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Poland's Voivodeships and Poviats and the Geographies of Knowledge: Addressing Uneven Human Resources

Abstract: In a postindustrial economic world, information economies are key components in local, regional and national development. These are service economies, built on the production, consumption and dissemination of information, including education, health care, outsourcing, tourism, sustainability and related human welfare services. We explore the geography/knowledge intersections in Poland's voivodeships and poviats by using the volumes of information or hyperlinks about selected information economies. Google hyperlinks are electronic knowledge data that can be mapped to highlight the areas of most and least information about certain subject categories. While some mapping results are expected, such as Warsaw and Krakow, being prominent, in other regions there are unexpected gaps within eastern, northern and southern Poland, including some places near major metropolitan centers. There is a significant difference between the cities with poviat rights, which stand out in the number of information on items comparing to the poviats that surround them. The majority of poviats in Mazowieckie voivodeship are surprisingly recognized as core areas on the map of knowledge, nevertheless they are considered undeveloped from the economic point of view.

Keywords: Google hyperlinks; human welfare; knowledge economies; knowledge gaps

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INTRODUCTION

This paper focuses on the geography of information and knowledge, an emerging theme in disciplinary and interdisciplinary research (Livingston, 2010). Before proceeding with our methodology and analysis, we wish to make five key points that are essential in understanding the focus. First, the economic, social and political world is increasingly being defined as “a world of information” or an “information world”. This is a world in which information as a good or product is considered a more important ingredient in an economy than studying agricultural land use patterns, extractive economies or the location of manufacturing plants. Second, it is not only information that is produced and consumed, but also information that is disseminated, that is, how is

it spread. Third, these “information worlds” include topics that were not considered a part of the economic geography research agenda thirty years ago: health care, banking, tourism, education, security, research and development and sustainability. These are “knowledge worlds” and information worlds. Fourth, the information world is associated with some very distinctive features; these include worlds that are fluid, dynamic, fast-changing, networked, global and transboundary. It is a cyberspace world where distance, direction, place and territory have different meanings than in a two or three-dimensional world. Nowadays, the Internet is the fastest and the most accessible source of information. We can add the Google Search Engine and maps, iPhones and other social media. Moreover, knowledge is transmitted mainly in electronic forms in a time-space compressed world (Brzozowski, 2013). Fifth, and a major objective of this paper, is seeking and exploring meaningful ways to map these “information worlds” for use in local, regional and national development. That is, we are thinking of ways to “map” the knowledge or information about a subject or topic. The maps in this study reveal the unevenness in information provided and available, that is, it reveals a surface with “hills and valleys” or “gaps” that may be small or huge, over both short or long distances.

Polish geographers among others are recognizing the importance of the emerging knowledge-based economy (Zioło and Rachwał, 2013). The access to information is being recognized as an important factor in achieving competitive advantage by companies, regions and states (Olechnicka, 2000). In our investigation we ask two central questions about these emerging “information worlds” vis-à-vis Poland. First, how might we map these information or knowledge worlds in some meaningful ways? Second, how can we interpret what these maps show? We maintain that mapping any subject or topic, in this case some feature of the existing and emerging information economy is crucial to understanding both regional and national development, but also in implementing sound and rational planning. Making “place” decisions for cities or regions or some other scale without maps and without understanding what the maps tell us may lead to decision makers at any scale (local or national) making poor, wrong and unwise decisions. Maps, in our thinking, are information sources themselves, just like photographs, tables and text which are already in many reports, documents and recommendations. Maps are different from tables and written text in that they are “visible” information sources that both inform us about “where something is,” but also are useful in making wise decisions about “where is something or might be or should be” in poviats or voivodeship.

