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Selected Microeconomic Effects of Ict Firms in Context of Level of Sectoral Concentration: Case Study in Selected Regions of the Czech Republic

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Abstract

Purpose of the article: It is assumed that a strongly territorially concentrated branch that transformed into the sectoral agglomeration of identical companies in terms of the branches is specific for a range of its network externalities such as positive effects resulting from a qualified workforce, spreading innovation and transferring knowledge, experience and information. In general terms, some microeconomic factors and relevant variables will be perceived differently by ICT firms in the context of the different intensity of the sectoral concentration in the particular territory.
Methodology/methods: The contribution is based on the primary research performed among ICT companies in two Czech selected regions expressing their attitudes and opinions in the context of the branch concentration emphasizing the specific localization of these companies within the centres, or on the periphery. The theoretical basis includes in particular „the core-periphery theory" and the New Economic Geography extended by the concept of the sectoral agglomerations and also selected theories of the period of post-Fordism.
Scientific aim: The presented contribution deals with the specification of the chosen microeconomic effects of the branch con-centration of companies in the ICT sector of the given area, and defines differences in factors of the branch concentration of ICT companies.
Findings: Based on the performed research, it was discovered that more than 60 % of the companies perceive branch concentration positively and consider its effect beneficial and desired. From interregional comparisons follows that ICT firms in the Moravian-Silesian Region are more decided towards their employees. South Moravian ICT firms feel less dependent on other ICT firms, but are less aware of their competition.
Conclusions: The results of the research reflect the assumptions of the chosen theoretical framework and support the conclusion that it is suitable for ICT companies to do business in a region where the ICT sector is concentrated.

Keywords: sector concentration, effects of concentration, information and communication technology, region, Czech Republic

JEL Classification: L86, O14, R12

Introduction

In recent years, the ICT sector has been seen as one of the key areas of economic activity that has significant potential for further development and which, thanks to the high added value it generates, is one of the most important sources of stable economic growth in todays and future economies. The ICT sector is characterized by multiplier effects in the economy, where activities in this sector directly or indirectly affect outputs in other sectors, contribute to significant savings and productivity gains, increased intellectual capital, the growth of social value generated by the synergy of knowledge, information and technology, Which are being developed, developed and supported by this sector of the economy. All these positive effects associated with business activity in the ICT sector increase the competitiveness of the regions in which they operate and contribute to improving a quality of life and living standards (Turečková, 2014 or Majerová, Nevima, 2016). Deepening sectoral specialization of ICT companies not only contributes to increasing the competitiveness and success of their own companies operating in this economical sector, but contributes also to regional sectoral competitiveness, which is further from the micro level transforming the competitiveness of the sector and subsequently into the competitiveness of the economy as a whole (Beneš, 2006). The agglomerating process of territorial concentration of the ICT industry would be interested in ICT firms themselves and should be actively supported by their leadership and management as well as by the national economic authorities.

The aim of this paper is to determine differences in the area of the selected microeconomic effects of the concentration of ICT companies in the South Moravian Region and the Moravian-Silesian Region with regard to the localization of companies within the given districts classified as centers and periphery. This territory dividing is necessary for the analysis of individual effects and their intensity, based on the theory of difference in respondents' answers according to the place where they perform their business activities. The results are based on the primary research conducted between 2016 and 2017 between ICT firms in both selected regions and looking for a parallel in theories called collectively "core-periphery", two theories of the period of post-Fordism and in approaches from sectoral agglomerations.

The article is organized as follows. Section 1 describes the theoretical approach towards the sectoral concentration with an emphasis on the main theoretical contributions to this problem. Most of the used questions in the questionnaire survey were based on finding out from the theoretical background. The Section 2, Methodology, provide information about primary survey and research. The Section 3, Empirical results of microeconomic effects of ICT firms in context of level of sectoral concentration, presents concrete basic empirical results on differences between regions and also between centers and periphery. The last part, the conclusion, provides us with concluding comments, and it highlights some of the major conclusions from the analysis provided.

