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Smart specialization and the manufacturing sector in the city regions of Hungary

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By today smart specialization has become a crucial part of the growth strategy of the European Union. Smart specialization is an innovative approach for the economic transformation of regions, a complex development strategy that builds on the unique characteristics and values of regions, and contributes to increasing the competitiveness of regions. The basis of Smart Specialization Strategy (S3) is identifying the competitive advantages of regions, including the identification of all economic activities that have determining weight, show growth and stand out due to their innovation capacity and performance in a region.

In traded sectors capable of dynamic development, enterprises are able to continuously expand their production and satisfy substantial local and extra-regional demand. In Hungary a significant part of the traded sector consists of the manufacturing sector. The manufacturing sector is one of the determining scopes of economic activities, which provides a considerable proportion of the Gross National Product, and involves economic activities that are associated with consumer expenditures, persons employed, exports and a substantial part of technological innovations.

The present study aims to prove the significance of the manufacturing sector in the city regions of Hungary. Given that place-based policies place a particular emphasis on the spatiality of economic activities, we examine the spatial distribution of the manufacturing sector by means of employment location quotient (LQ). The study centres on 13 sub-sections distinguished in the manufacturing sector and the analysis of their geographical concentration in the Hungarian city regions at the time of and following the accession to the European Union. The results show which activities in the manufacturing sector are worth specializing in by the city regions and whose support contributes to the further development of the regions.¹

Keywords: specialization, city regions, manufacturing sector, Hungary

JEL Classification: O14 - R12

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1. Introduction

For increasing the competitiveness of the European Union it is essential to create the conditions of smart, sustainable and inclusive growth, the priorities included in the Europe 2020 strategy². The entire European Union faces several challenges. These include (1) developing knowledge- and innovation-based economy, (2) achieving sustainable growth besides efficient use of resources, (3) and ensuring inclusive growth, which can contribute to strengthening territorial cohesion, economic restructuring and creating jobs. For the implementation of all these priorities and achieving the objectives of the Europe 2020 strategy, smart specialization is necessary³.

The innovative strategy of smart specialization differs from traditional strategies in several elements. The most important characteristics of smart specialization strategies are that they are place-based⁴, promote innovation based on local specificities, focus on R&D and innovation, in addition, they attribute a key role to the local entrepreneurial sphere and regard the existence of a critical mass of economic activities. Finally, their aim is not to promote the development of new or winning technologies and sectors, but to encourage the innovation-oriented cooperation of technological fields and sectors, thus the development of clusters. However, the scope of economic activities to be supported has to be clearly known in order to define the direction of smart specialization.

One of the most important conditions of implementing S3 strategies is an existing sphere of committed local entrepreneurs, which is embedded into the economy of the region and shows sufficient stability⁵. The enterprises of the traded sector generally produce for extra-regional demand. Because of this they are able to create new jobs, can be characterized by high inclination to cooperation and innovation, and contribute to the growth of the economy of regions through the income flowing into the region⁶.

² EC (2010): *Regional Policy contributing to smart growth in Europe 2020*. European Commission, Brussels.

³ Foray, D. – Goddard, J. – Beldarrain, X. G. – Landabaso, M. – McCann, P. – Morgan, K. – Nauwelaers, C. – Ortega-Argilés, R. (2012): *Guide to Research and Innovation Strategies for Smart Specialization (RIS 3)*. Smart Specialization Platform, European Commission, Brussels.

⁴ McCann, P. – Ortega-Argilés, R. (2011): *Smart Specialization, Regional Growth and Applications to EU Cohesion Policy. Economic Geography Working Paper*, University of Groningen, Groningen.

EC (2013): *The role of clusters in smart specialization strategies*. European Commission, Luxembourg.

⁵ OECD (2013): *Innovation-driven Growth in Regions: The role of Smart Specialization*. (Preliminary version). Organization of Economic Co-operation and Development, Paris.

⁶ Lengyel I. (2009): Knowledge-based local economic development for enhancing competitiveness in lagging areas of Europe: The case of the University of Szeged. In Varga A. (ed): *Universities, Knowledge Transfer and Regional Development: Geography, Entrepreneurship and Policy*. Edward Elgar, Cheltenham-Northampton, pp. 321-349.

A major part of the traded sector capable of dynamic development consists of the manufacturing sector, particularly in less developed regions, thus in Hungary as well. The manufacturing sector influences the entire economy, its transformation results in spillover effects in the regions. The changes in the manufacturing sector affect the tendency of productivity, employment or the disposition to invest and consume. The majority of services is also related to a kind of manufacturing activity, thus the collective presence of manufacturing activities and services also considerably influence the growth of the economy of regions.

The present study aims to trace the significance and specialization of the manufacturing sector in Hungary's city regions following the 2004 accession to the European Union. Furthermore the objective is to reveal what characterizes the spatial distribution of the manufacturing sector in the city regions of Hungary. For this, first we briefly examine the role of city regions and the manufacturing sector in the Hungarian economy. We find out which manufacturing sub-sections stand out from all the sub-sections in terms of the number of persons employed, production or export sales. We further examine the sub-sections in which the changes following the EU accession are determining. We explore whether a sort of specificity of the geographical concentration of the outstanding manufacturing sub-sections can be revealed in the Hungarian city regions. In Hungary, there are in total 21 city regions forming a regional-economic unit – urban settlement groups in a precise term – for whose delimitation the settlements having close relationships with each other and the concentration of the population were taken into consideration. The advantage of applying urban settlement groups is that they reflect daily spatial path, actual spatial inhabitant, business and workforce relations. We reveal the concentration of manufacturing sub-sections into urban settlement groups by means of location quotient based on the number of persons employed.

