Knowledge and Confidence in Győr Automotive Industrial District[1]

Dr Melinda Smahó PhD
assistant professor, Széchenyi István University
E-mail: smahom@sze.hu

Introduction

The automotive industry is characterised by high spatial concentration, which is favourable for research and development activities as well as innovation process. Successful working of these knowledge-based processes needs spatial proximity and a high degree of trust and networks; industrial districts can provide a suitable environment for spatial organisation of the automotive industry. *The study aims to analyse the role and working mechanism of knowledge and trust in automotive industrial districts. A theoretical overview of industrial districts, knowledge and trust is followed by the analysis of these issues in Győr Automotive Industrial District.*

Currently, automotive industry plays a vital role in the Hungarian economy; it accounted for 30% of manufacturing industrial output in the first eleven months of 2016 (*HIPA* 2016a). Four large car manufacturing companies (Audi, Mercedes-Benz, Opel[2], Suzuki), and 40 of the 100 most important global components suppliers are located in the country (*HIPA* 2016a). Győr and its surrounding have been the basis of Audi Hungaria Plc. since 1993. In this area, Győr Automotive Industrial District has evolved for the last 25 years, based on long industrial traditions (knowledge-base) in the field of vehicle industry. The centrum of the district is Győr, a town with 130 thousand inhabitants located in North-Western Hungary.

Trust and reliability may play a key role in strategic supply agreements in the automotive industry, where Just-In-Time and Just-In-Sequence systems are typically used. Thus, large car manufacturing firms usually choose the most reliable multinational companies to develop and supply modules and components for their production. These choices are based unequivocally on powerful trust, but what is the situation from Hungarian SMEs located in the Győr Automotive Industrial District regarding knowledge and confidence? Which experiences do they have regarding knowledge flow and trust?

[1] Publication of this study has been supported by the project „Internationalization, initiatives to establish new sources of researchers and graduates, development of knowledge and technology transfer as tools of intelligent specialisation at Széchenyi István University, EFOP-3.6.1-16-2016-00017". The content of this study has been based on research supported by TÁMOP-4.2.2.A-11/1/KONV-2012-0010 Regional Vehicle Industrial District as a New Direction and Tool of Area Development.
[2] PSA group took over Opel and Vauxhall brands from General Motors 2017. General Motors walk out from Europe with this sale. Opel engine plant located in Szentgotthárd is going to produce PSA engines from 2020 (*HVG* 2018).

This study seeks the answer to the following research questions:

1. Which roles do knowledge and trust play in the development of industrial districts?
2. How can trust/confidence influence the knowledge-based process of an industrial district?
3. Which features of the knowledge-based process can be identified in Győr Automotive Industrial District and how can they be improved?

To gain empirical evidence about Győr Automotive Industrial District, as a member of our research group I was involved in carrying out a company as well as a citizen survey. Both surveys contained specific questions about knowledge and confidence issues. In the frame of the company survey, micro, small and medium-sized enterprises (with two or more but fewer than 250 employees) were asked, that is, individual entrepreneurs and large businesses were not involved in the questionnaire. In this way, data of 240 firms located in Győr or its surroundings (less than 60-70 km away) were collected and put in a database between September 2013 and February 2014. The company sample is representative according to economic sectors, but unfortunately it does not fulfil the criteria of spatial representativity (*Nárai* 2014a).

The citizen survey enriches the analyses with new aspects. In the frame of this, 3032 persons were asked in Győr[3] and further 1547 in its surrounding, all of them over 18 years of age. This questionnaire, carried out between September 2013 and February 2014, resulted in two samples (city sample, surroundings sample), both of them are representative according to sex and age, and the first one according to quarter as well.

In the first part of the study, the concept of Industrial Districts originated from Alfred Marshall's definition is discussed, and completed with detailed theoretical considerations of trust and its role in knowledge sharing process. The second chapter investigates the role of knowledge and level of trust in different types of industrial districts. The third part concentrates on knowledge dynamics and specific features of innovation in automotive industrial districts, which is followed by an empirical analysis of Győr Automotive Industrial District in the fourth part. The last chapter contains the conclusion of the research and suggestions.

[3] After question 47 the Győr citizen survey was divided into three parts each of them with detailed thematic questions. Therefore, in case of some issues, the number of cases in the sample is smaller (N=1012, N=1013, N=1007).

