CONCENTRATION OF THE ICT INDUSTRY IN THE CZECH REPUBLIC, GERMANY AND POLAND

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Abstract

Information and communication technologies sector (ICT) is an important motor for innovation, growth and employment in the modern economy. At the same time, it is one of the fastest growing worldwide industries. ICT companies tend to concentrate in specific geographic regions in order to achieve higher profits and the overall effect of their clustering. High concentration of ICT makes the region more attractive and can foster its economic growth. Germany is one of the leaders in terms of innovation and promotion in Europe, but the Czech Republic and Poland are developing fast. The goal of this article is to compare concentration of the ICT industry representation, to identify regions highly specialized in this sector, as well as recognize potential ICT clusters in the Czech Republic, Germany and Poland.

Introduction

Information and communication technologies sector (ICT) is an important motor for innovation, growth and employment in the modern economy. At the same time, it is one of the fastest growing worldwide industries. According to an OECD definition, the ICT sector is a combination of manufacturing and service industries that capture, transmit, and display data and information electronically. ICT embraces information technology (combined industries of hardware and office machines, data processing equipment and data communications equipment) plus telecommunications (end-users of communications equipment and key systems, carrier services, cellular mobile radio infrastructure, transmission and other network equipment). [4] The arguably most important technological innovations of the past decade were initiated by ICT. According to United Nations, countries with well-developed, innovative and competitive ICT sectors achieve better productivity and growth rates than those with underdeveloped sectors. The European Commission estimates that ICT contributed with approximately 40% to the increase of productivity in the European Union in recent years and, thus, was the single most important source of productivity growth. This important role has encouraged many countries to place ICT at the heart of their economic policies. [10]

ICT companies tend to concentrate in specific geographic regions in order to achieve higher profits and the overall effect of their clustering. Michael Porter was the first one, who introduced the concept of clusters in the economic context. He defined a cluster as geographic concentrations of interconnected companies, including manufacturers, service providers, specialized suppliers and associated institutions (government agencies, universities, non-governmental organizations) in a particular field, that compete but also collaborate. [8] The advantages of clusters are many, some of them consisting of the following: more facile access to resources; reduced financial, time and transport costs; easier transfer of information; innovation creation; sharing of best practices; new business formation; a larger pool of talent and skilled labour; more opportunities for reaching to more customers; a higher level of efficiency and productivity within a cluster. [2] Clusters can be classified by the type of product or services they provide. There are clusters in tourism, in apparel, in textiles, in biotechnology, in automotive, in ICT, and many more. [7] The largest ICT clusters in Europe

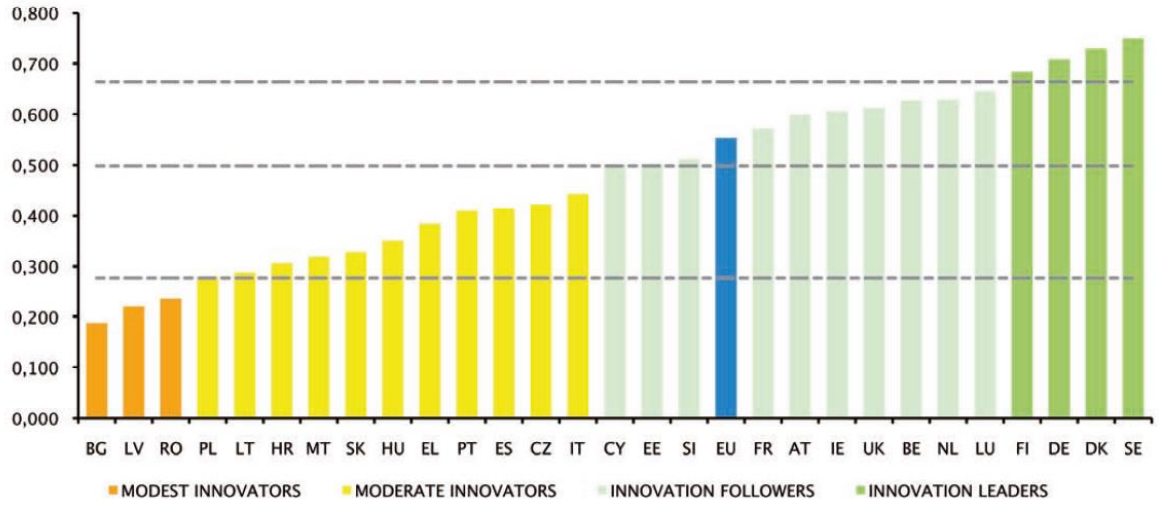
(by employment) are in the following regions: Île-de-France (France); Lazio, Lombardy (Italy); Comunidad de Madrid (Spain); Copenhagen (Denmark); Inner London; Berkshire, Buckinghamshire and Oxfordshire (United Kingdom); Darmstadt, Oberbayern (Germany) and Stockholm (Sweden). [1] Referring to Poland and the Czech Republic, there are a number of cluster initiatives. The examples are INTERIZON Polish ICT Cluster, Eastern Cluster ICT, Mazovia Cluster ICT, ICT Central Poland Cluster, and many more.