2. The importance of city regions in the spatial structure of Hungary

By today the role of locality has been revalued. This phenomenon has been recognized not only by regional studies but by several trends of economics. One significant trend is the new economic geography lying on neoclassical bases. According to this the restructuring of global economy can be observed mainly as a consequence of decreasing transport costs,

increasing returns to scale in global industries and a monopolistic competition⁷. As an impact of the transformation of the spatial structure and the recognition of spatial concentration processes, the analysis of regional disparities and regional competitiveness, the examination of the economic role of urban regions, settlement groups has been started, as well as the utilization of their economic development opportunities and the analysis of the dynamics of polycentric city networks⁸. In the regional and cohesion policy of the European Union the integrated development of cities and their agglomeration is a priority program also between 2014 and 2020. Nowadays a global city hierarchy is emerging, which also has an effect on the Hungarian city network.

Since the 1970s numerous attempts have been made to delimit the city regions in Hungary. The delimitation currently being in force was completed in 2003 based on the census data of 2001 and defines 21 so-called urban settlement groups, which we also take as a basis in our study⁹. A major advantage of applying urban settlement groups – as opposed to settlements or statistical sub-regions – is that it takes daily spatial path, actual spatial inhabitant, business and workforce relations into consideration. Agglomeration is significant particularly in the case of Budapest, in the absence of which highly distorted results would be obtained.

We do not deal with the urban settlement group of Balaton in the detailed analysis of urban settlement groups due to its unique specificity, since its characteristic of being a hub is questionable, e.g. it does not have a nodal area. We examine only the other 20 city regions, whose agglomeration is within their own counties (of Budapest within Pest County), i.e. their agglomerations do not exceed county borders.

The weight of urban settlement groups is outstanding in the country. 52% of the Hungarian population live here, and these settlement groups have been the targets of internal

⁷ Krugman, P. (1999): The role of geography in development. *International Regional Science Review*, 22, 2, pp. 142-161.

Varga A. (2006): The spatial dimension of innovation and growth: Empirical research methodology and policy analysis. *European Planning Studies*, 14, 9, pp. 1171-1186.

⁸ Lengyel, B. – Leydesdorff, L. (2011): Regional innovation systems in Hungary: The failing synergy at the national level. *Regional Studies*, 45, 5, pp. 677-693.

Lengyel I. – Rechnitzer J. (2013): Drivers of Regional Competitiveness in the Central European Countries. *Transition Studies Review*, 20, pp. 421-435.

Szakálné Kanó I. – Lengyel B. (2013): Related variety and regional growth in Hungary: towards a transition economy approach. *Regional Statistics*, 1, pp. 98-116.

Lukovics M. (2009): Measuring Regional Disparities on Competitiveness Basis. In Bajmóczy Z. – Lengyel I. (eds): *Regional Competitiveness, Innovation and Environment*. JATEPress, Szeged, pp. 39-53.

⁹ Kovács T. – Tóth G. (2003): Agglomerációs, településgyűttesek a magyar településrendszerben (A területbeosztás 2003. évi felülvizsgálatának eredményei). *Területi Statisztika*, 4, pp. 387-391.

migration in the past one decade. It is interesting that while the number of population increased only by 1% in the settlement group centres (and in their partner centres), there was an increase of 12% in the other settlements belonging to settlement groups (Table 1). That is, actually the population of the agglomerations grew in relative sense, and a suburbanization process can be observed. However, the growth is not significant in absolute value (83 thousand persons), since the population of the agglomerations totals only about a fifth of the population of the centres (obviously the population of Budapest distorts).

Table 1 Main characteristics of urban settlement groups

Name	Population		Number of active corporations and unincorporated enterprises per 1000 inhabitants, 2010	Number of active companies per 1000 inhabitants, 2010	Gross income serving as personal income tax base per capita, thousand forint, 2011	Rate of registered jobseekers (%) in population of working age, 2011
	Persons	Change compared to the year of 2002, %				
Centres and partner centres in total	4 206 316	1	95	61	2 135	5.5
Other settlements belonging to settlement groups in total	929 384	12	69	38	1 822	6.4
Towns not belonging to settlement groups in total	2 408 490	-7	58	24	1 549	9.7
Villages not belonging to settlement groups in total	2 413 541	-7	37	15	1 336	12.4
Country in total	9 957 731	-2	70	39	1 772	8.4

Source: own edition based on HCSO (2012)¹⁰

These urban settlement groups, in line with the attraction of inhabitants, are economic hubs at the same time. The number of active enterprises per thousand inhabitants is outstanding, particularly that of active corporations (the number of active corporations per thousand inhabitants is 61 in the centres and partner centres, while 39 in the country). However, quite many companies are active not only in the centres, i.e. in the cities, but in their agglomerations as well, roughly corresponding with the national average. The gross income serving as personal income tax base per capita is 20% higher in the centres than the national average. The rate of registered jobseekers in population of working age is much lower in the settlement groups, 5.5% in the centres and 6.4% in other settlements belonging to

¹⁰ HCSO (2012): *Regional Statistical Yearbook, 2011*. Hungarian Central Statistical Office, Budapest.

settlement groups, which can be considered very favourable. The national average of 8.4% is raised by the data of the other towns and villages.