1. Knowledge and confidence in industrial districts – theoretical considerations

Theory of Industrial Districts (IDs) goes back to Alfred Marshall, who recognised the economic importance of knowledge in his Principles of Economics (1890): ”*Knowledge is our most powerful engine of production; it enables us to subdue Nature and force her to satisfy our wants”* (*Marshall* 1961 [1920], 138). He also observed that industries concentrate in specific localities (’primitive localisation’), and over time, firms located in these concentrations gathered several advantages, which are essential for their operation. During this process, ’primitive’ localisation of firms changed into a ’more compound’ localisation, i.e. an industrial district. The above advantages were particular knowledge and information residing in the ’special atmosphere’, ’in the air’ of the district, identified by Marshall as follows (*Belussi–Caldari* 2009):

- ✓ hereditary skill (knowledge transmitted across generations and become locally bounded),
- ✓ the growth of subsidiary trades (supporting industry),
- ✓ the use of highly specialised machinery,
- ✓ the local market for special skill (easy to find specially trained workforce),
- ✓ industrial leadership and
- ✓ introduction of novelties into the production process.

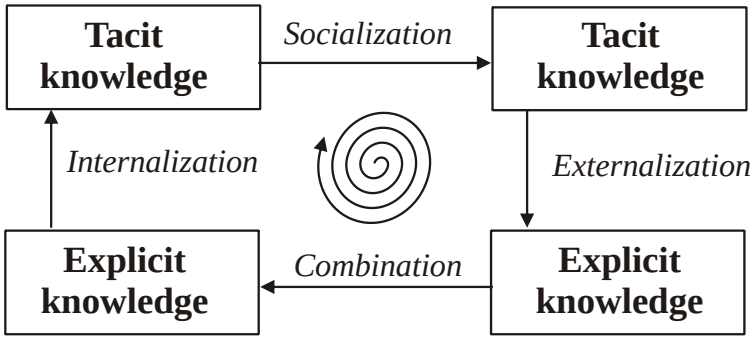
According to Marshall, *”if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas”* (Marshall 1961 [1920], p. 271.). With his notion about industrial districts, Alfred Marshall had foreseen the decisive role of implicit (tacit) knowledge (embedded in hereditary skill) conceptualized by Michael Polányi 1966 (*Polányi* 1997), as well as the interactive nature of knowledge creation process introduced by Nonaka and Takeuchi 1995 (*Nonaka* 1994, *Nonaka–Takeuchi* 1995, *Mészáros* 2001). Both of these issues influence vitally the success of industrial districts.

Michael Polányi distinguished between two types of knowledge; explicit (codified) and implicit (tacit) knowledge. Explicit or codified knowledge can be easily conceptualised in the form of words and can be transmitted by the formal language (*Polányi* 1997 [1966]). On the contrary, implicit or tacit knowledge has a personal character, encumbering its formalisation and transmission (*Polányi* 1997 [1966]). Obtaining tacit knowledge requires mutual trust and understanding, a common language and frequent personal interactions, i.e., the physical presence of both deliverer and recipient of knowledge. A growing geographical distance between the actors raises the cost and diminishes the frequency of personal interactions. Thus, the dispersion of tacit knowledge has geographical boundaries (*Audretsch* 1998; *Cooke et al.* 2007), and therefore it is called sticky (*von Hippel* 1994).

Related to the hereditary skills, also the concept of shared mental models set out by Douglass North, founder of the new institutional economics, should be mentioned. According to North, *“mental models are the internal representations that individual cognitive systems create to interpret the environment”* (*Denzau–North* 1993, 2.p.). Mental models are based on individuals’ cultural heritage, which is composed of norms, values and knowledge accumulated and transferred over generations (*North* 1993; *Denzau–North* 1993).

The thought of Marshall about combining someone other's idea with own suggestions can be recognised in the Nonaka-Takeuchi model according to which new knowledge is generated through conversion between different types of knowledge. The first step of this process is sharing tacit knowledge (socialisation), which is followed by externalisation, i.e., knowledge will be codified (explicit knowledge). Then, different explicit knowledge elements will be combined, recontextualised and synthesised, which process also generate new knowledge. Finally, explicit knowledge will be converted into tacit knowledge through understanding, traditional learning as well as learning-by-doing (internalisation). Thus, generation of new knowledge is a continuously growing spiral process, which starts from the individual level and goes on toward the community as well as organisational level. Finally, it crosses the border of the organisation and overreach to inter-organisational level (*Nonaka* 1994; *Nonaka–Takeuchi* 1995; *Sándori* 2001) (*figure 1*).

