	3.0	15.1	85.4	2.0	0.9	6.4	1.0	3.2
54	Paris	FRA	3	28.8	-5.4	34.0	31.9	3.0	2.2	-11.4	2.2	1.2
55	Sunnyvale	USA	3	6.4	0.3	15.6	53.0	3.0	0.5	0.7	1.0	2.0
56	Taipei	TWN	3	14.1	1.0	9.2	21.4	3.0	1.1	2.1	0.6	0.8
57	Hsinchu	TWN	4	9.9	1.3	24.8	66.8	4.0	0.7	2.8	1.6	2.5
58	Santa Clara	USA	4	51.9	2.3	76.0	269.8	4.0	3.9	4.8	4.9	10.2
59	Kyoto	JPN	5	24.1	1.7	40.9	58.1	5.0	1.8	3.7	2.6	2.2
60	San Jose	USA	5	35.4	5.2	54.5	240.7	5.0	2.7	11.0	3.5	9.1
61	Tokyo	JPN	14	333.9	1.9	326.8	216.4	14.0	25.2	4.0	21.1	8.1
Total			100	1324.9	47.1	1550.5	2658.0	100.0	100.0	100.0	100.0	100.0



Figure 1. Spatial concentration of IT corporate headquarters, 2003

Table 3. IT corporate headquarters, concentration by city, 2011

No.	City	Country (code)	Number of corporations	Total sales (value)	Total profit	Total assets	Total market value	Structure				
				[USD billion]				number of corporations	sales value	profit	asset value	market value
1	Abeno-ku	JPN	1	36.4	0.2	33.6	6.7	1.0	1.4	0.1	1.2	0.2
2	Armonk	USA	1	106.9	15.9	116.4	238.7	1.0	4.1	7.1	4.1	6.3
3	Beijing	CHN	1	2.2	1.0	3.7	47.5	1.0	0.1	0.4	0.1	1.3
4	Boston	USA	1	2.4	0.4	12.2	24.9	1.0	0.1	0.2	0.4	0.7
5	Corning	USA	1	7.9	2.8	27.8	21.8	1.0	0.3	1.3	1.0	0.6
6	Dallas	USA	1	13.7	2.2	20.5	37.8	1.0	0.5	1.0	0.7	1.0
7	Dublin	IRL	1	28.5	2.4	15.3	44.2	1.0	1.1	1.1	0.5	1.2
8	Englewood	USA	1	8.6	-0.2	14.2	8.7	1.0	0.3	-0.1	0.5	0.2
9	Espoo	FIN	1	50.1	-1.5	44.6	19.6	1.0	1.9	-0.7	1.6	0.5
10	Geneva	CHE	1	9.0	0.6	10.9	7.5	1.0	0.3	0.3	0.4	0.2
11	George Town	CYM	1	11.6	0.9	9.2	12.0	1.0	0.4	0.4	0.3	0.3
12	Hopkinton	USA	1	20.0	2.5	34.3	59.3	1.0	0.8	1.1	1.2	1.6
13	Icheon City	KOR	1	9.4	-0.1	14.9	17.8	1.0	0.4	0.0	0.5	0.5
14	Irvine	USA	1	7.4	0.9	9.0	20.6	1.0	0.3	0.4	0.3	0.5
15	Islandia	USA	1	4.8	0.9	11.8	13.2	1.0	0.2	0.4	0.4	0.4
16	Kuala Lumpur	MYS	1	5.2	0.7	12.7	14.2	1.0	0.2	0.3	0.4	0.4
17	Lake Forest	USA	1	9.3	0.7	7.8	9.0	1.0	0.4	0.3	0.3	0.2
18	Libertyville	USA	1	13.1	-0.2	9.7	11.9	1.0	0.5	-0.1	0.3	0.3
19	Melville	USA	1	21.4	0.6	9.8	4.6	1.0	0.8	0.3	0.3	0.1
20	Mexico City	MEX	1	3.7	2.1	12.7	21.7	1.0	0.1	0.9	0.4	0.6
21	Milpitas	USA	1	5.7	1.0	10.2	12.2	1.0	0.2	0.4	0.4	0.3
22	Morrisville	USA	1	21.0	-0.7	20.6	9.3	1.0	0.8	-0.3	0.7	0.2
23	Mumbai	IND	1	8.4	2.0	7.3	45.5	1.0	0.3	0.9	0.3	1.2