The weight of settlement groups and the potential of achieving higher innovation performance are demonstrated by what percentage of higher education graduates live in the region of a county town, and what rate higher education graduates have in the population (Table 2). It is surprising but understandable that 95% of the graduates of the Central Hungarian region live in Budapest and its agglomeration. Győr and Sopron (they are featured collectively), Pécs, Debrecen and Szeged also have high shares. In the case of the remaining settlement groups it can be noticed that the role of the county town as a city region is less dominant within the county.

Table 2 Higher education graduates and their rate in urban settlement groups (2011)

Urban settlement groups	Rate of higher education graduates in population, %	Rate of higher education graduates in the population of counties, %	Number of public higher education institutions	
			University	College
Budapest (together with Pest County)	23.0	95	11	2
Győr and Sopron	15.7	72	1+1	
Miskolc	16.3	49	1	
Pécs	18.1	70	1	
Eger	18.8	42		1
Szombathely	15.4	63	*1	
Zalaegerszeg	15.0	36		
Békéscsaba	12.5	54		
Debrecen	18.1	68	1	
Kaposvár	15.5	39	1	
Kecskemét	14.6	41		1
Nyíregyháza	17.9	47		1
Salgótarján	12.3	36		
Szeged	18.3	67	1	
Szekszárd	15.7	36		*1
Székesfehérvár	18.2	45		
Szolnok	16.4	41		1
Tatabánya	11.8	48		
Veszprém	17.7	35	1	
Country in total	19.1	71	20	7

* Outsourced higher education institutions

Source: own edition based on www.ksh.hu (HCSO census data) and www.oktatas.hu

It is completed with that the majority of the 20 examined urban settlement groups is a university or college centre. Nine of the settlement groups have a state/public university, and six have a state/public college of education. There are two regions (Szombathely and Szekszárd) which have outsourced higher education institutions of larger provincial universities and five settlement groups remain which have no state background institutions

that could provide the workforce base and workforce reproduction of the region. But these regions have less social and economic weight in the comparison of all settlement groups.

Having reviewed some main items of data of the urban settlement groups it becomes clear that these regions are indeed the hubs of regional concentration within the country, and mainly these regions have the potential to implement S3 strategies. The internal migration of inhabitants is directed to the urban settlement groups, since they find jobs more easily due to lower unemployment rates. The wages and incomes are also higher. As a consequence, the spatial structure of the country is restructured in these poles, hubs. Economic activities are also concentrated in space.

3. The role of the manufacturing sector in the Hungarian economy

The competitive operation of the Hungarian economy necessitated the creation of the conditions of market economy in the 1980s. One of the most important elements of the regime change in 1990 was the privatization, which had a major impact on industrial transformation. The country was opened for capital-intensive foreign companies with developed technologies, as a result of which almost 70 % of subscribed capital in the manufacturing sector came from abroad by the turn of the millennium. Foreign direct investment was located in Hungary partly because of more favourable costs, partly because of the markets and partly because of the unique factors of production (e.g. well-prepared workforce).

The Hungarian industry gave nearly 80% of the exports of the country at the time of the 2004 accession to the European Union, which share fell back to 65% in 2012¹¹. The share of the manufacturing sector from the GDP was around 21-22% throughout the period after 2004. However, the proportion of persons employed¹² decreased from 22% in 2004 to 20% in 2012, from 850 thousand persons to about 800 thousand. In 2010 the impacts of the crisis were still perceptible, at that time nearly 786 thousand persons were employed by the manufacturing sector. Following the millennium and the accession to the European Union in 2004, industrial production and exports increased dynamically until 2007. However, in the case of domestic sales stagnation and decline can be observed from as early as 2000, since products from the EU were already present in domestic markets at that time. Industrial production came to a halt first in 2007 and then sharply declined in 2009 due to the global crisis. As the crisis receded

¹¹ The source of data is the STADAT database of the Hungarian Central Statistical Office (www.ksh.hu)

¹² Following the proposal of the International Labour Organization related to the population aged 15-74.

and the main market partner countries, the German, French, Austrian, Dutch etc. economies strengthened, exports gained momentum, reaching the level of 2008 already in 2011, and considerably exceeding that in 2013. However, domestic sales continued to decrease after 2008. Because of the decline of domestic demand, industrial production basically stagnated only at the level of 2006 in 2013. Within industry, the manufacturing sector is characterized by a value around 85-90% in almost every index.

An accurate picture of the situation and the transformation of the manufacturing sector is provided by the analysis of a manufacturing sub-sections defined based on the NACE Rev. 2. We complete our analysis based on production, persons employed and export sales, and we examine the period of 2005-2010, which the data used in subsequent spatial analyses also applies to.

The analysis of the production of manufacturing sub-sections indicates that after the EU accession the impacts of the crisis became perceptible by 2009. Until the crisis, production increased in almost every sub-section, and in 2009 none of the sub-sections reached the production value of 2004, with the exception of 3 sub-sections (CF, CK, CM) (Table 3).