CONCEPTUAL FRAMEWORK

There are many ways geographers, planners and regional developers can measure the importance of a specific “information” category or subject such as education, health care, security, unemployment, economic development, sustainability and tourism. These might include a look at the percentage of youth graduating from high school, public expenditures for health care for children and elderly, investments in transportation and communication, housing subsidies for those with low incomes, small business startups, renewable energy initiatives and the volume of developing tourist infrastructures. The allocation or dispersal of money and human resources are also “information” topics that are useful in making policy decisions at any scale, a village, city, poviats or

voivodeship. Aside from these data collected by government sources and included in official reports, one might also use the number of books in a library, conference presentations, book chapters and journal articles about specific topics of interest to those making policies and those affected by policies. More often than not, these are data that appear in tables and graphs in government and economic policy reports, not maps which are scrutinized for patterns of “unexpected unevenness” that exists.

We submit that the Google Search Engine, a generic database with electronic data entries for many different sources (books, chapters, reports, citizen reports, maps and photos) would be a better source than the number of library books, government reports or scholarly articles on a specific subject. Google is most useful if we wish to include a wide array of different sources, not on a single source. We believe the entries in the generic Google database would probably be a more complete and accurate data source than another source. Using Google as a source is not without some reservations as admittedly there may be mixed entries of quality and possibly some duplicate references. The same reservations would apply in using the volumes of library holdings, the number of journal citations and number of government reports.

A number of scholars have used the generic Google Search Engine and the more scholarly database, Google Scholar, to measure the importance of world cities, financial markets, sustainability, international development and our knowledge about EU member countries and cities (see Brunn 2003, 2011, 2014, 2015; Brunn and Dodge 2001; Brunn et al. 2010, 2016; Devriendt et al. 2009, 2011; Williams and Brunn 2004).

METHODOLOGY

Our overriding purpose was to prepare some maps on various “information topics and categories” for Poland’s voivodeships and poviats to discern if there were any major regional or national differences in the amount of information available included in the Google Search Engine at the different scales. The methodology is fairly straightforward. We entered into an Excel spread sheet the following: the rows were the names of each of the 16 voivodeships and the 380 poviats. The columns were the volume or number of hyperlinks for 8 specific subject categories; they were economic development, health care, research and development, outsourcing, education, sustainable development, tourism, elderly people. The number of hyperlinks for the particular searches was the measured value for each voivodeship and poviat. For example, we entered Mazowieckie Voivodeship + Health Care, Wielkopolskie Voivodeship + Tourism, Małopolskie Voivodeship + Outsourcing, etc. Examples of poviats are Bielski Poviat + Health Care, Prudnicki Poviat + tourism, Krakowski Poviat + Outsourcing, etc. These data provided us the volume of information in the Google Search Engine about each topic for each voivodeship and also each poviat. We had 16 data entries for the voivodeship and 380 entries for the poviats in the country. Data in Polish were collected using the Google Search Engine from 12 to 16 November 2015.

With these entries we then created maps for every individual category for all poviats and general maps for voivodeships and poviats, which collect information from all categories. A computer program ranked the data, that is, from the most to fewest

hyperlinks for each of the eight subject categories. The data were then organized in quintiles, the first fifth of the voivodeships being the first quintile, that is those with the most hyperlinks, the second fifth the second quintile, etc. For the poviats, the same: the first 76 poviats being the first quintile (those with the most hyperlinks), poviats ranked 77–153 the second quintile, etc. The fifth quintiles for each data set were those voivodeships and poviats with the lowest values or fewest hyperlinks. The quintile maps were based on where an individual voivodeship or poviats ranked in the eight data categories.