High concentration of ICT makes the region more attractive. ICT industry attracts more investment, more capital, highly skilled workers and fosters economic growth of the region. The goal of this article is to compare concentration of the ICT industry representation and to identify regions highly specialized in this sector in the Czech Republic, Germany and Poland. This analysis could be useful for:

- government in order to stimulate regional development,
- investors looking for attractive location for their businesses,
- businesses with high demand for ICT services,
- people searching for a job in the ICT sector,
- cluster policy makers in order to initiate and/or support cluster development.

1 Innovation Performance and IT Competitiveness of the Czech Republic, Germany and Poland

According to the European Comisson Report "Innovation Union Scoreboard 2014", Germany, Finland, Denmark and Sweden are leaders in terms of innovation and promotion in the European Union. A summary picture of innovation performance is provided by the Summary Innovation Index, a composite indicator obtained by an appropriate aggregation of 25 indicators (e.g. R&D expenditure in the public sector as a percentage of GDP, small and medium enterprises introducing product or process innovations as a percentage of SMEs, license and patent revenues from abroad as a percentage of GDP, medium and high-tech product exports as a percentage total product exports). [5] Figure 1 shows the performance results for the 27 EU Member States.



Note: Average performance is measured using a composite indicator building on data for 25 indicators going from a lowest possible performance of 0 to a maximum possible performance of 1.

Source: [5]

Fig. 1: *European Union Member States' Innovation Performance*

The performance of Sweden, Denmark, Germany and Finland is well above that of the EU27. These countries are the 'Innovation leaders'. The Czech Republic and Poland are classified as the "Moderate innovator." Nevertheless, the Czech Republic occupies a much higher position in this ranking than Poland.

The IT Industry Competitiveness Index created by the Economist Intelligence Unit compares 66 countries on the extent to which they are capable of supporting a strong IT production sector. The Index consists of 26 indicators (e.g. desktop and laptop computers per 100 people; the gross government expenditure on R&D per capita; the number of new domestic IT patent applications filed by residents each year, as a percentage of total patent applications; government spending on IT hardware, software and services per capita). The United States tops the global IT competiveness ranking of 2011. The USA are followed by Finland, Singapore and Sweden. Germany occupies the 15th position in the ranking, the Czech Republic is at the 27th and Poland at the 30th. [3]