Table 3 Tendency of production in the sub-sections of manufacturing sector
(year of 2004 = 100%)

Code	Sub-sections	2005	2006	2007	2008	2009	2010
CA	Food products, beverages and tobacco products	94.7	95.8	97.3	89.7	91.4	97.3
CB	Textiles, apparel, leather and related products	90.8	92.9	102.0	88.3	68.0	74.7
CC	Wood and paper products, and printing	102.6	105.3	104.9	102.7	89.1	105.8
CD	Coke, and refined petroleum products	110.9	108.9	102.1	102.2	88.0	91.4
CE	Chemicals and chemical products	112.0	111.2	105.5	100.3	79.2	95.4
CF	Pharmaceuticals, medicinal chemical and botanical prod.	98.9	111.6	107.8	102.5	107.0	106.1
CG	Rubber and plastics products, and other non-metallic prod.	108.0	122.4	132.0	118.9	78.7	83.0
CH	Basic metals and fabricated metal products, except machinery and equipment	97.7	108.9	114.7	103.8	61.9	69.1
CI	Computer, electronic and optical products	119.7	140.4	134.3	111.4	83.2	104.6
CJ	Electrical equipment	105.5	112.1	109.0	98.1	75.5	69.1
CK	Machinery and equipment n.e.c.	108.8	120.1	127.7	130.5	102.4	128.7
CL	Transport equipment	113.8	138.0	140.2	116.5	71.2	83.4
CM	Other manufacturing, and repair and installation of machinery and equipment	102.1	116.1	124.2	135.7	126.2	96.4
C	Manufacturing	107.7	119.4	120.2	107.7	81.1	91.3

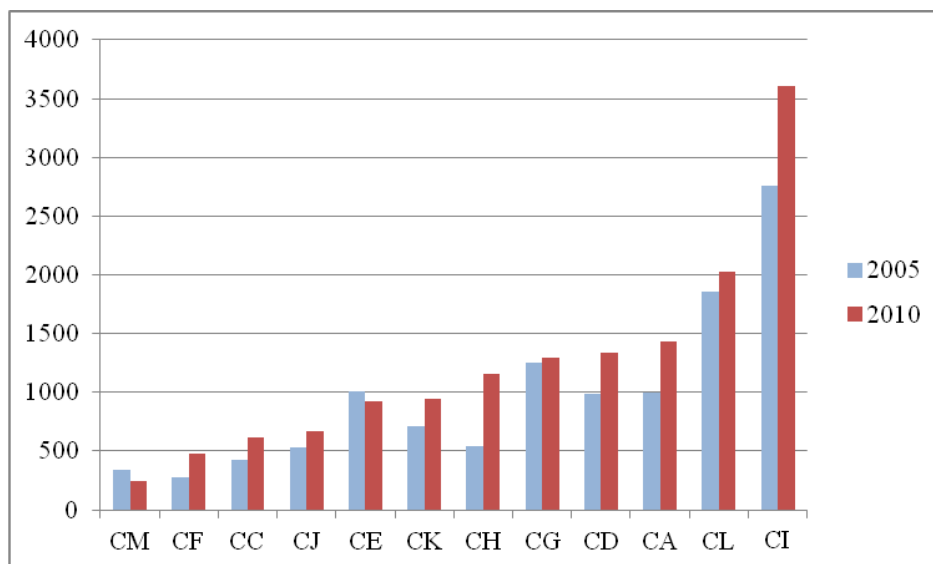
Source: www.ksh.hu (STADAT)

The most glaring of these tendencies is the decline of the production of electrical equipment (CJ), where the value of production in 2010 reached 69.1% of the level of 2004. As an impact of the crisis of 2008 the production of each sub-section decreased in 2009. The

sub-section of food products, beverages and tobacco products (CA) is the only exception. It was able to almost continuously increase its production, presumably because the production of the sub-section for exports is not significant, and it was less affected by export markets during the crisis. From 2010 different growth rates can be observed. From the EU accession of 2004 to 2010 the sub-section of machinery and equipment n.e.c. (CK) achieved an outstanding growth (of almost 30%), three sub-sections (CC, CF and CI) performed a growth of 5-6%. Following the crisis the production of several sub-sections started to grow, but compared to the EU accession period the production fell back in many sub-sections. Consequently, reorganization within the Hungarian manufacturing sector can be observed, partly as the impact of the international crisis.

It can be noticed in the analysis of production that the sub-section performing the highest growth does not have the highest value of production. The value of production is outstanding in two sub-sections, computer, electronic and optical products (CI) and transport equipment (CL) (Figure 1). Respectively 22% and 19% of the manufacturing sector production is provided by these sub-sections.

Figure 1 Production value of the sub-sections of manufacturing sector
(at current price, billion HUF)



Source: own edition based on www.ksh.hu (STADAT)

As an impact of the crisis the number of employees¹³ in the manufacturing sector in 2009 was almost 592 thousand persons, which number continued to decrease in 2010. From 2005 to 2010 the number dropped by 15%. Up until the crisis the manufacturing of electrical equipment (CJ) employed the most people out of all sub-sections (nearly 133 thousand persons), however, it sharply fell back after the crisis (to 37 thousand persons by 2010). Following the crisis the sub-section of food products, beverages and tobacco products (CA) employed the most persons (95 thousand persons in 2010), but the number of workers in the sub-sections of basic metals and fabricated metal products (CH) and transport equipment (CL) is also significant. Both of the latter sub-sections employed nearly 67 thousand persons in 2010.