24	Nanjing	CHN	1	11.4	0.6	6.6	12.5	1.0	0.4	0.3	0.2	0.3
25	Neublberg	DEU	1	5.4	1.5	7.5	10.9	1.0	0.2	0.7	0.3	0.3
26	Norwalk	USA	1	22.6	1.3	30.1	11.1	1.0	0.9	0.6	1.0	0.3
27	Norwood	USA	1	2.9	0.8	5.3	11.8	1.0	0.1	0.4	0.2	0.3
28	Pembroke	BMU	1	14.4	1.2	17.5	15.9	1.0	0.5	0.5	0.6	0.4
29	Phoenix	USA	1	26.7	0.7	10.2	5.2	1.0	1.0	0.3	0.4	0.1
30	Redmond	USA	1	72.1	23.5	112.2	273.5	1.0	2.7	10.5	3.9	7.3
31	Redwood City	USA	1	36.7	9.4	72.9	149.5	1.0	1.4	4.2	2.5	4.0
32	Richfield	USA	1	50.6	1.1	22.7	8.9	1.0	1.9	0.5	0.8	0.2
33	Round Rock	USA	1	62.1	3.5	44.5	30.5	1.0	2.4	1.6	1.6	0.8
34	San Diego	USA	1	16.3	4.5	37.6	110.6	1.0	0.6	2.0	1.3	2.9
35	Santa Ana	USA	1	54.0	12.9	71.1	138.5	1.0	2.0	5.8	2.5	3.7
36	Schaumburg	USA	1	8.2	1.2	13.9	16.1	1.0	0.3	0.5	0.5	0.4
37	Seattle	USA	1	48.1	0.6	25.3	84.2	1.0	1.8	0.3	0.9	2.2
38	Singapur	SGP	1	29.9	0.5	11.5	5.1	1.0	1.1	0.2	0.4	0.1
39	St. Petersburg	USA	1	4.4	0.4	10.0	11.3	1.0	0.2	0.2	0.3	0.3
40	Stockholm	SWE	1	32.9	1.8	39.0	32.4	1.0	1.2	0.8	1.4	0.9
41	Tainan County	TWN	1	16.9	-0.5	24.1	3.8	1.0	0.6	-0.2	0.8	0.1
42	Takasaki	JPN	1	25.9	0.9	11.0	6.0	1.0	1.0	0.4	0.4	0.2
43	Teaneck	USA	1	6.1	0.9	5.5	23.3	1.0	0.2	0.4	0.2	0.6
44	Veldhoven	NLD	1	7.3	1.9	9.4	20.0	1.0	0.3	0.9	0.3	0.5
45	Walldorf	DEU	1	18.4	4.5	29.6	88.1	1.0	0.7	2.0	1.0	2.3
46	Waterloo	CAN	1	19.8	2.2	14.0	7.6	1.0	0.8	1.0	0.5	0.2
47	Bangalore	IND	2	13.2	2.7	15.2	53.6	2.0	0.5	1.2	0.5	1.4
48	Cupertino	USA	2	134.5	33.8	150.9	559.3	2.0	5.1	15.2	5.3	14.9
49	Mountain View	USA	2	54.7	10.1	79.8	208.8	2.0	2.1	4.5	2.8	5.6
50	Osaka	JPN	2	119.8	2.4	113.7	39.5	2.0	4.5	1.1	4.0	1.1
51	Palo Alto	USA	2	128.8	6.6	135.3	93.9	2.0	4.9	3.0	4.7	2.5
52	Shenzhen	CHN	2	15.2	2.1	21.9	61.0	2.0	0.6	0.9	0.8	1.6