1. Theoretical remarks of sectoral concentration

Regarding the methodological perspective, the current research is based on economic-geographical methods which are part of Economic geography. The discipline (New) Economic Geography was strengthened in 1990s as a synthesis of the new theory of trade, Myrdal, respectively Hirschman theory of cumulative causes and neoclassical location theory (Šimanová, Trešl, 2011; Baldwin *et al.*, 2005). The core of the theoretical area is based on the findings of localization theories and the "core-periphery" theory, supplemented by other selected theo-

retical approaches from the postfordism period and the theoretical conception of sector agglomerations. The polarization of regions based on sectoral specialization through decreasing explicit and implicit costs (comparative advantage) explains traditional and new business theories based on the neoclassical assumptions of perfect competition and constant yields on scale, the difference in productivity of production factors (Ricardo, 1817) or different regions required production factors (Heckscher, 1919; Ohlin, 1933).

In the "core-periphery" theory it was a set of partial theories explaining the long-term divergent processes between regions in the context of the development taking place in the sectoral structure of the economy, whose main theorists include Myrdal (1957), Friedmann (1966), Perroux (1950) or Hirschman (1967). In general, they are within the theory of "core-periphery" mentioned other factors that cause divergence regions in the context of the development sector, external savings agglomeration advantages (savings), selective migration of labor and capital mobility (especially human).

To the above mentioned theories and to the neoclassical ideas widespread about imperfect competition, it continued in the 80s and 90s of the 20th century. New Economic Geography (David, 1985; Arthur, 1988; Romer, 1986; Krugman, 1991 and others) extending the core-periphery theory of aspects of network effects, knowledge transfer and technological advances, accumulation and dissemination of knowledge or the importance of positive expectation. The theory works with the three agglomeration advantages of (1) the concentration of skilled and specialized workforce; (2) mutually strengthen technology and innovation in the industry, and (3) the interdependence of local businesses through subcontracting and joint use of specialized infrastructure. There is also need to add a significant cumulative effect, which contributes to the specialization of the regions for certain economic activities (positive expectations).

The concentration of the sector in the given space can also be explained by other theories explaining this development in the post Fordist period (Blažek, 1999). At the core of the theory of production district (Brusco, 1982) is the key to prosperity are high quality social in the region, cultural and institutional structures, a non-hierarchical system of organizing small business cooperation and networking (Wokoun *et al.*, 2008). The theory of learning regions (Lundvall, 1992 or Saxenian, 1991) explains the success of the region in the ability of their subjects to learn and share their experiences, knowledge, skills and information. The theory of learning regions is based on the knowledge, the ability to learn, and the creation of a cultural climate that encourages innovation which are the sources of competitiveness. A region in which workers are motivated to further education and adapt to new technologies and practices in a particular area of interest has both subjective and objective competitive advantages over regions of others.

At the beginning of the 21st century, the idea of agglomeration benefits was elaborated in the concept of sectoral industrial agglomerations. Sectoral industrial agglomerations are firms that are concentrated on a certain, limited territory, operating mainly in the same sector, interconnected by a network of mutually meaningful and non-binding relationships and links that complement other participating private and public institutions that are with the firms or industries concerned, direct or indirect and exist in the same territory. The reason for the evolutionary formation and the existence of industrial agglomerations are the benefits of participation in this agglomeration, especially in the form of deepening specialization, externalities and economies of scale (Turečková, 2015). Today, many industrial agglomeration studies deal with the influence of the generated, supported and distributed externalities into technical and technological efficiency which are positively reflected in corporate,

sectoral, regional and aggregate – macroeconomic levels (Valle, 2015). Kim *et al.* (2009), based on DEA Method demonstrated a positive effect of externalities on the efficiency of the biotech industry in the USA. Driffield, Munday (2001) in their UK research have confirmed that the regionally concentrated industry improves its technical efficiency and shifts it to the production possibilities. The most concentrated manufacturing enterprises showed the highest production efficiency. Mitra, Sato (2007) and Otsuka, Goto (2015) came to similar conclusions. Improving efficiency and enhancing competitiveness resulting from the concentration of firms was confirmed at the microeconomic level in the textile industry in India (Mitra, 1999) and salmon production in Norway (Tveteras, Battese, 2006).