Regarding the extent of growth, from among all sub-sections computer, electronic and optical products (CI) and transport equipment (CL) could increase the number of employees significantly, in the latter due to the increase in the number of German car assembly plants (Audi, Daimler-Benz, Opel).

In the manufacturing sector exports reached high values within total sales looking at any year, and noticeably from 2005 the rate continuously increased (Table 4). In 2010, the exports made up 70.2% of the total sales of the Hungarian manufacturing sector. While in 2005 the rate of export sales was between 23 and 91% by sub-section, by 2010 this rate was between 31 and 94%. In 2005 3 sub-sections (CI, CJ and CL) were able to export at least 75% of their production; while in 2010 already 6 sub-sections (CC, CD, CG, CK, CL and CM) were able to do so. In these sub-sections domestic sales have a low volume.

Throughout the years after the EU accession of 2004, the CI sub-section provides nearly 30% and the CL provides one-fourth of export sales in the manufacturing sector, i.e. collectively these two sub-sections give over half of the exports of the manufacturing sector. Furthermore, it can be seen that after the crisis the rate of export sales increased in the manufacturing sector. By 2010 the rate of exports increased in 12 sub-sections, it decreased only in the case of other manufacturing, and repair and installation of machinery and equipment (CM).

¹³Source: HCSO (2005, 2006, 2007, 2008, 2009, 2010): *Statistical Yearbook of Hungary*. Hungarian Central Statistical Office, Budapest.

According to HCSO institutional labour data collection system, employee = a worker who has an employment contract with the employer, and based on their labour contract, labour agreement they are required to complete at least 60 working hours on monthly average in exchange for wage. The scope of observation is the companies with a staff of at least 5 persons.

Table 4 The rate and distribution of manufacturing exports among sub-sections

Code	Rate of exports of total sales						Distribution of manufacturing exports among sub-sections					
	2005	2006	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010
CA	23.5	23.9	24.8	27.1	29.6	31.5	4.6	4.0	3.9	4.4	5.5	4.9
CB	74.1	76.8	79.0	76.8	78.2	78.2	2.7	2.5	2.3	1.9	1.8	1.5
CC	32.4	33.5	38.3	39.2	38.5	41.8	1.8	1.6	1.8	1.9	2.0	2.1
CD	27.2	25.0	26.6	25.0	21.5	27.0	2.7	2.6	2.5	3.0	2.1	2.9
CE	52.2	54.5	56.4	54.8	55.4	54.5	3.9	3.8	3.9	3.8	3.6	3.9
CF	70.5	75.8	74.8	76.5	77.0	82.6	3.0	3.4	2.9	3.1	4.0	3.8
CG	37.6	39.9	45.4	46.7	49.9	54.8	3.8	4.1	5.1	5.4	5.5	5.5
CH	50.6	54.3	58.5	59.5	58.5	60.9	6.6	7.0	7.1	7.6	5.8	5.9
CI	91.2	89.4	93.8	94.0	94.6	93.8	31.6	29.4	29.1	26.8	29.1	29.3
CJ	84.1	86.2	85.8	86.6	87.9	86.1	8.6	8.6	7.7	7.7	7.9	5.9
CK	68.3	72.2	72.8	72.1	76.9	87.2	3.6	3.8	4.0	4.7	5.7	7.6
CL	89.5	90.2	89.7	89.6	90.0	91.5	25.8	28.1	28.4	28.1	25.0	24.9
CM	38.9	40.0	38.8	42.1	45.2	47.7	1.2	1.2	1.2	1.5	2.0	1.7
C	64.2	65.7	67.9	66.7	67.7	70.2	100.0	100.0	100.0	100.0	100.0	100.0

Source: own edition based on www.ksh.hu (STADAT)

Overall, the manufacturing sector transformed after the EU accession and then the crisis, which affected the growth potential of the Hungarian regions. Four sub-sections stand out from all manufacturing sub-sections: machinery and equipment n.e.c. (CK), which was capable of an outstanding growth in its production; computer, electronic and optical products (CI) and transport equipment (CL), which sub-sections provide a considerable proportion of production and exports, and food products, beverages and tobacco products (CA), which employs the most persons out of all sub-sections.

4. Spatial distribution of manufacturing sub-sections

In the centre of further analysis we reveal the spatial specificities of the four highlighted sub-sections, and we examine their geographical concentration in the Hungarian city regions (urban settlement groups). In the case of each sub-section the strength of spatial concentration carries important information. We can measure the relative position of the given sector of a region within the country and the specialization of the region with location quotient (LQ).