No.	City	Country (code)	Number of corporations	Total sales (value)	Total profit	Total assets	Total market value	Structure				
				[USD billion]				number of corporations	sales value	profit	asset value	market value
53	Taoyuan	TWN	2	54.0	2.6	25.8	26.3	2.0	2.0	1.2	0.9	0.7
54	Hsinchu	TWN	3	31.3	3.1	55.0	82.3	3.0	1.2	1.4	1.9	2.2
55	Kyoto	JPN	3	41.2	1.8	41.6	43.9	3.0	1.6	0.8	1.5	1.2
56	Santa Clara	USA	3	20.8	3.2	27.7	50.2	3.0	0.8	1.4	1.0	1.3
57	Seoul	KOR	3	198.8	12.0	178.3	186.5	3.0	7.5	5.4	6.2	5.0
58	Sunnyvale	USA	3	13.2	2.3	31.2	48.2	3.0	0.5	1.0	1.1	1.3
59	Taipei	TWN	3	147.8	4.0	65.6	50.0	3.0	5.6	1.8	2.3	1.3
60	Paris	FRA	4	64.1	2.9	80.4	33.0	4.0	2.4	1.3	2.8	0.9
61	San Jose	USA	4	62.8	11.8	129.9	185.8	4.0	2.4	5.3	4.5	4.9
62	Tokyo	JPN	14	539.1	10.9	615.3	253.2	14.0	20.4	4.9	21.5	6.7
Total			100	2639.1	222.8	2868.3	3761.0	100.0	100.0	100.0	100.0	100.0



Figure 2. Spatial concentration of IT corporate headquarters, 2011

In 2011, the number of headquarters of the IT corporations changed geographically (Tab. 3; Fig. 2):

- 26 corporations analysed above were headquartered in the western part of the USA;
- the Japanese-Korean area reported 25 headquarters;
- 13 headquarters of the analysed corporations were based in eastern China;
- the eastern part of the USA reported 12 corporate headquarters;
- 11 corporate headquarters were located in north-western Europe;
- 5 corporate headquarters were presented in the central part of the USA (Fig. 2).

Concentration areas in central and eastern USA grew weaker as the number of headquarters of leading IT corporations decreased in that area while the eastern Chinese area has grown in importance, with an increased number of headquarters of the analysed corporations.

In terms of sales and asset value, in 2011, Japan and Korea remained the most important area in terms of the highest concentration of headquarters, with 36.8% and 35.2% of the total value of these indicators, respectively. In terms of profit and market value, the western part of the USA dominated with 54.7% of the total value of profit and 52.1% of the total market value. The central area of the USA demonstrated the lowest importance in terms of the analysed indicators, below 6% per each indicator in their total value. As mentioned, the role of eastern China grew in importance, with its share increasing by 8.5% in sales, 4.7% in assets and 3.9% in market value.

The literature in the field, characterised in the introduction to this paper, discusses the areas with the largest number of IT corporation headquarters and their economic potential, and describes them as areas demonstrating the highest technological advancement, concentration and specialisation of the located state-of-the-art business operations in the form of science, technology, science and technology parks, scientific and industrial parks or industrial centres, scientific centres and technopolia.

In general terms, these areas fully overlap the areas of the most advanced technology concentration, specified in the literature.

According to Wilczyński (2007: 59), this stage in development has been referred to by Nałkowski as 'The Pacific Phase'. "The political and economic centre of the world has been gradually shifting from the area we may refer to as the Atlantic Region, towards the Pacific Region under consolidation".

Changes have resulted in different concentration trends as regards corporate headquarters and different trends in their business potential in each city. This is manifested by changes in the settlement concentration coefficient¹ for IT corporate headquarters. In the years 2003-2011, the settlement concentration indicator for specific features fluctuated from 0.282 to 0.868 (Tab. 4). The profit, decreasing from 0.868 to 0.507, reported the highest settlement concentration. Similar and stable values of indicators were calculated for sales, asset value and market value, and ranged from 0.453 to 0.479.

Table 4. The settlement concentration coefficient for IT corporations, 2003-2011 – fluctuations

Year	Sales value	Profit/loss	Asset value	Market value
2003	0.460	0.868	0.453	0.470
2008	0.478	0.603	0.465	0.478
2011	0.464	0.507	0.463	0.479

The high degree in the differentiation of the economic potential of corporate headquarters in the IT sector is emphasised by very high values of the variability indicator for specific features. They range from 294.8% for profits and loss generated by corporations, to 107.8% for the number of corporations (Tab. 5).