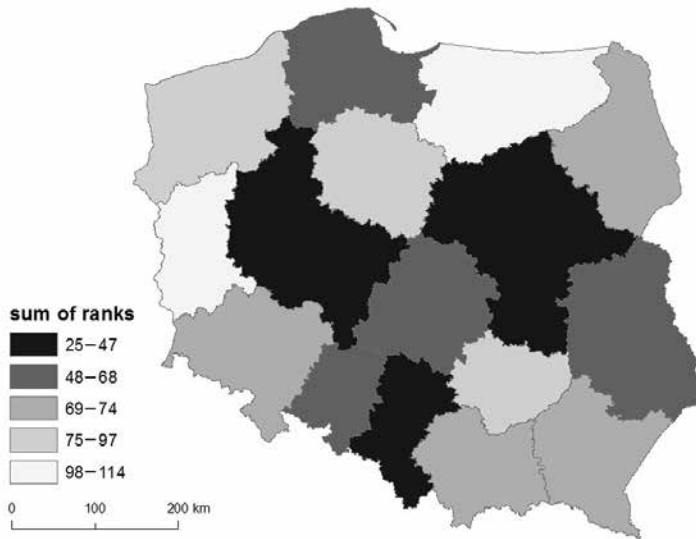
We prepared two general maps of the 16 voivodeships and 380 poviats. Each provided information collected from all eight categories, 8 maps for the poviats show the distribution of specific topics/categories and a summing up map presenting core, semi-periphery and periphery areas. Mapping the data revealed major differences in the volume of hyperlinks not only for a specific topic within the voivodeships and poviats, but also variations within a specific category, such as tourism, outsourcing and health care. Not all maps we prepared are discussed in this paper, only a representative sample. Others are available per request from the authors. We describe and discuss below examples in the two spatial units: poviats and voivodeships. We selected topics or themes where there were some major differences and also some unexpected differences in the regional patterns. Summary maps are also included. The maps fairly speak for themselves in that they reveal the different levels of information available about the subject categories. And, not unexpectedly, there are some regional and national variations in the patterns themselves, some which are described in the following section.

ANALYSIS

Before discussing examples of specific “information” topics and categories, it is important to make one point clear. First, as we embarked on this task, we did not know what we would find out in the raw data we gathered or in the maps that were generated. Second, we expected there would be some surprises based on the maps, but we did not know beforehand what might be some of the unexpected results. It merits repeating that we are mapping “information” about a topic, not the number of people who visit a tourist site, not the number of companies doing outsourcing, not the number of people with a higher education degree and not the number who visit a hospital. We are collecting information about these subjects (that is, references to tourism, to education, to health care, etc.) We are examining and identifying categories (quintiles) and mapping results from a huge electronic database that will include, as noted above, many, many references about a given topic. The more hyperlinks, the more electronic data entries in Google and the more important that topic is in a specific voivodeship or poviat. The smaller number of hyperlinks, the smaller volume of electronic data entries.

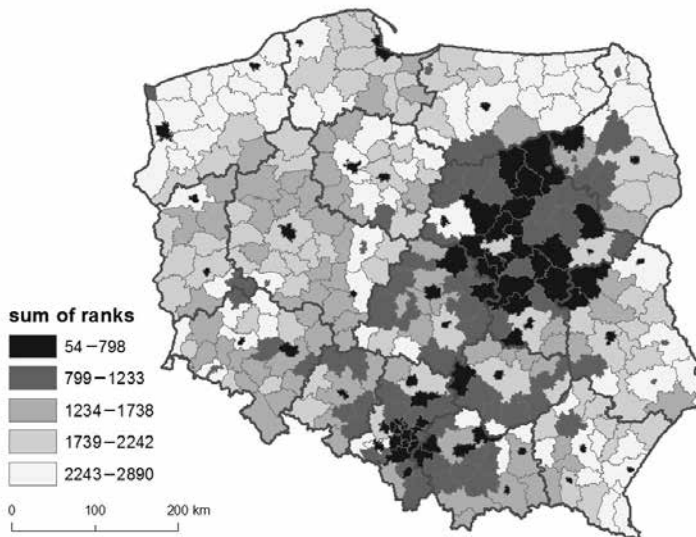
The categories with the largest volume of “information hyperlinks” for the voivodeships were tourism, education and research and development. The voivodeships with the largest total volume of hyperlinks were Mazowieckie (19 721 950), Śląskie (10 224 520) and Wielkopolskie (7 545 430). The fewest hyperlinks were for Warmińsko-Mazurskie (4 825 470), Świętokrzyskie (4 668 990) and Lubuskie (4 585 030). This classification is not completely unexpected if we compare it with the number of inhabitants