Figure 1. Types of knowledge conversion

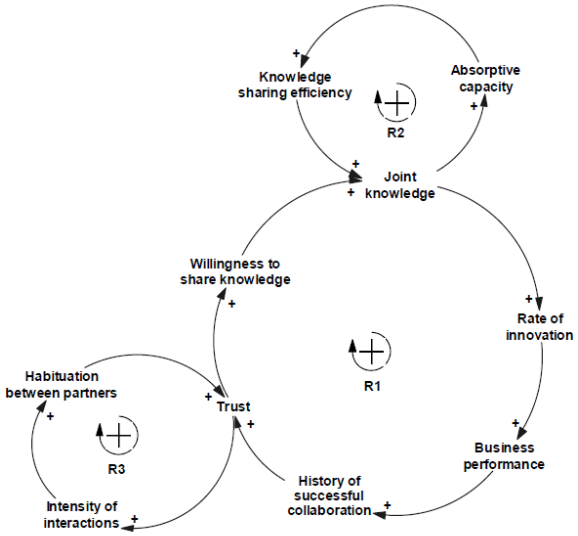


Source: Nonaka–Takeuchi 1995, 71.p.; Mészáros 2001

One of the most important prerequisites of sharing tacit knowledge is mutual trust among actors, e.g. business or cooperation partners. Trust is a comprehensive interdisciplinary concept, but in our relevance, it can be defined as *"an expectation concerning the convergence between promised and effective behaviour of an agent"* (*Mistri–Solari* 2003). It comprises the sum of beliefs and expectations on the one hand and the intention of whether business partners are going to act according to the agreement on the other hand (*Piritz* 2013).

Trust in the partner enhances the willingness to share knowledge, which results in collective knowledge. This leads – through accelerated innovation – to an increase in the business performance (R1). The more an organisation learns, the bigger absorptive capacity it can possess, which improves the organisation's efficiency in knowledge sharing process further (R2). Over time, successful cooperation enlarges trust between partners, which follow that interactions become more and more frequent. Because of mutual adaptation of partners to each other, common habits evolve, which tends to deepen trust between partners (R3), and a collective learning process takes place between them (*figure 2*) (*O'Callaghan* 2006).

Figure 2. Self-reinforcing loops of interorganisational knowledge transfer and learning



Source: O'Callaghan 2006, 7.p.

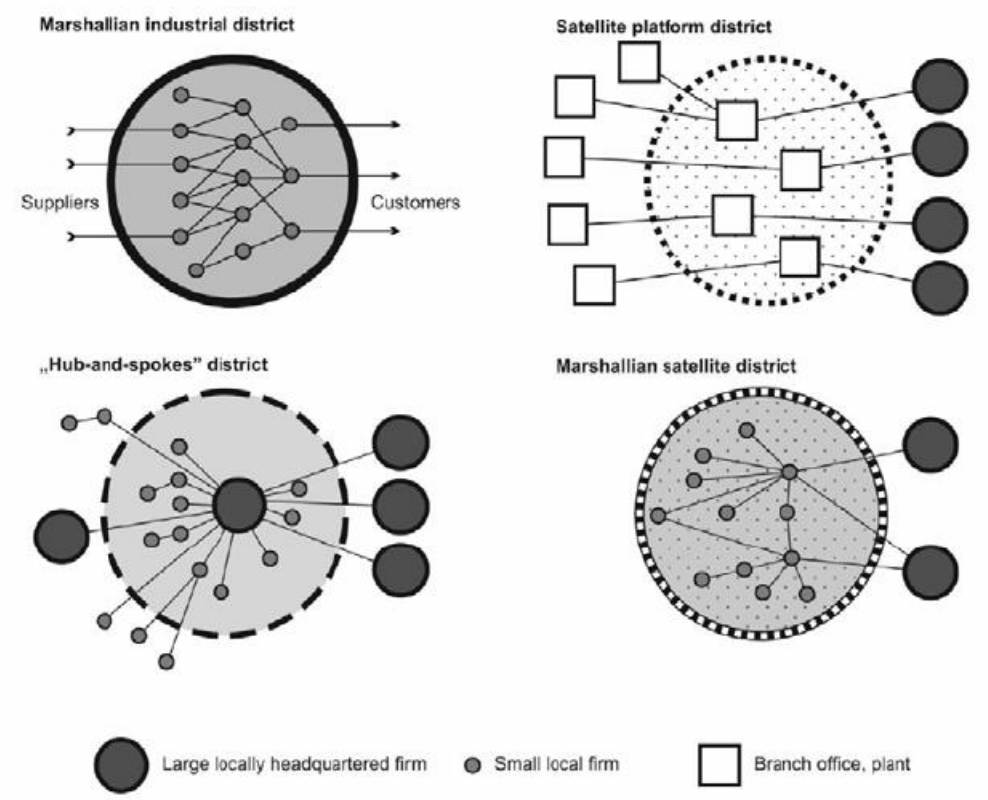
The existence of trust in industrial districts is fundamentally a positive and essential phenomenon; it can be regarded as a driver of sharing tacit knowledge and innovation. However, as a negative consequence, high level of trust can lead to lock-in effects in industrial districts in the long run, in three different ways. Firstly, tight and stable linkages among district firms (or between leader firm and its suppliers) make possible the reduction of transaction costs, but, at the same time, these relationships suffer from lack of diversity and lack of external information (functional lock-in). Secondly, "group thinking" evolving from long-standing personal ties makes the perception of innovation opportunities as well as bridging linkages more difficult; sources of knowledge and innovation cannot be widened (cognitive lock-in). Thirdly, vested interests of political actors and leaders of organisations discourage reorganisation of the district over time and stand the necessary changes again because their position is felt to be threatened (*Cai* 2004).