The calculation of the location quotient is a frequently applied method of mapping potential key sectors, clusters in the international and national literature¹⁴. Identifying potential clusters is also necessary because the possibility of higher innovation performance is provided for companies of a given industry organized into a cluster¹⁵. The location quotient can be calculated based on data of employment, enterprise and exports. If we want to measure the regional concentration of the persons employed in an economic activity within the country, we can calculate employment LQ according to the following:

$$LQ = \frac{\text{Number of employees in a particular industry in a particular region} / \text{Total number of employees in a particular region}}{\text{Number of employees in a particular industry in the country} / \text{Total number of employees in the country}}$$

Based on this we can draw conclusions on the role of a given economic activity in the regional economy. We can identify a concentration if the value of the location quotient is at least 1. In this case we can infer a relatively higher geographical concentration of the examined economic activity in the given region compared to the entire national economy. In the cluster mapping conducted in Great Britain, a higher minimum value was defined for the LQ, $LQ \geq 1.25$. For this reason, in our study we examine the manufacturing sub-sections where $LQ \geq 1.25$, and we pay special attention to the regions where $LQ \geq 2$, following the cluster mapping methodology of the European Cluster Observatory.

In our case we examine the weight of manufacturing sub-sections compared to all economic activities. We calculate the employment LQ by comparing the periods of 2005 and 2010. The Company Code Register¹⁶ publication of the Hungarian Central Statistical Office serves as the source of data, which contains the data of companies according to seat. The edition of 2005 defines manufacturing activities according to NACE Rev. 1, therefore we converted these items of data corresponding with NACE Rev. 2.

¹⁴EC (2009): *EU Cluster Mapping and Strengthening Clusters in Europe*. European Commission, Brussels.
Miller, P. – Botham, R. – Gibson, H. – Martin, R. – Moore, B. (2001): *Business Clusters in the UK*.
Department of Trade and Industry, London.

Szakálné Kanó I. – Vas, Zs. (2013): Spatial distribution of knowledge-intensive industries in Hungary.
Transition Studies Review, 19, 4, pp. 431-444.

Vas Zs. (2009): Role of Proximity in Regional Clusters: Evidence from the Software Industry. In Bajmócy Z. – Lengyel I. (szerk.): *Regional Competitiveness, Innovation and Environment*. JATEPress, Szeged, pp. 162-182.

¹⁵ Porter, M. E. (2000): Location, Competition and Economic Development: Local Clusters in a Global Economy. *Economic Development Quarterly*, 14, 1, pp. 15–20.

Sölvell, Ö. (2009): *Clusters and Balancing Evolutionary and Constructive Forces*. Ivory Tower Publishers, Stockholm.

¹⁶ HCSO (2005): *Company-Code-Register 2005. (4. quarter)*. Hungarian Central Statistical Office, Budapest.

HCSO (2010): *Company-Code-Register 2010. (4. quarter)*. Hungarian Central Statistical Office, Budapest.

Based on the calculations, a mixed picture is outlined about the spatial distribution of the highlighted manufacturing sub-sections in Hungarian city regions (Table 5). Machinery and equipment n.e.c. (CK), generally in the region of North Hungary (in the urban settlement groups of Miskolc, Eger), closely related to transport equipment (CL) but “forced out” of the urban settlement groups specialized in transport equipment manufacturing, is concentrated in the region of Northern and Western (Figure 2).

Table 5 Spatial concentration of highlighted sub-sections in urban settlement groups (LQ in year 2005 and 2010)

	Food products, beverages and tobacco products (CA)		Computer, electronic and optical products (CI)		Machinery and equipment n.e.c. (CK)		Transport equipment (CL)	
	2005	2010	2005	2010	2005	2010	2005	2010
Budapest	0.61	0.71	0.78	0.62	0.66	0.72	0.63	0.45
Győr	1.18	0.91	0.57	1.17	**3.41	0.55	**5.21	**7.14
Miskolc	0.95	0.58	0.59	0.41	0.68	**2.37	0.44	*1.28
Pécs	*1.65	0.63	*1.92	**2.53	0.58	*1.56	0.11	0.09
Eger	1.14	*1.67	**2.55	**2.76	*1.62	**3.49	*1.59	**3.06
Szombathely	0.46	0.63	**2.18	**3.36	*1.29	0.78	**2.79	**3.76
Zalaegerszeg	**2.30	*1.64	0.50	**2.72	1.13	1.19	0.54	0.35
Békéscsaba	**2.64	**2.33	0.60	**3.04	0.80	*1.68	0.16	0.62
Debrecen	*1.91	*1.74	0.92	1.05	0.86	*1.35	0.65	0.43
Kaposvár	*1.81	**2.55	*1.56	0.70	0.74	0.84	0.40	0.03
Kecskemét	**3.56	**3.05	**2.06	0.99	*1.94	*1.39	*1.66	*1.91
Nyíregyháza	**2.91	*1.32	0.37	**2.75	0.60	0.64	0.20	0.02
Salgótarján	0.64	0.21	0.27	0.89	**3.04	0.25	0.72	1.07
Sopron	*1.32	**2.00	0.60	*1.744	1.03	0.83	1.15	1.18
Szeged	2.83	**3.98	0.29	**2.05	0.64	0.45	0.50	0.30
Székesvárad	*1.67	**2.83	**2.24	**4.05	0.74	0.82	0.39	*1.35
Székesfehérvár	0.79	1.03	**4.36	0.64	**4.58	0.84	**3.50	**6.50
Szolnok	0.94	**2.33	0.11	**6.62	0.23	0.47	*1.70	0.39
Tatabánya	0.50	0.64	**2.54	0.61	*1.99	**6.78	*1.62	*1.38
Veszprém	*1.45	0.59	0.74	0.11	*1.20	**2.74	**3.92	1.88