2 Methodology

The most often used quantitative method of clusters examination is a location quotient (LQ). Formula (1) for computing location quotients can be written as [6]:

$$LQ = \frac{RE\ in\ Industry\ in\ Year\ T}{Total\ RE\ in\ Year\ T} \Big/ \frac{NE\ in\ Industry\ in\ Year\ T}{Total\ NE\ in\ Year\ T} \quad (1)$$

where

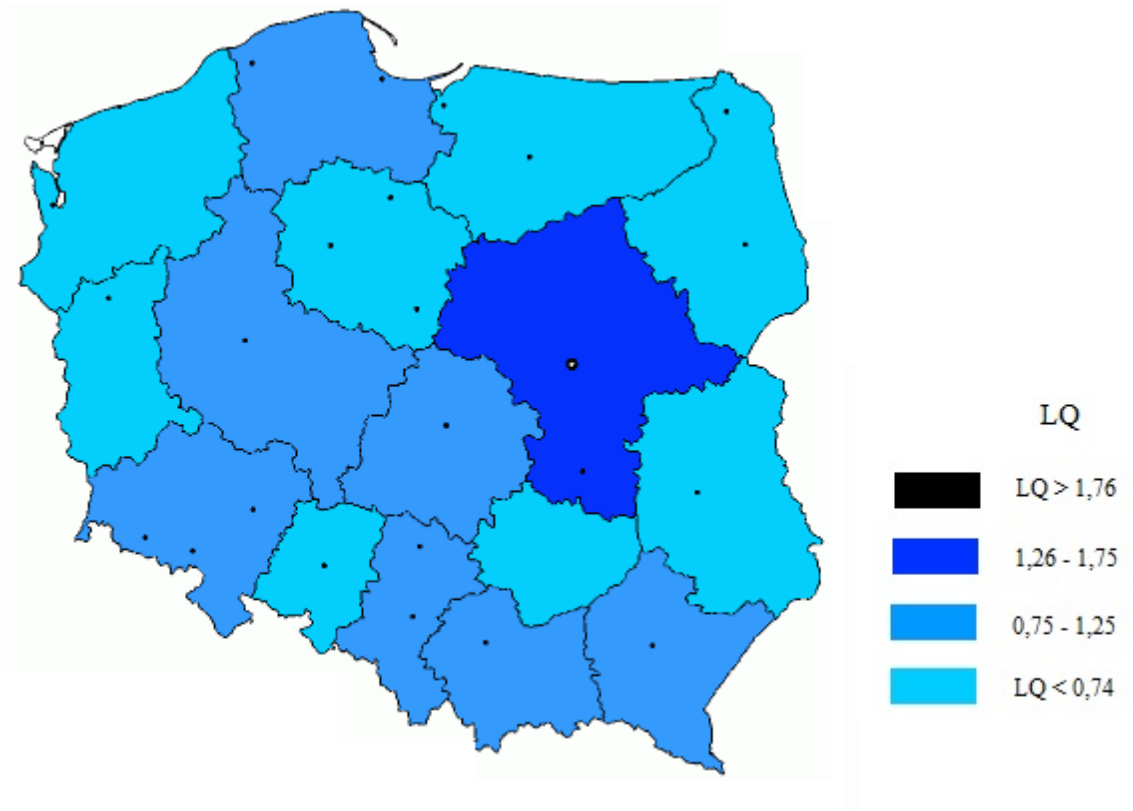
LQ is *Location Quotient*,
RE is *Regional Employment*, and
NE is *National Employment*.

It is assumed that the base year is identical in all of the above variables.

The location quotient compares the regional share of economic activity in a particular industry to the national share of economic activity in the same industry. The result reveals the degree of regional specialization in each industry. If the location quotient for a particular industry is between 0 and 1, the region is less specialized than the nation. A location quotient of one (1.0) means the region has the same proportion of economic activity in the sector as does the nation. Location quotients greater than 1 reveal a greater specialization of the industry in the local economy than in the national economy. It is assumed that location quotients greater than 1.25 reveal the specialization of the region in a particular industry. Also, observing location quotients over time shows if an industry is becoming more or less specialized in the region. [9]

3 Concentration of ICT Industry in Poland

The concentration of the ICT industry in Poland was measured using both a location quotient based on the number of enterprises from the section J "Information and communication" according to the Polish Classification of Activity 2007 and the total number of enterprises in the national economy. The data come from 2013 (the latest available data in the Central Statistical Office of Poland). The results are presented at a regional level (Figure 2) and a district level (Table 1).