2. Methodology

Primary data to determine the effects of sectoral concentration of ICT companies in the region was obtained through own primary research via a questionnaire survey. The questionnaire survey was carried out by mail correspondence in The Moravian-Silesian Region and The South Moravian Region. In order to ensure the electronic addresses of ICT companies, MERK company database by IMPER CZ, s.r.o. was used. All economic entities listed in the Merk database were filtered only for location, *i.e.* for the region, and for economic sector, *i.e.* for Information and communication define by NACE Rev. 2, Section J. The legal form, finance, employees, *etc.* were not taken into account.

A questionnaire survey to determine selected effects and differences of the sectoral concentration was carried out between November 2016 and April 2017 in The Moravian-Silesian Region (MSR) and South Moravian Region (SMR) among firms operating in the ICT sector. In fact, 580 firms in the MSR and in the SMR 1021 companies were addressed by the questionnaire. The return was in MSR 61 filled in questionnaires (10.52%) and in SMR 106 questionnaires, *i.e.* 10.38%. 167 questionnaires were evaluated, representing 10.43% of the total number of 1601 addressed firms (respondents). The questionnaire received answered all questions. The questionnaire consisted of nine closed questions concerning the aspects of the company's position on the market in the context of the sectoral concentration effects on the given territory and six other identified identification issues characterizing

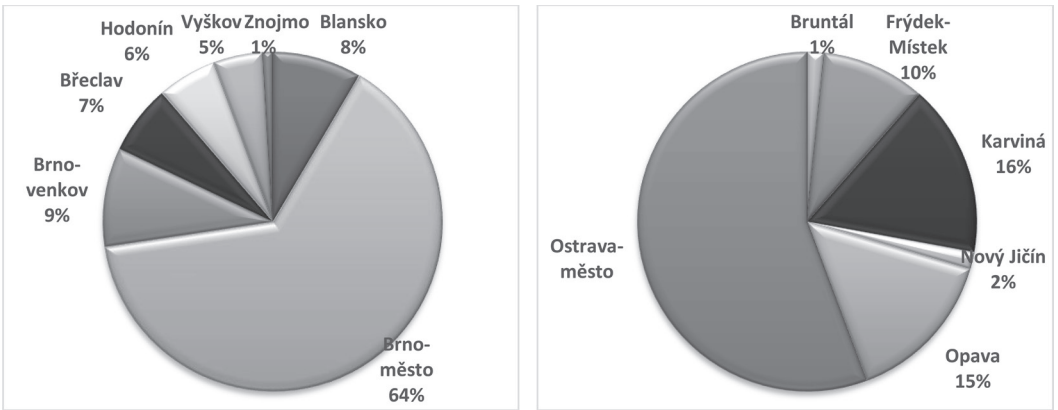

Figure 1. Localization of the surveyed ICT firms in The South Moravian and in The Moravian-Silesian regions according to the lower territorial units LAU 1 (districts). Source: questionnaire survey, own processing, 2017. Note: The South Moravian Region: n=106, The Moravian-Silesian Region: n=61.

the company. The questionnaire was anonymous, it took no more than 5 minutes to complete it.

Based on the questionnaire survey, it was confirmed that the addressed companies most often live in the regional cities (in Brno-city it is 68 firms (64%), in Ostrava-city 34 firms (56%)). At the same time, for ICT companies, the more their headquarters are from the regional city, the less they responded to the questionnaire (see Figure 1). This distribution of companies on the territory of the regions is suitable because of the problem being investigated, because it will subsequently enable to better determine the effects of the concentration. The finding of localization of ICT firms at the level of lower territorial units (districts, LAU 1) is crucial for a detailed analysis of the questionnaire survey in which the responses for regional centers (districts Brno-city and Ostrava-city) are examined in the context of the survey of the effects of sectoral concentration and confronted with answers from peripheral regions (other districts).