2. Knowledge and trust in different types of industrial districts

The firstly evolved districts, i.e., the so-called *'Marshallian Industrial Districts'* (MIDs), with their specialised and organically linked small- and medium-sized enterprises (SMEs), are the 'paradise' of firms' collective learning process and joint problem solving; they can be regarded as the ideal type of industrial districts. A Marshallian Industrial District consists of locally owned SMEs operating in the same (specialised) industry, while the majority of supporting industries and consumers are also local. District firms are characterised by strong personal trust and a high level of cooperative ability; people and entrepreneurs residing in the district form a tight-knit internal community (*Becattini–Bellandi–De Propris* 2009, *Lengyel* 2010). The flexibility of enterprises as well as trust-based horizontal relations between organisations are typical features. Trust can lower transaction cost and encourage knowledge flow within the district, where firms possess similar positions regarding knowledge access and absorption. Furthermore, short distances facilitate the institutionalisation of behavioural rules as well as knowledge transfer and collective learning process (*Boschma–Lambooy* 2002).

Marshallian Industrial Districts (*figure 3*) are characterised by an intense flow of *internal knowledge*, which is generated within the district and becomes the genetic property of IDs in the course of time. This is an experimental type of knowledge generated by learning by doing and learning by using process; it is transmitted among districts' firms by people as well as by their informal relationships (out of work). Internal knowledge gives the typical social-cultural atmosphere of the district (*Vito et al.* 1999). Nevertheless, innovation process is based on the combination and integration of knowledge coming from several different sources (*Robertson–Jacobson–Langlois* 2009). Therefore, to be successful, MIDs need to canalise *external knowledge*, which is originated from the continuous interaction of district firms with their external (out of district) environment. This can appear in the form of market information or can be embodied in products and services (*Vito et al.* 1999).

Figure 3. Types of industrial districts



Source: Lux 2014, 32, based on Lengyel 2010, 211

Lack of external knowledge led to lock-in phenomena in Marshallian Industrial Districts in the 1970s constraining their development and enforcing their necessary changes to survive (*Cai* 2004). Typical MIDs located in Italy went through fundamental changes from the beginning of the 1980s, concerning also the issues of knowledge and trust. In the era of increasing globalisation and competition, industrial districts became more and more concentrated, both horizontally and vertically. Vertical concentration resulted in the emergence of a dominant firm or business group inside of the district, disrupting or fundamentally changing the former systems of trust-based relationships, knowledge flow and equal distribution of SMEs to power. Consequently, the number of relationships among district firms decreased, as well as the process of interactive collective learning weakened unequivocally (*Boschma–Lambooy* 2002).