Fig. 1. Spatial variation in the number of searches of the selected 8 terms (in Polish) using Google Search Engine (November 2015)



Source: own elaboration on the basis of Google Search Engine data

Fig. 2. Spatial variation in the number of searches of the selected 8 terms (in Polish) using Google Search Engine (November 2015)



Source: own elaboration on the basis of Google Search Engine data

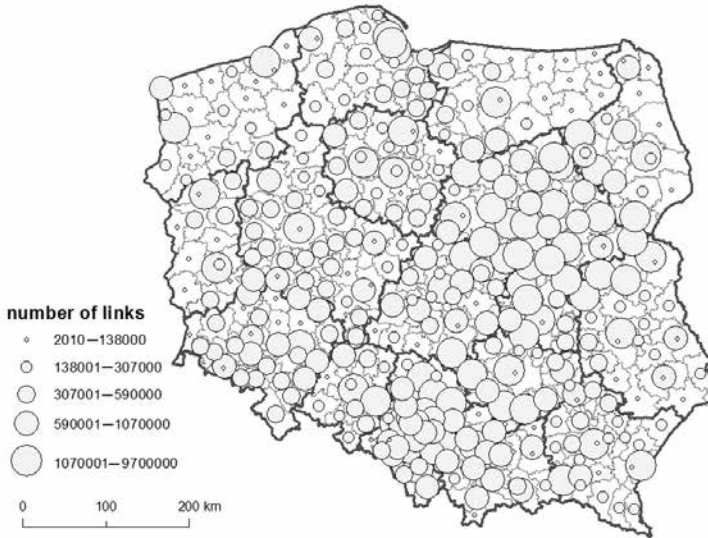
who live in particular voivodeships. The first map provides a general overview of the spatial differentiation of the amount of information in Poland's regions and can legitimately be treated as a background to the following more detailed analysis (Figure 1).

The categories with the largest volume of hyperlinks for the poviats were tourism, education and public health. The total number of hyperlinks in these three categories respectively were 805 083 100, 37 651 200, 67 364 330. The poviats with the largest total volume of information were in Mazowieckie voivodeship's powiat grójecki (1 470 000) and miński (1380000), in Łódzkie voivodeship's powiat łowicki (1 410 000) and cities Warszawa (9 700 000), Krakow (4 100 000) and Łódź (3 980 000). The fewest hyperlinks were for powiats dąbrowski (Małopolskie 2 010), pączężański (Łódzkie 3 410) and brzozowski (Podkarpackie 4 710). In general, we observe that the largest number of hyperlinks are in cities with powiat rights. They significantly stand out from the surrounding areas, as can be seen on the following map. It also shows that the division of Poland into poviats provides a different set of results compared to the voivodeships division. It also shows some gaps, which were not discernible on the first map. For example, there are some powiats in the southern part of Wielkopolskie voivodeship and in the western part of Mazowieckie voivodeship which can be characterized as having a very low levels of information about the topics studied (Figure 2).

When we analyzed the poviats, we discovered that mapping these results yielded some similar results. For Education, the volume of hyperlinks were on the highest level for those poviats located in the Mazowieckie and Śląskie voivodeships. The map of spatial differentiation of the number of information about education shows concentration of information in the central regions of Poland and a significantly lower amount of information in the peripheral poviats located in the farthest western, northern and eastern parts of Poland (Figure 3). The map of information about outsourcing revealed some unexpected results. It shows that in Mazowieckie, Upper and Lower Silesia voivodeships there is a great deal of information about this kind of activity. The job opportunities in Outsourcing, which occurs in their major cities like Warszawa, Katowice, Wrocław and Krakow, contribute to the spread of information throughout the whole region. Surprisingly, in other parts of Poland, especially in Wielkopolskie and Pomorskie voivodeships, with their biggest cities and simultaneously outsourcing centers like Poznań and Gdańsk, the information focuses only in the cities; that is, its impact does not spread throughout the whole region. Perhaps there are fewer outsourcing companies, or maybe they are not as popular as in the aforementioned regions. Information about outsourcing is very important, especially for young people who search for their first jobs after finishing their studies. However, it must be emphasized that the location of outsourcing companies location is limited to Poland's biggest cities (Figure 4).