3. Empirical results of microeconomic effects of ICT firms in context of level of sectoral concentration

3.1 The South Moravian Region

The ICT firm's structure in Brno-city (68 companies) consists of 18 companies where the owner is also the only employee, 18 companies have employees between 1–9, 30 companies have 10–99 employees and two big companies have stated that 100–499 employees work. 62 (92%) of the firms said they were cooperating with other companies doing business in the same industry sector, and 61 firms (90%) are in growth. At the same time, 60 companies said (88%) that they plan to expand their business activities over the three year horizon. 30 companies (44%) will get new employees in the near future. Only 41% of companies (28 companies) require higher education for their employees, only four companies do not support further training of their employees and only 23 firms (34%) cooperate with an educational institution. 46 firms (68%) are considered completely independent of other ICT companies in their region. The same number of companies (46; 68%) offers their employees a reasonable and usual wage, 11 companies (16%) said they rated their employees above average. 28 companies (41%) believe that it is difficult for them to retain their employees currently. 39 companies (57%) are convinced that it is better for them to do business in an environment where more than one company is located because positive effects result from them. 32 of the respondents (47%) replied that they knew in their area more than 5 other firms that are doing business in the same economical sector as the surveyed company.

If we analyze firms in districts outside of Brno-city (on the periphery, 38 companies), then the structure of companies is made up of 13 firms without employees (outside the owner), for 19 companies the number of employees is 1–9 and only 6 companies have 10–99 employees. This means that the size of firms outside the center (Brno-city) is smaller. 34 (89%) of ICT firms said that they were cooperating with other companies doing business in ICT as they and 33 companies (87%) are currently in growth. The same number of companies plans to expand their business within 3 years, but only 7 of the 38 companies surveyed on the periphery (18%) will be getting new employees in the near future. 7 companies (18%) also require higher education for their technicians, all companies support further training of their employees and 14 companies (37%) work with an educational institution. 10 companies (26%) offer higher wages than wages in the industry are appropriate. 27 companies (71%) are considered completely independent of other ICT companies in region, and

Table 1. Selected differences of the results of the questionnaire survey among the districts of The South Moravian Region.

Variable	Brno-city (center; 68 firms)	Other districts (the periphery; 38 firms)
Requirement to recruit next workers	44%	18%
Wage higher than usual	16%	26%
Requirement for university education	41%	18%
Independence from other ICT firms – yes	68%	71%
The difficulty of retaining your employees	41%	34%
Awareness about 5 or more similar firms around	47%	24%
Do business in an environment with more similar firms is positively perceived	57%	47%

Source: questionnaire survey, own processing, 2017.

only 13 firms (34%) think that it is difficult for them to keep their employees. 18 companies (47%) perceive the positive effects of other similar companies in their area. 29 companies (76%) know about 0–4 similar companies in their region.

Table 1 summarizes the selected differences in the results from the questionnaires between Brno-city and other districts of The South Moravian Region. In other areas of research, the differences in the answers between Brno-city and the surrounding districts were not so significant. In Brno-city, there is a greater demand for labor between companies, and indirectly, the higher the difficulty of retaining employees. Generally, ICT firms also require higher education of their employees than companies in other districts. In the center, more ICT companies are aware of the positive effects of company concentration. In the periphery, on the contrary, more