¹ (k_o) settlement concentration coefficient calculated as follows:

$$k_o = \frac{1}{200} \sum_{i=1} |m_i - p_i|$$

Where:

m_i – share of a given city in the set;

p_i – the value of the potential of a given feature – its share in a city from the total value of the set.

Table 5. Variation coefficient for leading IT corporations by selected features – fluctuations, 2003-2011

Year	Number of corporate headquarters	Sales value	Profit value	Asset value	Market value
2003	114.7	204.5	280.6	177.6	147.0
2004	107.8	203.2	156.8	185.2	137.3
2005	128.8	203.0	156.7	192.6	132.9
2006	129.3	196.5	140.9	184.7	135.9
2007	128.8	188.5	150.1	185.2	132.0
2008	126.3	206.9	178.0	202.1	128.3
2009	120.5	191.4	294.8	185.6	128.4
2010	112.1	200.6	161.1	199.6	140.3
2011	110.8	177.6	165.0	181.0	151.7

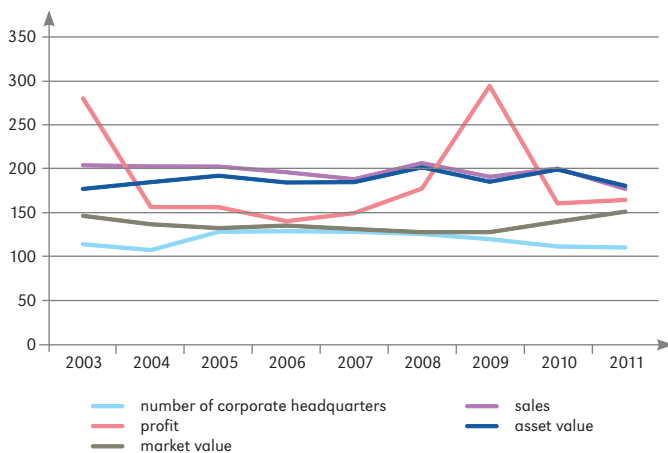
Corporate headquarters in cities are diversified to the lowest extent by their number, as illustrated by the lowest variability coefficient ranging from 107.8% to 129.3% (Fig. 3). A trend reducing the share to 110.8% in 2011 was observed since 2006.

Sales and asset value were characterised by major changes in the analysed period and both demonstrate similar changes in these years, and their respective coefficient ranged from 177.6% to 206.9% (Fig. 3).

Cities analysed in this paper display similar variability in terms of profits, as illustrated by the coefficient ranging from 140.0% in 2006 to 294.8% in 2009. The global economic crisis

clearly affected the analysed period, resulting in significant changes in the coefficient. In terms of the market value, cities reported very different trends. The years 2003-2008 saw a drop in the market value to 128.3% signifying a reduced interest in investment in IT corporations in the wake of the approaching crisis. From 2009, the value of the coefficient grew, indicating a larger variation of the market in investing into corporations in the cities.

The above coefficient largely differentiated IT corporate headquarters in cities. To the highest degree, they are differentiated by sales and, to the lowest degree, by the number of headquarters per city.

**Figure 3.** The variation coefficient of selected features of IT corporation potential – fluctuations, 2003-2011

The above-presented analysis of the settlement concentration coefficient and variability coefficient emphasises a different degree of the variation in the potential of different cities. In light of the above, it is interesting to learn how the values of specific features are related. This is illustrated by correlation coefficients.