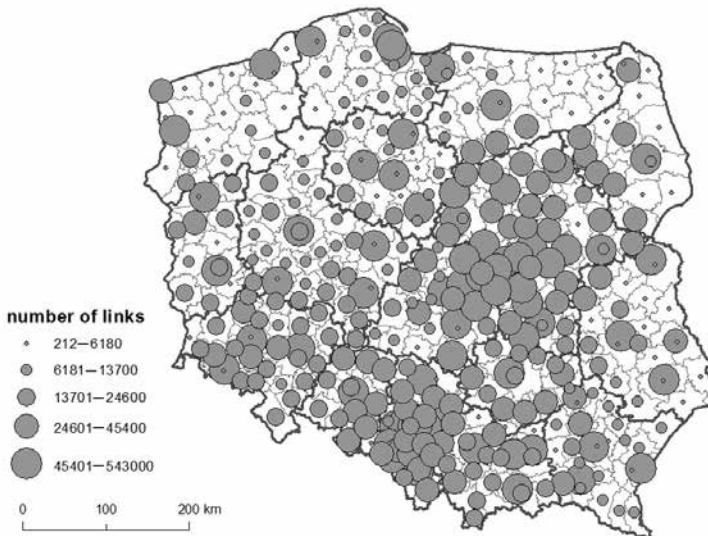
The collected data provided us a useful dataset to analyze the number of hyperlinks in particular regions of Poland. Besides the detailed maps that show the spatial differentiation of information about the specific topics, we also wished to create a map that would synthesize our findings. Our objective in this effort was to designate the core, semi-periphery and periphery areas in Poland with regard to the amount of information available in the Google Search Engine. We created a map by dividing the ranks of poviats into three groups. The rank was created on the basis of number of hyperlinks in all of the examined categories. Those poviats at the highest positions in the rank were

Fig. 3. „Education”. Number of Hyperlinks, Google Search Engine (November 2015)



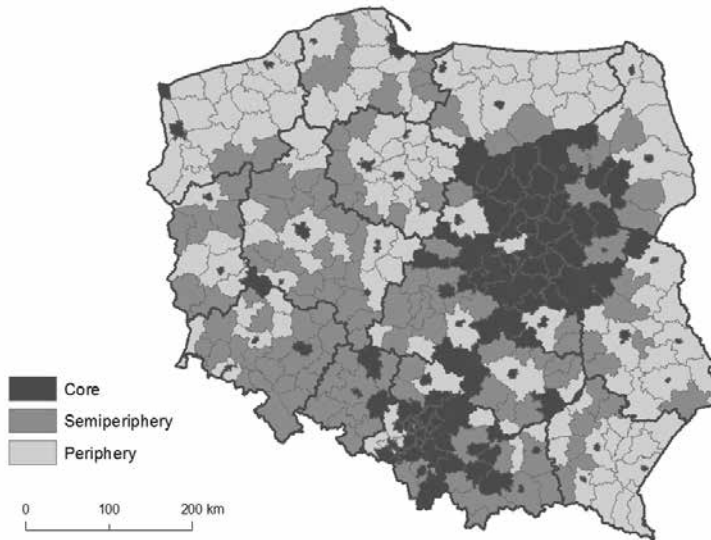
Source: own elaboration on the basis of Google Search Engine data

Fig. 4. „Outsourcing”. Number of Hyperlinks, Google Search Engine (November 2015)



Source: own elaboration on the basis of Google Search Engine data

Fig. 5. Spatial Variation of core, semiperiphery and areas delimited on the basis of the volume of information



Source: own elaboration on the basis of Google Search Engine data

designated as the core areas and the poviats that were at the lowest positions were designated as the periphery areas (figure 5).