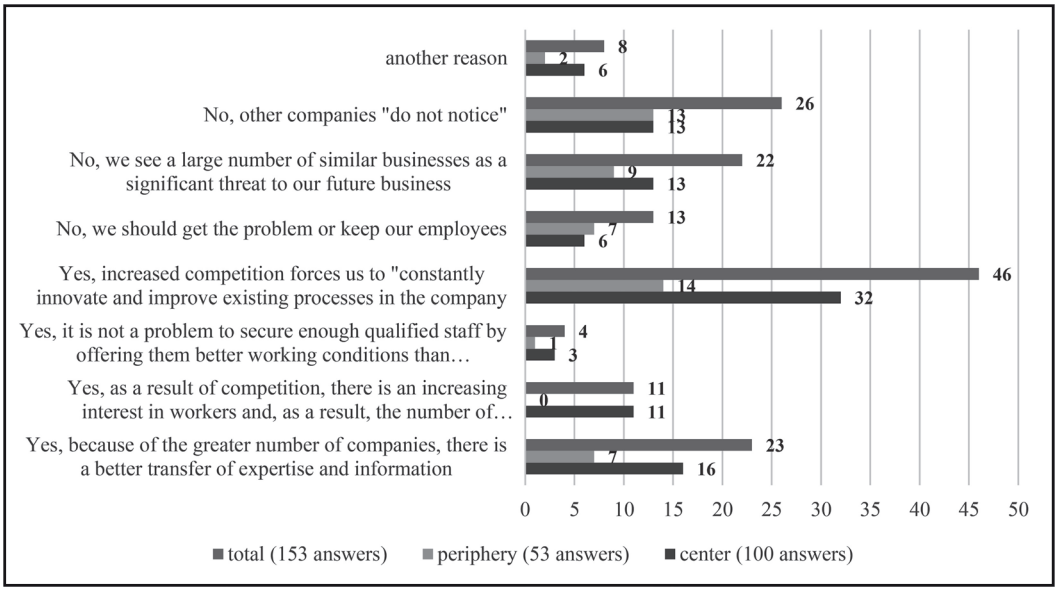

Figure 2. Effects of Sectoral Concentration of ICT firms in The South Moravian Region (in number). Source: questionnaire survey, own processing, 2017.

companies feel dependent on their actions on other companies. It is also characteristic of the center that companies know more ICT firms in their neighbourhood than in peripheral parts of the region.

The histogram in Figure 2 specifies sub-areas from which respondents could choose their responses in the context of the perceived benefits or costs associated with sectoral concentration of firms.

According to the findings of the questionnaire survey, the greatest benefit for companies is the need for a continuous improvement of innovation and of the existing processes in the company. This benefit was chosen by 46 companies out of 106 (43%). Another positive feature was the ability to better transfer expertise and skills across companies involved in the concentration process (22%). In the case of the cost of concentration, the companies perceive their competition as a threat to their future business (at the center of 13 responses, on the periphery 9 responses, a total of 22 companies, *i.e.* 21%). However, a number of companies simply do not notice their competitors (in total, 26 companies have chosen this option, *i.e.* 25%). A larger percentage of companies on the periphery (34%) said they did not notice other companies, while in the center it was only 19%. ICT firms on periphery are more concerned with the problem of retaining employees (18%, center 9%). On the other hand, in the center, 16% positively perceive the fact that, thanks to competition, the number of skilled workers in the market is growing. There is not one company on the periphery.

3.2 The Moravian-Silesian Region

The structure of the ICT firms in Ostrava-city is made up of 34 firms, 9 companies led by the owner (self-employed), 11 companies employing 1–9 employees, 13 companies employing 10–99 employees, and one large company said they employ more than 500 employees. 28 companies (82%) in Ostrava-city require higher education in their employees and 56% of all employees are valued higher than usual in the region. 26 companies (76%) feel that it is difficult for them to keep their employees. 28 companies (82%) support further training of their employees and 11 firms (32%) admitted to cooperating with educational institutions. More than half of the ICT firms in survey (25; 74%) know about another 5 similar companies in their region. 31 companies (91%) are now in growth and all companies consider to expand their business activities over the 3-year horizon. 20 companies (59%) will recruit new employees in the near future. 31 companies (91%) of the total 34 cooperate with other companies in the industry but only 14 (41%) of them feel dependent on the behavior of other companies on their neighbourhood. 27 companies (79%) are convinced that doing business in an environment where more than one company is beneficial to them. The most often chosen advantage of business in the territory with more similar companies is, according to respondents, the need to constantly innovate and improve the existing processes in the company.