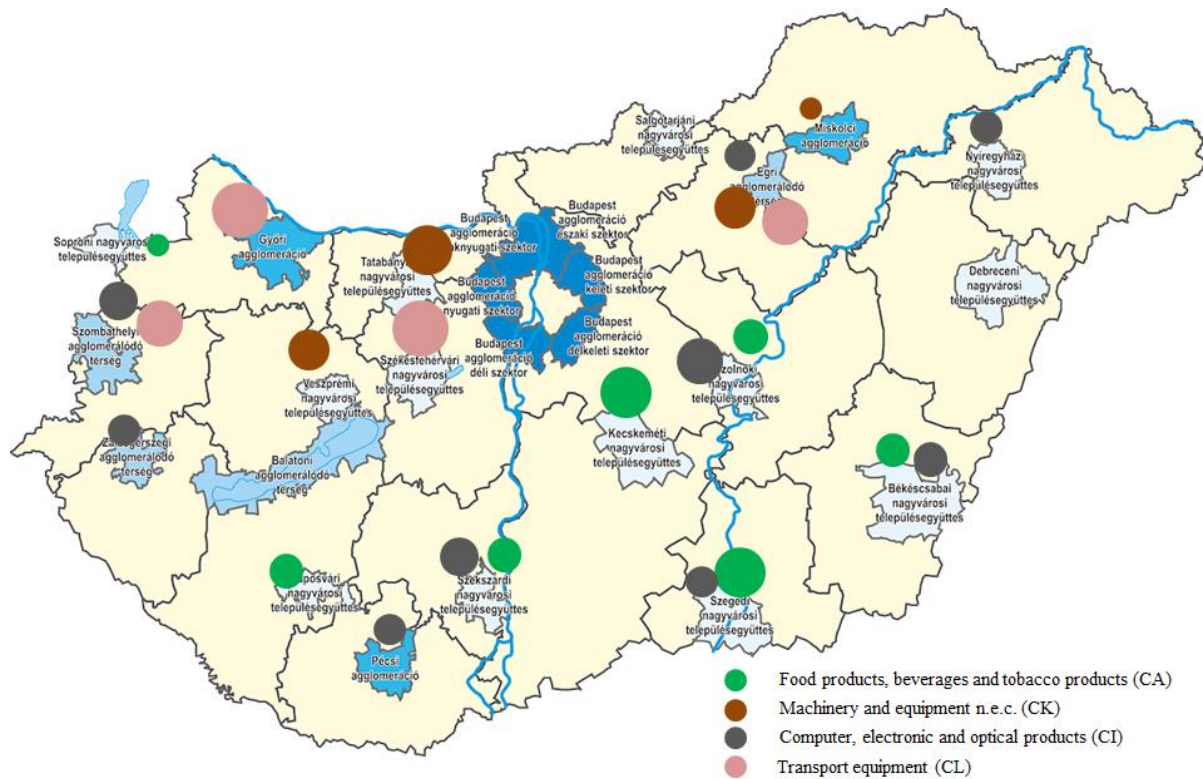
Note: *LQ≥1,25, **LQ≥2

Source: own edition based on HCSO (2005, 2010) – Company Code Register

The sub-section of computer, electronic and optical products (CI) is also concentrated relatively highly in some city regions, but these city regions are not necessarily found close to each other, they are not concentrated in a NUTS 2 level region. It may derive from the specificity that the companies try to strengthen their competitive position without cooperating with each other. An example for this is the Holocher+Bauer Electronics Ltd. in the region of Szolnok, employing over 200 persons, whose customers are the Mercedes-Benz and the General Motors. The performance of the sub-section is important for the companies of the Central Hungarian region, but it is the most outstanding in North Hungary and Southern

Transdanubia based on its weight. In the case of the companies of this sub-section it is particularly true that they are separated in space and a high percentage of their sales is realized abroad.

Figure 2 Potential key sectors of urban settlement groups



Note: potential key sectors based on data of 2010 where $LQ \geq 2$

Source: own edition

In the country, besides computer, electronic and optical products (CI), the performance of transport equipment (CL) is the highest, which is attributable to the high rate of foreign direct investment in the sub-section. In 2012, almost two thirds of the stocks of foreign capital were concentrated in 7 companies of these two sub-sections (HCSO 2012b). These are in the CL sub-section the AUDI Hungaria Motor Ltd. in Győr, the Hungarian Suzuki Co. Ltd. in Esztergom, and the LUK SAVARIA Clutch Manufacturer Ltd. in Szombathely; in the CI sub-section the Nokia Komárom Ltd., the Samsung Co. Ltd. in the agglomeration of Budapest, the Robert Bosch Electronics Ltd. in Miskolc and the NI Hungary Ltd. in Debrecen.

In the case of transport equipment it is glaring and inevitable that they are concentrated in urban regions and (level NUTS 2) regions. This can be traced back to the large-scale cooperation in the transportation industry and its related industries. Geographical proximity has a positive effect on the establishment of network cooperations and supplier relationships,

and it is necessary in the creation of an expert base, training and the implementation of collective developments.