It should be pointed out that between the Mazowieckie voivodeship and the Silesian region there is a belt of poviats for which the amount of information for each term/category we used is the largest. It seems that concentration of poviats with a great amount of information in this “belt” allows us to designate the core area of Poland there (Figure 5). Also we can see that for cities with poviats rights the volume of hyperlinks for each category is outstanding, for example, in Szczecin, Wrocław, and Poznań. Moreover, the smallest numbers in all searched categories were in the northern (poviats in Zachodnio-Pomorskie, Warmińsko-Mazurskie voivodeships) and eastern parts of the Poland (poviats in Lubelskie and Podkarpackie voivodeships). These areas can be considered as peripheral regions in respect of the volume of information. It is surprising that the majority of poviats located in Mazowieckie voivodeship are recognized as the core areas whereas in the economic analysis they are considered as rather undeveloped regions. The economic dominance of the capital city of Warsaw is not apparent in the regional scale. However, maybe its influence is the strongest in the surrounding poviats.

SUMMARY AND FUTURE DIRECTIONS

What we learned from this approach to understanding information economies and mapping information volumes about certain topics are several important findings that should aid those planning human welfare services (health, education, etc.), those

promoting tourism and recreation opportunities and those involved in regional economic development initiatives. The methodology and maps could and should be used by planning policies at regional and national levels throughout the country.

These “information or knowledge maps” clearly identify some major differences or “gaps” within the country. Perhaps some of those “gaps” were known beforehand and others emerged in the maps prepared for this article. The maps clearly illustrate that there are examples of cities and capitals or district centers of voivodeships that are performing very well on the measures or variables we studied. Examples include Krakow, Wrocław and Lublin. There are also some voivodeships and poviats where there are major gaps, that is, places where there are health problems, education problems, or which are benefitting little from outsourcing and tourism. Examples of these are poviats: aleksandrowski (Kujawsko-pomorskie Voivodeship), brzozowski (Podkarpackie Voivodeship) and wołowski (Dolnośląskie Voivodeship).

The maps depict current or “state of the art” patterns about knowledge-information categories crucial in studying specific human welfare and development investments and programs. They could be used by national and regional governments to invest more financial resources in some places or invest less in other places. They could also be used as guideposts for where to allocate human resources, whether health care workers, teachers, tourist developers, etc. The maps can clearly be used to identify “gaps” or “problem areas” within a given region or at a national level. It would be very interesting and informative to compare these “information” maps with actual “government spending” categories in the country’s voivodeships and poviats. This would be of interest since all monies for programs, whether education, tourism, health care or research and development, are earmarked for specific geographic locations, that is, poviats or voivodeships. Significant differences in the maps of “information knowledge” and “government spending” might surface, which might suggest a need to revisit national and regional development and spending priorities and policies.

Our final point is that mapping the “geographies of knowledge” within a country, such as Poland, can and do inform the scholarly communities, the regional and local planners, and government officials about what (or how much) is known about a specific topic or information category and what is not known. Knowing where the “gaps” are and seeking strategies to narrow them, if that is a government policy, can best be accomplished by making and using maps of the type discussed above. It is a challenge that calls for the cooperation of those in university, private sector and public sector communities. These are challenges that face the country in the coming decades and our hope is that this exercise will stimulate additional research on the “knowledge geography” questions raised above. The volume of information about a given topic or category and the maps prepared will change over time. One would expect that the reallocation of financial resources and human talent would result in maps that would reflect more or less investment in human resources.