A different structure of ICT firms offers companies from other districts of The Moravian-Silesian Region (27 companies) forming, in this case, the periphery. There are 9 self-employed, 14 companies with a number of employees between 1–9 and four companies with between 10 and 99 employees. Only 26% of technicians require higher education, all companies (100%) support further training for their employees, but only 9 companies (33%) cooperate with institutions providing training and education acitivities. 13 companies (48%) said that they offered their employees a higher wage than their wages were adequate, but never to keep their employees. 18 companies (67%) said that they had enough staff in the winter of 2016/2017. Still 11 companies (41%) feel

Table 2. Selected differences of the results of the questionnaire survey among the districts of The Moravian-Silesian Region.

Variable	Ostrava city (center; 34 firms)	Other districts (the periphery; 27 firms)
Requirement to recruit next workers	56%	48%
Wage higher than usual	82%	26%
Requirement for university education	59%	33%
Independence from other ICT firms – yes	59%	56%
The difficulty of retaining your employees	76%	41%
Awareness about 5 or more similar firms around	74%	33%
Do business in an environment with more similar firms is positively perceived	79%	63%

Source: questionnaire survey, own processing, 2017.

that it is difficult for them to keep their employees. 25 companies (93%) are currently in a growth phase and 22 companies (81%) are considering expanding their business activities over the three-year horizon. 23 companies (85%) cooperate with other companies doing business in information and communication technologies but only 15 companies (56%) of all are perceived as entities completely independent of other ICT companies in their region. 17 respondents (63%) perceive the positive effects of other similar companies on their neighbourhood, especially the impact of increased competition and based on the need to constantly innovate and improve existing processes in the company (15 companies). 11 companies out of a total of 27 ICT firms on the periphery (41%) admit that they are indifferent to their competitors and "ignore" them.

Table 2 shows some different manifestations in the answers between Ostrava-city and other districts in the region. Surprisingly, there is a considerable demand for higher education at technical staff in the "center". In Ostrava-city, ICT companies are aware of the increased risk associated with keeping their current employees. Firms in the center also consider expanding their employee capacity than is typical for ICT companies in other districts of The Moravian-Silesian Region. In the center, 79% of ICT firms are aware of the positive effects of sectoral concentration, while in peripheral areas it is only 63%. Also for the center in The Moravian-Silesian Region, ICT firms are better known for their competition, where 74% of respondents know about more than 5 sector-like companies in their region.

Figure 3 summarizes the answers to the questionnaire survey of selected effects of sectoral concentration of firms. The results partly correspond to the effect analysis performed for The South Moravian Region. Again, the most frequent benefit of increased competition among ICT firms is the positive perception of the need to constantly innovate and improve the existing processes in the company (36 companies, *i.e.* 59% of all 61 companies in The Moravian-Silesian Region). Sectoral concentration also has a positive impact on the number of skilled workers on the market and easier sharing of information and knowledge. Negatives of participating in the ICT agglomeration includes the feeling of being threatened by other ICT firms in their region. A larger number of companies (14 companies in total) prefer not to notice their competitors.