Cities where headquarters of the analysed IT corporations are based differ in terms of the advancement of the relations between specific values of the feature. In the analysed period, the highest degree of correlation was

demonstrated by sales and the value of assets, ranging from 0.964 in 2003 to 0.985 in 2008 (Tab. 6; Fig. 4). Similar trends in behaviours and values were characteristic for relations between the value of profits and the value of assets, and the value of sales and the value of profits. In the years 2003 to 2008, the value of the coefficient grew from 0.361 to 0.631 and from 0.285 to 0.614, respectively. The crisis had a very strong impact on weakening these relations; in consequence, the correlation coefficient dropped to -0.207 and -0.280

Table 6. Fluctuations of the coefficient defining the correlation between selected features of the economic potential in IT corporations, 2003-2011

No.	Dependence of features		Correlation coefficient								
			2003	2004	2005	2006	2007	2008	2009	2010	2011
1	sales value	profit value	0.285	0.409	0.548	0.565	0.563	0.614	-0.280	0.410	0.450
2	sales value	asset value	0.964	0.978	0.978	0.974	0.977	0.985	0.971	0.969	0.969
3	sales value	market value	0.549	0.530	0.673	0.704	0.686	0.560	0.577	0.586	0.529
4	profit value	asset value	0.361	0.471	0.592	0.610	0.588	0.631	-0.207	0.443	0.505
5	profit value	market value	0.708	0.912	0.895	0.887	0.914	0.825	0.491	0.841	0.961
6	asset value	market value	0.663	0.607	0.732	0.767	0.732	0.619	0.671	0.669	0.588



Figure 4. The variation coefficient of selected features of IT corporation potential – fluctuations, 2003-2011

to bounce back to the pre-crisis trend in 2010 and 2011. Consequently, the correlation coefficient jumped to 0.505 and 0.450.

The years 2003-2011 saw a moderate correlation (a significant statistical dependence) between sales and profit, sales and market value, and profit and asset value (Fig. 4). A high correlation between asset and market value has been reported. A very high correlation (very high statistical dependence) was reported between profits and the market value. Full statistical dependence is characteristic for the correlation of sales and asset value.

Conclusions

In light of the above-presented analysis, we may assume that headquarters of IT corporations are centred in cities within the territory of the USA, Japan and Taiwan. However, it's important to note that the global space demonstrates powerful opportunities for differentiating headquarters of leading IT corporations.

This is emphasised by the number of headquarters per city and their spatial concentration. The best conditions for locating the headquarters of IT corporations are offered by: Tokyo, Kyoto, Hsinchu, Paris, Santa Clara, San Jose, Sunnyvale and Taipei – their number is the largest in these cities while typically, the majority of large cities host only one IT corporation headquarters. In consequence, individual cities as seats of corporations demonstrate differentiated economic potential.

Cities occupied by the headquarters of IT corporations mainly cover six areas: Japan and Korea, eastern China, the West Coast of the USA, the East Coast of the USA, the central part of the USA, and north-western Europe.

References

- AOYAMA Y., RATICK S.J., 2007. *Trust, transactions, and Information Technologies in the U.S. logistics industry*. *Economic Geography*, vol. 83, no. 2, pp. 159-180.
- ARAUZO-CAROD J.M., MANJÓN-ANTOLÍN M.C., 2007. *Entrepreneurship, industrial location and*

It is fair to assume that the headquarters of IT corporations and their economic potential should be approached as one of the basic criteria determining the degree of advancement towards forming an information society. Areas with the largest number of IT corporation headquarters are characterised by the concentration and specialisation of the located state-of-the-art business operations in the form of science, technology and science and technology parks, scientific and industrial parks or industrial centres, scientific centres and technopolia.

Confirmation of the developing process involving the concentration of IT corporate headquarters and, consequently, the concentration of their financial performance, are values of the settlement concentration indicator for headquarters of IT corporations and differentiation of their variability ratio.

In light of the above, it is re-emphasised that the location of IT corporate headquarters is largely dependent on location-related factors, which also apply to other technologically advanced sectors, i.e. access to a large pool of highly qualified staff, extensive employment in the R&D sector, socio-economic development of the areas, developed ICT infrastructure, accessibility, environment supporting the creation of new knowledge and technologies (e.g. special economic zones or business incubators), metropolitan areas or areas of specialised business clusters using specific types of advanced technologies.

Editors note:

Unless otherwise stated, the sources of tables and figures are the author's on the basis of their own research.

economic growth. New Horizons in Regional Science, Cheltenham-Northampton: Edward Elgar.

- AUNG K., 2001. *Decentralization of production and the formation of technology regions: A case study of the Koriyama Technopolis*. *Geographical Review of Japan*, ser. B, vol. 74, no. 2, pp. 199-211.