Connected to the appearance of leader firm(s), internationalisation of districts took place, i.e., district firms established more and more relations with suppliers and service providers located out of the ID. Leader firms have been able to acquire codified scientific knowledge from several external sources through their international network; in this way, the knowledge base of the districts has been increasing. As technology has become more complex, leader firms have been a crucial role in its streaming into the IDs, because smaller district firms usually suffer from lack of absorptive capacities, i.e., adequately trained workforce. In addition to this, support and capacities of local universities and R&D institutions are also needed for a successful adaptation of complex technologies within the district (*Boschma–Lambooy* 2002).

Leader firms are interested in keeping vital elements of their knowledge (core competencies) inside of their gates, to avoid technological spillovers in the district. At the same time, they need to rely on other district firms (suppliers) strongly in favour of maintaining or increasing their compatibility. Relationships between leader firm and its suppliers are characterised by a high level of dependency, which raises uncertainty and emphasises the need for coordination. Leader firm can decide to codify transferable knowledge to have a more coordinated relationship with their supplier firms. Knowledge codification increases the speed of knowledge transfer, thereby more information can be exchanged, and tasks can be defined more clearly; in this way, knowledge codification makes knowledge transfer process reliable and decreases its uncertainty (*Vito et al.* 1999).

As a result of the codification process, knowledge can be shared with other district firms (competitors) more easily. To avoid the risk of imitation as well as giving not deserved advantages for competitors, leader firms try to control knowledge transfer by reducing the number of suppliers, choosing the most competitive and most reliable ones; in this way, vital vertical business relationships can be established in the ID. It follows from this that there are very tight trust-based relations between the leader firm and its suppliers; however, increasing level of the hierarchy causes a reduction in the number of knowledge transfer channels (*Vito et al.* 1999). Thus, former trust-based horizontal relations of SMEs lost their relevance in this environment; new types of industrial districts (hub-and-spokes district, satellite industrial platform, Marshallian satellite district) evolved also integrating a vertical dimension, where knowledge-based process and level of trust have considerably changed.

The so-called *'Hub-and-spokes district'* is dominated by one or some locally based large company(s) belonging to a single industry or related set of industries. Leader firms of the district usually demonstrate a low level of ability to cooperate with each other, instead of this, they are connected to other large businesses located outside of the ID. Furthermore, they have a well established vertically integrated network of local suppliers, that is, local SMEs are mainly linked to them, and do not dispose of external relationships and cooperations. Local financial and business services are adjusted to the needs of powerful leader firm(s). Both central and local governments take considerable efforts to maintain the encouraging business environment and infrastructure inside of the district. Hub-and-spokes districts usually gain advantages from utilising economies of scale (*figure 3*) (*Lengyel* 2010, *Lux* 2014).

In *'Satellite industrial platforms'* (*figure 3*), branches (subsidiaries) of some large companies headquartered externally are settled, representing a diversified industrial structure. They are strongly connected to external mother firms but do not cooperate with each other inside of the ID. Furthermore, local SMEs have trust-based business cooperations neither with foreign mother firm, nor its subsidiary located in the district (i.e. the leader firm). Subsidiaries concentrate on taking advantages of mass production (economies of scale) and are influenced by mother firms' decisions taken externally. Local governments can facilitate their location by local tax discounts and infrastructure development (*figure 3*) (*Clark–Huang–Walsh* 2009, *Lengyel* 2010, *Lux* 2014).

Some features of satellite industrial platforms combined with those of Marshallian Industrial Districts describe a hybrid type of district, the so-called Marshallian satellite district. It is characterised by trust-based and strongly connected locally-owned SMEs, and, at the same time, strong external dependency. There is a high level of cooperation and engagement regarding the development of the ID, but the implementation of development ideas depends on external sources (*figure 3*) (*Lengyel* 2010, *Lux* 2014).