Source: Own work based on regional statistics from Central Statistical Office of Poland <http://stat.gov.pl/bdl/> [accessed 2014-06-02]

Fig. 2: *Concentration of ICT industry in Poland (regional level)*

Tab. 1: *Concentration of ICT industry in Poland (district level)*

	District	**Voivodeship**	**LQ**
1.	Warszawa	Mazowieckie	2.50
2.	Wrocław	Dolnośląskie	1.80
3.	Poznań	Wielkopolskie	1.74
4.	Piaseczyński	Mazowieckie	1.73
5.	Kraków	Małopolskie	1.71
6.	Rzeszów	Podkarpackie	1.59
7.	Katowice	Śląskie	1.50
8.	Grodziski	Mazowieckie	1.47
9.	Gdańsk	Pomorskie	1.44
10.	Pruszkowski	Mazowieckie	1.43
11.	Legionowski	Mazowieckie	1.42
12.	Gliwice	Śląskie	1.41
13.	Wrocławski	Dolnośląskie	1.33
14.	Otwocki	Mazowieckie	1.28
15.	Sopot	Pomorskie	1.28
16.	Gdynia	Pomorskie	1.28

Source: Own work based on regional statistics from the Central Statistical Office of Poland <http://stat.gov.pl/bdl/> [accessed 2014-06-02]

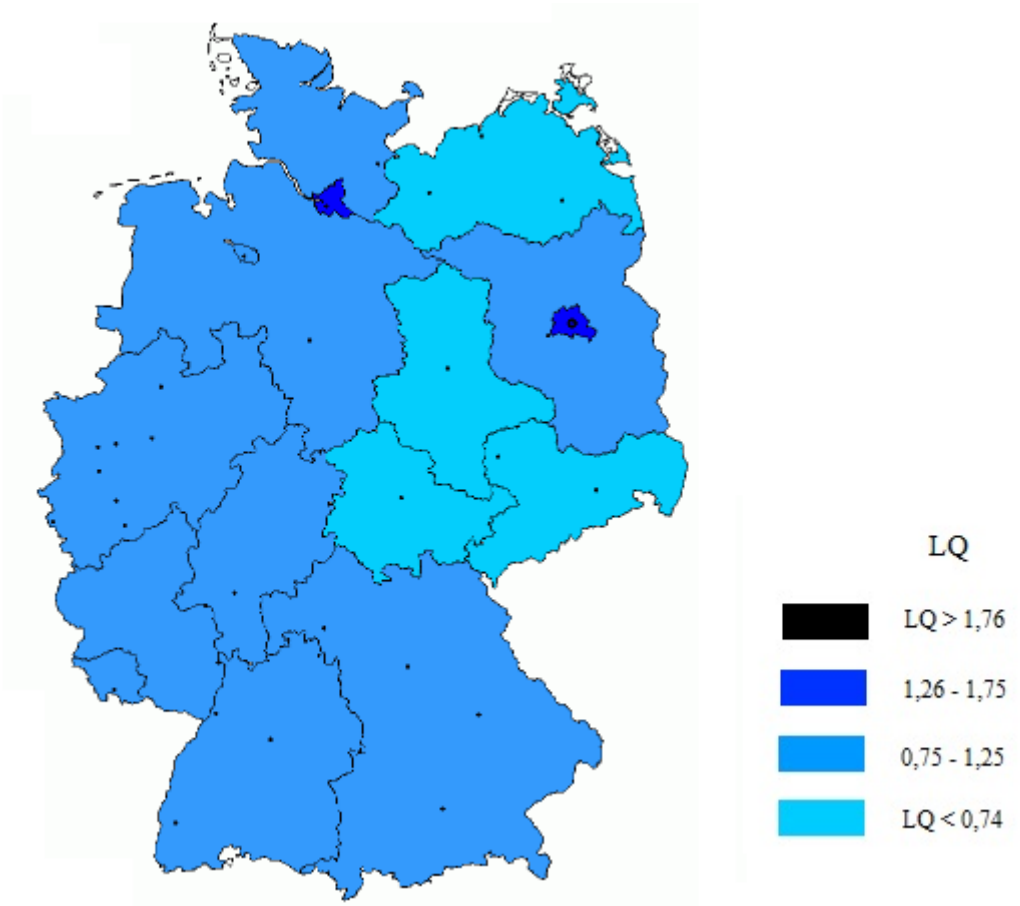
The highest concentration of enterprises in the sector of information and communication technologies in Poland is observed in mazowieckie voivodeship (Mazovia Province) (LQ = 1.74). The higher level of specialization of the ICT industry in the local economy than in the