- BEUGELSDIJK S., 2007. *The regional environment and a firm's innovative performance: A plea for a multilevel interactionist approach*. *Economic Geography*, vol. 83, no. 2, pp. 181-199.
- BORCHERT J.R., 1978. *Major control points in American economic geography*. *Annals of the Association of American Geographers*, vol. 68, no. 2, pp. 214-232.
- BROWNEN J.T., LEINBACH T.R., 2006. *Competitive advantage in global production networks: Air freight services and the electronics industry in Southeast Asia*. *Economic Geography*, vol. 82, no. 2, pp. 147-166.
- BURNS L.S., 1977. *The location of the headquarters of industrial companies: A comment*. *Urban Studies*, vol. 14, no. 2, pp. 211-214.
- DICKEN P., 1977. *A note of location theory and the large business enterprise*. *Area*, vol. 9, no. 2, pp. 138-143.
- DLUHOSCH B., 2000. *Industrial location and economic integration: Centrifugal and centripetal forces in the new Europe*. Cheltenham-Northampton: Edward Elgar.
- DRUCKER J., 2011. *Regional industrial structure concentration in the United States: Trends and implications*. *Economic Geography*, vol. 87, no. 4, pp. 421-452.
- EVANS A.W., 1973. *The location of the headquarters of industrial companies*. *Urban Studies*, vol. 10, no. 3, pp. 387-395.
- GIERAŃCZYK W., 2008. *Problematyka definiowania zmian w tendencjach lokalizacyjnych przedsiębiorstw przemysłowych w dobie globalizacji*. *Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego*, 11, pp. 86-96.
- HAYTER R., WATTS H.D., 1984. *The geography of enterprise: A reappraisal*. *Progress in Human Geography*, vol. 7, no. 2, pp. 157-181.
- HINO M., 1995. *The agglomeration of branch offices and their recent changes in major Japanese cities*. *Annals of the Association of Economic Geographers. The Japan Association of Economic Geographers*, vol. 41, no. 3, pp. 192-207.
- HOLLOWAY S.R., WHEELER J.O., 1991. *Corporate headquarters relocation and changes in metropolitan corporate dominance, 1980-1987*. *Economic Geography*, vol. 67, no. 1, pp. 54-74.
- KAMP B., 2007. *Location behaviour and relationship stability in international business networks: Evidence from the automotive industry*. Routledge Studies in Business Organizations and Networks, London-New York: Routledge.
- KARIMI H.A., HAMMAD A., 2004. *Telegeoinformatics: Location-based computing and services*. Boca Raton: CRC Press.
- KILAR W., 2009a. *Koncentracja przestrzenna światowych firm informatycznych*. *Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego*, 12, pp. 97-108.
- KILAR W., 2009b. *Zróżnicowanie potencjału ekonomicznego światowych korporacji informatycznych*. *Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego*, 13, pp. 110-121.
- KILAR W., 2014a. *Spatial concentration of IT corporation headquarters*. *Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego*, 25, pp. 56-80.
- KILAR W., 2014b. *Differentiation of Visegrad Group international corporations in comparison to world's largest corporations* [in:] D. Kiendl-Wendner, K. Wach (eds.), *International competitiveness in Visegrad Countries: Macro and micro perspectives*. Graz: Fachhochschule Joanneum, pp. 171-186.
- KILAR W., 2014c. *Problematyka lokalizacji korporacji ponadnarodowych (ze szczególnym uwzględnieniem korporacji informatycznych)*. *Zeszyty Naukowe Podkarpackiej Szkoły Wyższej w Jaśle*, 11, pp. 163-185.
- KIM S.J., 2006. *Networks, scale, and transnational corporations: The case of the South Korean seed industry*. *Economic Geography*, vol. 82, no. 3, pp. 317-338.
- KLIER T.H., 2006. *Where the headquarters are: Location patterns of large public companies, 1990-2000*. *Economic Development Quarterly*, vol. 20, no. 2, pp. 117-128.
- LIU Y., YANG Z., 2011. *Location, localization and localizability: Location-awareness technology for wireless networks*. New York: Springer Science, Business Media.
- MCCANN P., 2002. *Industrial location economics*. Cheltenham-Northampton: Edward Elgar.
- Ó HUALACHÁIN B., 2012. *Inventive megaregions of the United States: Technological composition and location*. *Economic Geography*, vol. 88, no. 2, pp. 165-195.
- PRED A., 1977. *City-systems in advanced economies. Past growth, present processes and future*