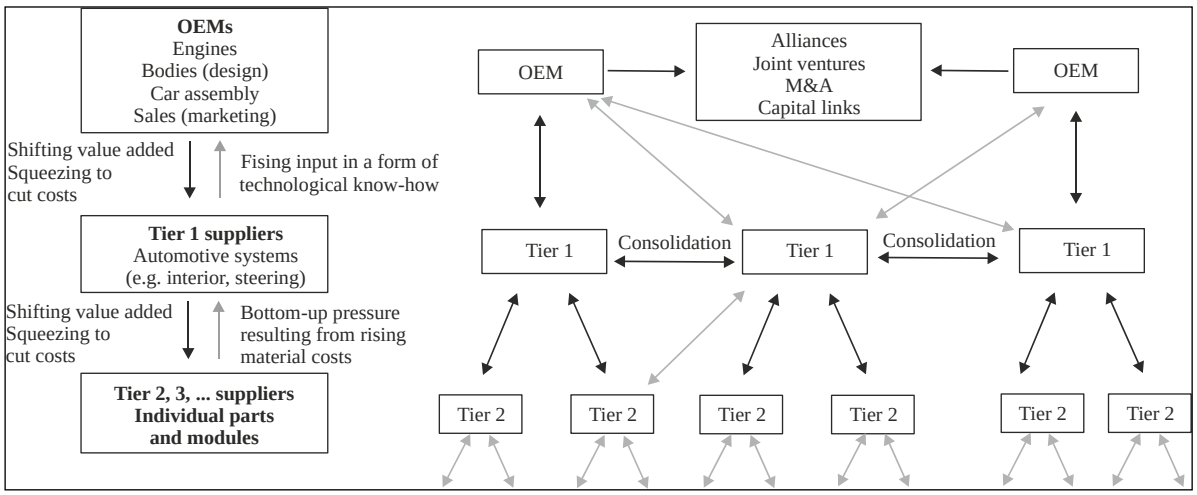
In the automotive industry, hub-and-spokes districts are characteristic (e.g. USA, Japan). However, in case of foreign leader firms (OEMs), often satellite industrial platforms evolve, where the leader firm and the local small- and medium-sized enterprises are not connected. Over time, with better embeddedness of the leader firm, a satellite industrial platform can transform into a hub-and-spokes district (*Lengyel* 2010; *Lux* 2014).

3. Knowledge dynamics of automotive industrial districts

Innovation in the automotive industry may be interpreted mainly as a collaborative work, i.e. the outcome of vertical cooperation between the car manufacturing companies (leader firms) and their technologically experienced Tier1 suppliers (*Sofka et al.* 2008). A peculiarity of this sector is that the production of components having high added value, being capital intensive and requiring research and development is combined with the manufacturing of parts and components having low added value and being labour intensive (*Fortwengel* 2011).

The automotive industry is a typical example of the so-called quasi-hierarchical value chains in which Original Equipment Manufacturers (OEMs) – operating as leader firms – organise and control the value chain by their corporate and market power. They decide on which suppliers to involve in the network and which ones to exclude therefrom. Furthermore, it is also their competence to define the characteristics of supplied parts, as well as the production, transportation and quality control process relevant to such parts; their coordination activity expands not only on their direct suppliers but also on all of them along the supply chain *(figure 4)* (*Humphrey–Schmitz* 2002; *Pavlínek–Ženka* 2010).

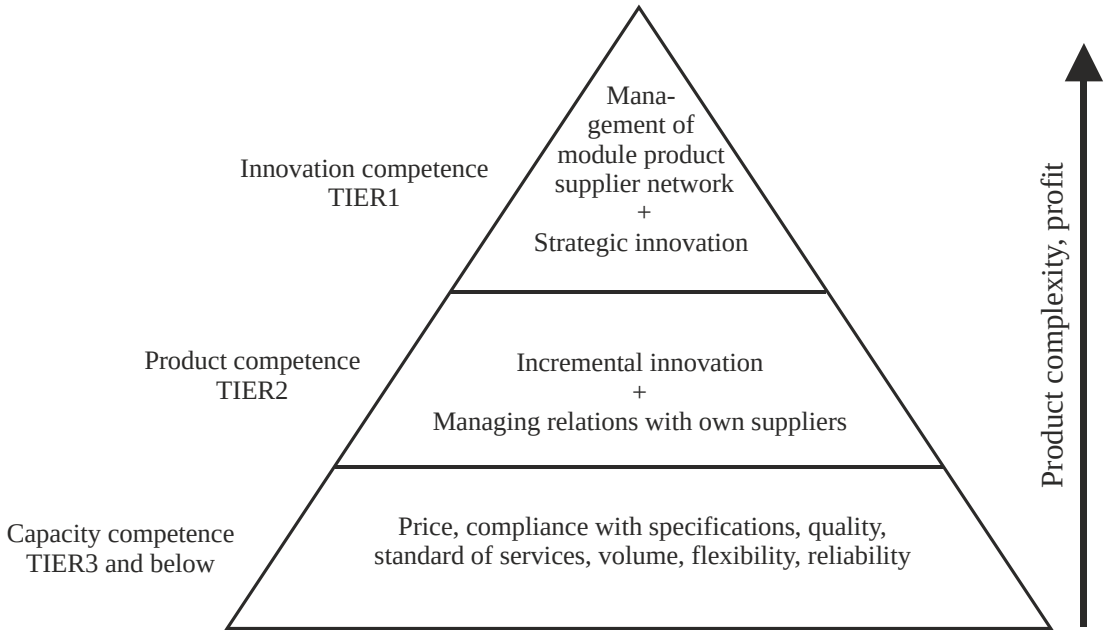
Figure 4. The system of relations between car manufacturers (OEMs) and their suppliers; structure of the value chain