national economy was revealed only in one more area – małopolskie voivodeship (Lesser Poland Voivodeship) (LQ = 1.02). The regions with the lowest levels of concentration of ICT companies are: opolskie voivodeship (Opole Province) (LQ = 0.65), świętokrzyskie voivodeship (Holy Cross Province) (LQ = 0.65), lubuskie voivodeship (Lubusz Province) (LQ = 0.62) and warmińsko – mazurskie voivodeship (Wamia-Masuria Province) (LQ = 0.58).

According to the research results the greatest specialization of the ICT industry in Poland was revealed for the Capital City of Warsaw with adjacent districts (piaseczyński district, grodziski district, pruszkowski district, legionowski district, and otwocki district). The areas with a high degree of specialization in the ICT sector were also identified in the biggest Polish cities: Wrocław (dolnośląskie voivodeship), Poznań (wielkopolskie voivodeship), and Kraków (małopolskie voivodeship).

4 Concentration of ICT Industry in Germany

The concentration of the ICT industry in Germany was measured with the use of both the location quotient based on the number of enterprises from the section J "Information and communication" according to the German Company Register – System 95 and the total number of enterprises in the national economy. The data come from 2011 (the latest available data in the Federal Statistical Office of Germany). The results are presented at a regional level (Figure 3) and a district level (Table 2).



Source: Own work based on regional statistics from the Federal Statistical Office of Germany <http://www.regionalstatistik.de/> [accessed 2014-06-02]

Fig. 3: *Concentration of ICT industry in Germany (district level)*

The most specialized regions in the ICT sector in Germany are Hamburg (LQ = 1.74) and Berlin (LQ = 1.63). The higher level of specialization of the ICT industry in the local economy than in the national economy was revealed in four more states: Hessen (LQ = 1.22), Bremen (LQ = 1.13), Bayern (LQ = 1.09), and Nordrhein-Westfalen (LQ = 1.07). There is observed a significant difference in the level of the concentration of the ICT companies between the western and eastern parts of Germany. States like Sachsen, Thüringen, Sachsen – Anhalt, and Mecklenburg-Vorpommern are much less specialized than the nation.