It can be observed that the sub-sections of machinery and equipment n.e.c. (CK) and transport equipment (CL) are concentrated in the same regions of level NUTS 2, but in different, often neighbouring city regions. The reason for this is to be found in the rate of foreign direct investment, the proximity of higher educational institutions and the nature of the economic activity of companies. The difference in the composition of the sub-sections is demonstrated by that while the average corporate size in machinery manufacturing was the highest in the urban settlement group of Eger with 56 persons in 2010, in transport equipment manufacturing in the city region of Győr it equalled nearly 570 persons on average. The difference between the spatiality and composition of the two sub-sections can be presumably attributed not only to smaller organizational size but the different market demand for products.

Regarding any time horizon, the manufacturing of food products, beverages and tobacco products (CA) is relatively very highly concentrated. The results point out clearly that the “pantry” of Hungary is the Southern Great Plain region and its city regions (the urban settlement groups of Szeged, Kecskemét and Békéscsaba). The presence of CA sub-section is determining in the Northern Great Plain region as well, with the difference that the relative weight of the urban settlement groups of Debrecen and Nyíregyháza decreased over time, while that of Szolnok increased in the years after the accession. In addition, the city regions of Szekszárd and Zalaegerszeg appear island-like, in which the average food company size is the highest, following the small regions of Szeged and Szolnok (while it is 98 persons in Szeged, 42 persons in these small regions). However, any city region we examine, the majority is dominated by companies with Hungarian ownership and employing several persons (e.g. Pick Szeged Co. Ltd. in Szeged, Csabahús Ltd. in Békéscsaba, Kométa 99 Co. Ltd. meat industrial company or Hungarian Sugar Co. Ltd. in Kaposvár). Furthermore, it has to be noted that even if the Northern Great Plain and the Southern Great Plain regions are not the most developed regions of Hungary, they have excellent local conditions (production site, workforce etc.) for food industry.

Based on the unique characteristics of the studied sub-sections different city region types are outlined, which have to be taken into consideration in the development of the smart specialization strategy:

(1) On the one hand, manufacturing settlement groups producing for domestic market have to be distinguished. In these regions there are (similarly to Pavitt’s industrial typing of

1984) supplier-dominant industries (e.g. food industry) which use relatively simple technologies, employ less qualified workforce and the main resource of their innovation activities is the equity of the companies.

(2) Similarly to the former, we separate the manufacturing settlement groups generally producing for foreign markets and manufacturing related products. These include production-intensive industries (e.g. machinery industry) which have close relationships with their clients and customers and in which the company size is generally small, and the source of innovation is often represented by industry-consumer relations.

The supplier-dominant and production-intensive sub-sections can generally find their future in reindustrialization. In the regions providing location, S3 strategies could be started based on the traditions of existing manufacturing sector and utilizing localization and agglomeration advantages.

(3) The third circle of settlement groups is constituted by the externally (FDI) controlled and science-based manufacturing settlement groups (involved in computer, electronic and optical products and transport equipment). Within this, two groups of sub-sections emerge: (3/a) on the one hand, the sub-sections (e.g. transport equipment) which are concentrated in neighbouring settlement groups and for which the geographical proximity of universities, colleges and intra-industry and extra-industry partners (in related industries) is important for efficient corporate cooperations and completing innovation activities; (3/b) on the other hand, the sub-sections which are located dispersed in space, and for which the proximity of higher educational institutions is not necessary.

These city regions are characterized by that they can be integrated into the European economy through the departments of multinational companies of the manufacturing sector. In the case of these regions the departments of multinational companies often function as an “island”, they have minimal local multiplier effects. The regions are generally externally controlled, which enjoy localization and agglomeration advantages. It is difficult to involve them in the implementation of place-based strategies, the emphasis mostly has to be placed on the support of networking with local supplier base in the elaboration of S3 strategies.

5. Conclusion

In the examination of the spatial distribution of manufacturing sub-sections several specificities become visible, which carries an important message in the elaboration smart specialization strategies. Urban settlement groups have an important role in the Hungarian

economy, thus it would be practical to elaborate S3 strategies at the level of city regions. It is outlined through the analysis on the geographical concentration of the manufacturing sector that the particular city regions have different specificities, the strength and specialization of manufacturing sub-sections are different. The cause of differences is the diverse demand of sub-sections for resource, but similarly the composition of demand, technological intensity, rate of foreign direct investment, or the number of corporate cooperations ensuring better innovation performance. The different characteristics of manufacturing sub-sections also determine the specificities of the region providing location for the sub-sections. The results showed that it is useful to separate the three large groups of the settlement groups – producing for domestic market, producing for foreign market and manufacturing related products and the externally (FDI) controlled and science-based manufacturing settlement groups – and the sub-section groups within these categories.

Of course the geographical concentration of manufacturing companies itself does not represent the possibility for the development and successful operation of key sectors, clusters, which is also essential to implement the strategies of smart specialization. It is necessary to have for example suitable workforce, networking, development of business environment, etc. The traded nature of economic activities and the existence of a domestic base are also important for the development of potential key sectors.

We believe that this analysis provided a suitable tool to found the strategy for the smart specialization of city regions, of course together with other analyses. If the specificities of a particular city region are outlined, the scope of economic activities with a domestic base and their character of a potential key sector become visible, then it is possible to outline the development path of the region, the basis of the strategy for smart specialization.