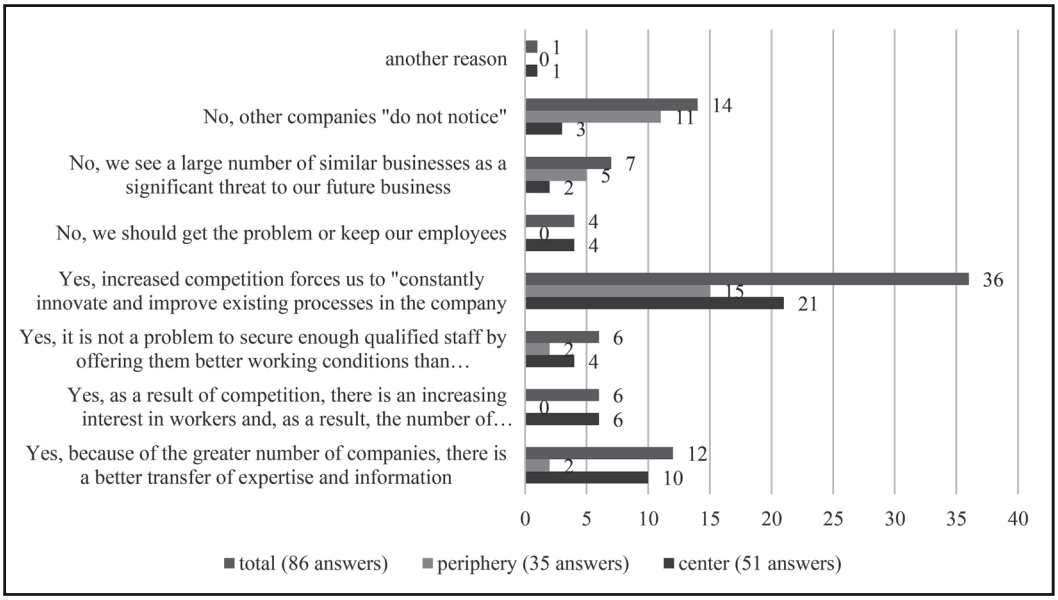

Figure 3. Effects of Sectoral Concentration of ICT firms in The Moravian-Silesian Region (in number). Source: questionnaire survey, own processing, 2017.

Conclusion

If we make a interregional comparison of the results in context the division of the territory of the regions into centers and periphery, then we can generally claim that ICT firms in The Moravian-Silesian Region are more distinct from their employees – 82% require higher education, offer higher wages than their perceived wage (56%), feel worried about keeping their employees (76%), and consider increasing recruitment (59%). These ICT firms feel less responsive to the behavior of other ICT companies in their neighborhood (59%), but are more aware of the positive effects of sectoral concentration (79%). ICT companies in Ostrava-city know more than five similar companies (74%), while in Brno-city it is only 47% of the surveyed companies. 102 ICT firms (61%) feel free to operate independently of other companies in their region, although a total of 150 companies (90%) have been allowed to cooperate with other sectoral-similar companies. 101 firms (61%) perceive the positive effects of sectoral concentration, of which 66 firms from the center and 35 companies from the periphery. On the basis of the above, it can be argued that owners of ICT firms should place their business in a local ICT business agglomeration in which ICT firms are already concentrated, should foster inter-company cooperation and promote mutual dissemination of knowledge and information.

Through the findings from the questionnaire survey and in the background of the analysis of the answers, we can find partial links between the examined issues and some specific theories of regional development. Significant similarity is offered to the theory of the production district, which emphasizes the non-hierarchical system of organizing cooperation between small and medium-sized companies. In both regions – The South Moravian and The Moravian-Silesian regions, ICT firms cooperate in 90% but in 61% feel independent.

From the theory of learning regions it can be assumed that a region in which workers

are motivated to further education and adaptation to new technologies and practices in a particular area of interest achieves subjective and objective competitive advantages over regions of others. In both surveyed regions, further education is supported in more than 94%. Cooperation between companies and educational institutions is realized in one third of them. It is well known how important it is for the ICT companies around Brno and Ostrava to link to technical faculties of local universities and universities.

From the concept of sectoral industrial agglomerations, it is possible to emphasize the parallel between the actual findings and the thesis that the dissemination of information, knowledge, technological processes and practices and innovations enhances efficiency, success, growth dynamics and the competitiveness of the system itself. This fact was confirmed in the case of The South Moravian Region, which has developed significantly more dynamically than in The Moravian-Silesian region.

If we take into account the established reality for the prerequisites of the New Economic Geography, then in our case we can talk about the three agglomeration advantages, which are (1) the proven concentration of skilled and specialized labor force (higher education requirement and support for further, additional education up to 94% of surveyed ICT companies), (2) mutually reinforcing technology and innovation in the industry (necessity and response to competition) and (3) the interdependence of local businesses through subcontracting and joint use of specialized infrastructure (90%). There is still a need to add a significant cumulative effect, which contributes to the region's specialization in certain economic activities, and thus positive expectations (89% of companies expect growth and extend of staff structure in the near future and many of ICT firms will expand their existing business activities).

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