Tab. 2: *Concentration of ICT industry in Germany (district level)*

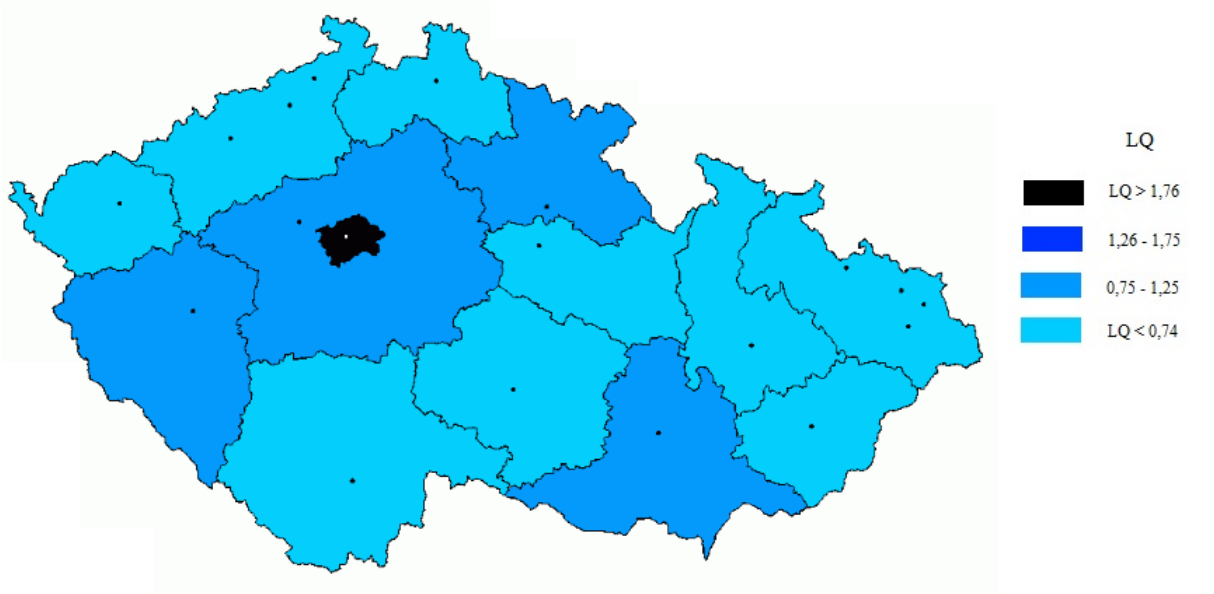
	District	**State**	**LQ**
1.	Darmstadt	Hessen	2.22
2.	München	Bayern	2.17
3.	Bonn	Nordrhein-Westfalen	1.95
4.	Köln	Nordrhein-Westfalen	1.92
5.	Karlsruhe	Baden-Württemberg	1.86
6.	Main-Taunus	Hessen	1.80
7.	Mainz	Rheinland-Pfalz	1.76
8.	Hamburg	Hamburg	1.74
9.	Frankfurt am Main	Hessen	1.71
10.	Potsdam	Brandenburg	1.71
11.	Aachen	Nordrhein-Westfalen	1.64
12.	Hochtaunus	Hessen	1.64
13.	Berlin	Berlin	1.63
14.	Starnberg	Bayern	1.61
15.	Ebersberg	Bayern	1.61
16.	Erlangen	Bayern	1.56
17.	Fürstenfeldbruck	Bayern	1.56
18.	Stuttgart	Baden-Württemberg	1.53

Source: Source: own work based on regional statistics from the Federal Statistical Office of Germany <http://www.regionalstatistik.de/> [accessed 2014-06-02]

(Table 2 presents only those districts for which the location quotient is greater than 1.5) According to the research results German's main ICT hubs are in the following districts: Darmstadt, Main-Taunus district, Frankfurt am Main, Hochtaunus district (State of Hessen), München, Starnberg, Ebersberg (State of Bayern), Bonn, Köln, Aachen (State of Nordrhein-Westfalen), Karlsruhe (State of Baden-Württemberg), Mainz (State of Rheinland-Pfalz), Hamburg (State of Hamburg), Potsdam (State of Brandenburg), and Berlin (State of Berlin). In these areas the concentration of the ICT companies is the highest in Germany.

5 Concentration of ICT Industry in the Czech Republic

The concentration of the ICT industry in the Czech Republic was measured using both the location quotient based on the number of employed in section "Information and communication" according to the CZ – NACE (Statistical Classification of Economic Activities in the Czech Republic) and the total employed in the national economy. The data come from 2012 (the latest available data in the Czech Statistical Office). The results are presented at a regional level (Figure 4). Research at a district level was not possible (proper data were not available).



Source: own work based on regional statistics from the Czech Statistical Office <http://www.czso.cz/> [accessed 2014-06-02]

Fig. 4: *Concentration of ICT industry in the Czech Republic (regional level)*

The highest concentration of enterprises from the ICT sector in the Czech Republic is found in the Capital City of Prague (LQ = 2.68 – which represents a much higher level of specialization in comparison to Hamburg and Berlin and is quite similar to the level of the Capital City of Warsaw). The higher level of specialization of the ICT industry in the local economy than in the national economy was revealed in two more regions: Jihomoravský (South Moravian) Region (LQ = 1.18) and Středočeský (Central Bohemia) Region (LQ = 1.11). Regions with the lowest level of the concentration of the ICT companies are: Zlín Region (LQ = 0.46), Ústí Region (LQ = 0.39), and Karlovy Vary Region (LQ = 0.37).