We have met the objectives stated at the outset of the paper, viz., the discuss and illustrate with maps, the geographic variation in the knowledge-information base about emerging information economies throughout Poland. The maps compiled from Google Search Engine demonstrate clearly the variations in voivodeships and also in poviats.

Those maps illustrate some expected patterns, but also some unexpected results. The maps could/might be used in future policy discussions at national, regional and local levels to implement new policies and/or to reduce “gaps” that exist at urban and rural levels throughout the country. Poland’s entry into the “information worlds” of research and development, tourism development, health care, education and other social programs merit the attention of social and policy scientists at all levels. Maps can and should be integral parts of those research and policy initiatives.

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References

- Brunn, S.D., Dodge, M. (2001). Mapping the “worlds” of the world-wide web: (re) structuring global commerce through hyperlinks. *American Behavioral Scientist*, 44(1), 1717–1739.
- Brunn, S.D. (2003). A note on the hyperlinks of major Eurasian Cities. *Eurasian Geography and Economics*, 44(4), 321–324.
- Brunn, S.D. (2011). World cities: Present and future. In J.P. Stoltman (ed.) *Geography for the 21st Century*. Thousand Oaks, CA: Sage Publications, 301–314.
- Brunn, S.D. (2014). Cyberspace knowledge gaps and boundaries in sustainability science: Topics, regions, editorial teams, journals. *Sustainability* 6, 6576–6603; doi. 10. 3390/su6106576
- Brunn, S.D. (2015). Constructing and mapping an EU knowledge base: Worlds of gaps and opportunities. *Mitteilungen der Osterreichischen Geographisches Gesellschaft*, 157, 51–70.
- Brunn, S.D., Devriendt, L., Boulton, A., Derudder, B., Duan, J., Witlox, F. (2010). Networking European cities in worlds of economic crises and global environmental change. *Fennia*, 188(2), 37–44.
- Brunn, S.D., Devriendt, L., Boulton, A., Derudder, B., Duan, J., Witlox, F. (2016). Assessing the Impacts of the Global Financial Crisis on Major and Minor Cities in South and Southeast Asia: A Hyperlink analysis. In Ashok Dutt et al., *Spatial Diversity and Dynamics in Resources and Urban Development. Vol. 2: Urban Development*. Dordrecht: Springer Science+Business Media, 135–155.
- Brzozowski, T.T. (2013). Wiedza jako podstawowy czynnik rozwoju usług [Knowledge as a Basic Development Factor of Industry and Services]. *Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego [Studies of the Industrial Geography Commission of the Polish Geographical Society]*, 21, 390–404.
- Devriendt, L., Boulton, A., Brunn, S., Derudder, B., Witlox, F. (2009). Major cities in the information world: Monitoring cyberspace in real-time. *GAWC Research Bulletin 308*. Online available at: <http://www.lboro.ac.uk/gawc/rb/rb308/html>.
- Devriendt, L., Boulton, A., Brunn, S., Derudder, B., Witlox, F. (2011). Searching for cyberspace? The position of major cities in the information age. *Journal of Urban Technology*, 18(1), 73–92.
- Google Search Engine (2015). Data collected from 12 to 16 November 2015.
- Livingston, D.N. (2010). Landscapes of knowledge. In: P. Meusberger, D.N. Livingston and H. Jons (Eds.). *Geographies of Science*. Dordrecht: Springer, 3–22.
- Olechnicka, A. (2000). Rozwój regionalny w warunkach gospodarki informacyjnej. *Studia Regionalne i Lokalne*, 4(4), 37–50.
- Williams, J.R., Brunn, S.D. (2004). Cybercities in Asia: Measuring globalization using hyperlinks. *Asian Geographer*, 23(1–2), 121–147.
- Zioło, Z., Rachwał, T. (ed.). (2013). Funkcje przemysłu i usług w rozwoju gospodarki opartej na wiedzy [Functions of industry and services in the development of knowledge-based economy]. *Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego [Studies of the Industrial Geography Commission of the Polish Geographical Society]*, 21.

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