- development options. London: Hutchinson University Library.
- REES J., 1978. *Manufacturing headquarters in a postindustrial context*. *Economic Geography*, vol. 54, no. 4, pp. 337-354.
- SEMPLER R.K., 1973. *Recent trends in the spatial concentrations of corporate headquarters, 1955-1974*. *Economic Geography*, vol. 49, pp. 309-318.
- SEMPLER R.K., PHIPPS A.G., 1982. *The spatial evolution of corporate headquarters within an urban systems*. *Urban Geography*, vol. 3, no. 3, pp. 258-279.
- SHEPPARD E., MAIER G., TÖDTLING F., 1990. *The geography of organizational control: Austria 1973-1981*. *Economic Geography*, vol. 66, no. 1, pp. 1-21.
- STRYJAKIEWICZ T., 2009. *Lokalizacja firm i zachowania przestrzenne pracowników sektora informatycznego (na przykładzie poznańskiego obszaru metropolitalnego)*. *Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego*, 13, pp. 21-33.
- STUTZ F.P., WARF B., 2007. *The world economy: Resources, location, trade and development*. Upper Saddle River: Pearson.
- ŚLESZYŃSKI P., 2002a. *Struktura i rozmieszczenie ośrodków zarządzania w polskiej gospodarce w 2000 r.* *Przegląd Geograficzny*, vol. 65, no. 2, pp. 199-228.
- ŚLESZYŃSKI P., 2002b. *Struktura i koncentracja przestrzenna siedzib ważniejszych przedsiębiorstw w Warszawie w 1999 roku*. *Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego*, 4, pp. 89-114.
- TAKAHASHI S., 2001. *Location factors of Japanese - Affiliated companies in the High Plains, the United States of America*. *Geographical Review of Japan*, ser. B, vol. 74, no. 2, pp. 212-222.
- TAYLOR M.J., THRIFT N., 1981. *Spatial variations in Australian enterprise: The case of large firms headquartered in Melbourne and Sydney*. *Environment and Planning A*, vol. 13, no. 2, pp. 137-146.
- WALL R.S., 2011. *Sectoral differentiation and network structure within contemporary worldwide corporate networks*. *Economic Geography*, vol. 87, no. 3, pp. 267-308.
- WESTAWAY J., 1974. *The spatial hierarchy of business organizations and its implications for the British urban systems*. *Regional Studies*, vol. 8, no. 2, pp. 145-155.
- WHEELER J.O., 1986. *Corporate spatial links with financial institutions: The role of metropolitan hierarchy*. *Annals of the Association of American Geographers*, vol. 76, no. 2, pp. 262-274.
- WHEELER J.O., PARK S.O., 1984. *External ownership and control: the impact of industrial organization on the regional economy*. *Geoforum*, vol. 15, no. 2, pp. 243-252.
- WILCZYŃSKI W., 2007. *Uwagi na temat przemian współczesnego świata w świetle koncepcji geograficznego biegu dziejów i jedności geografii* [in:] W. Maik, K. Rembowska, A. Suliborski (eds.), *Podstawowe idee i koncepcje w geografii*, vol. 3, Bydgoszcz: Wyższa Szkoła Gospodarki, pp. 55-69.
- ZELLER CH. 2000. *Rescaling power relations between trade unions and corporate management in aglobalising pharmaceutical industry: The case of the acquisition of Boehringer Mannheim by Hoffman-La Roche*. *Environment and Planning A*, vol. 32, no. 9, pp. 1545-1567.
- ZIOŁO Z., 2001. *Struktura branżowa i koncentracja przestrzenna wiodących światowych firm przemysłowych*. *Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego*, 3, pp. 29-41.