Conclusion

The ICT sector is highly concentrated spatially in the Czech Republic, Germany and Poland. According to the research results, the highest concentration of ICT industry in the Czech Republic and Poland is found in the capital cities (Prague, Warsaw) and their surroundings. Highly specialized in the ICT sector are also the biggest Polish cities of Wrocław, Poznań, and Kraków (research at the district level was not possible in the Czech Republic). The main German ICT hubs are in Darmstadt, München, Bonn, Köln, and Karlsruhe. In this country there is observed a significant difference in the level of the concentration of the ICT companies between the western and eastern parts.

The above-mentioned regions are potential cluster regions. Analysis indicated the relative presence of the ICT industry in the local region. However, in order to truly identify clusters it is necessary to conduct a qualitative analysis.

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Mgr. Piotr Szwinta

KONCENTRACE ODVĚTVÍ ICT V ČESKÉ REPUBLICE, NĚMECKU A POLSKU

Informační a komunikační technologie (IKT, ICT) jsou důležité pro inovaci, růst a zaměstnanost v moderní ekonomice. Zároveň jsou jedním z nejrychleji rostoucích odvětví průmyslu po celém světě. Společnosti v odvětví ICT mají tendenci soustředit se na konkrétní oblasti za účelem získání ekonomických výhod a posílení konkurenční převahy. Vysoká koncentrace IKT dělá region atraktivnější a může podpořit jeho hospodářský růst. Německo je evropským lídrem ve vývoji a prosazování inovací. Rovněž Polsko a Česká republika se snaží jít touto cestou. Cílem tohoto článku je porovnat úroveň koncentrace společností z odvětví ICT a identifikovat regiony zaměřující se na toto ekonomické odvětví v České republice, Německu a Polsku.

KONZENTRATION DER IKT-INDUSTRIE IN TSCHECHIEN, DEUTSCHLAND UND POLEN

Die Informations- und Kommunikationstechnik (IKT) ist eine wichtige Quelle der Innovation. Wachstum und Beschäftigung in der modernen Wirtschaft. IKT gehört zu den am schnellsten wachsenden Branchen der Welt. Die IKT-Unternehmen ballen sich regional aufgrund gemeinsamer günstiger Standortfaktoren, Regionen, die sich auf IKT spezialisieren. sind attraktiver für Investoren und beeinflussen Wirtschaftswachstum. Innerhalb der EU hat Deutschland sich in die Spitzenposition der innovativsten Länder vorgekämpft. Polen und Tschechien wollen den Abstand verringern. Ziel des Artikels ist es, die Regionen, die sich auf IKT spezialisieren, zu identifizieren und die Konzentration der IKT-Industrie in Tschechien, Deutschland und Polen zu vergleichen.

KONCENTRACJA SEKTORA TELEINFORMATYCZNEGO W REPUBLICE CZESKIEJ, NIEMCZECH I W POLSCE

Sektor teleinformatyczny (ICT) jest kluczowym źródłem innowacji, wzrostu i zatrudnienia we współczesnej gospodarce. Przedsiębiorstwa sektora ICT wykazują tendencję do koncentrowania się na ściśle określonych obszarach w celu uzyskania korzyści ekonomicznych i wzmocnieniu przewagi konkurencyjnej. Regiony o wysokiej koncentracji firm z tego sektora są bardziej atrakcyjne dla inwestorów i mają kluczowe znaczenie dla wzrostu gospodarczego. Niemcy należą do europejskich liderów w zakresie tworzenia i promowania innowacji, również Polska i Czechy starają się podążać tą ścieżką. Celem artykułu jest porównanie poziomu koncentracji przedsiębiorstw sektora ICT oraz zidentyfikowanie regionów specjalizujących się w tej gałęzi gospodarki w Republice Czeskiej, Niemczech i w Polsce.