Source: The Automotive Sector in CEE… (2007, 9).

In fact, only the largest (Tier 1) suppliers have the appropriate innovation competencies; they are the ones, who are capable of implementing radical (strategic) product and technological innovations. Additionally, they are expected to produce their parts, to assemble the complex module associated with the parts as well as to manage the supply chain related to this module – in compliance with the OEM's demands and requirements (*Gelei–Venter–Gémesi* 2011). According to the logic of modular production, the geographical proximity of OEMs and Tier 1 suppliers is inevitable (*Pavlínek–Ženka–Žížalová* 2010). Thus, relocation of car manufacturers to establish module-competence often encourages or forces suppliers to follow them and be globally present. In this case, Tier 1 suppliers' usual best practice is to acquire their competitors, of course, inclusive of their technologies (*Kremlicka et al.* 2011).

Figure 5. Pyramid of supplier competences



Source: Own editing based on Gelei–Venter–Gémesi (2011, 186–190).

At the same time, not only conventional suppliers may benefit from the outsourcing of developmental functions, but also companies providing developmental services. They have appeared as new, independent role players in automotive industry hence they may enter into service of any – or even more than one – car factories or suppliers at the same time. As third parties, they are increasingly involved in the cooperation between suppliers and OEMs, and with their technological knowledge, they support the participants of the development network significantly. Furthermore, they often undertake the role of the "leader firm" in the development process of modules and components, including also the responsibility for the coordination of developmental networks. However, their future role cannot be sufficiently estimated, since system suppliers taking over more and more developmental functions from the car manufacturers are not interested in transferring or outsourcing developments; on the contrary, they take all efforts to retain them, to enhance and reinforce their key know-how (*Kinkel–Zanker* 2007).

Tier 2 suppliers have only product-competences, which cover the implementation of incremental innovations, i.e., development of specifications or production technologies (for instance in case of a model change) of the manufactured product *(figure 5)* (*Gelei–Venter–Gémesi* 2011). Although fewer suppliers are capable of meeting the ever-increasing requirements, the remaining ones are appreciated and respected by the car manufacturers as equal strategic partners. Thus, competition between suppliers increases, they put even more emphasis on direct connections with car manufacturers, and in case of location decisions, on spatial proximity of large car manufacturers (*Kinkel–Zanker* 2007).

From the beginning of the 1990s, subsidiaries of foreign OEMs started to appear in Central and Eastern European countries making green- or brown-field investments, and supplier firms were expected to follow them. Their location was mostly based on historical automotive or vehicle industrial traditions of the selected Central and Eastern European regions. However both leader firms and big suppliers have taken advantages of low wages in these regions, they have led in world standard high technology to old and new factories as well (*Smahó* 2012). In any case, they dynamised the economy of the region where they settled in, and new industrial districts started to evolve around them.

4. Empirical evidence – the case of Győr Automotive Industrial District

Győr Automotive Industrial District has remarkable industrial traditions in the field of vehicle industry thanks to the activity of Hungarian Railway Carriage and Machine Works Plc. (RÁBA) founded in 1896. The firm was producing different kinds of railway and armoured cars as well as passenger cars and trucks. Currently, RÁBA Automotive Holding Plc. is manufacturing axles and axle components for trucks, special vehicles and busses; whole trucks and parts; bus chassis and superstructures (bodies) as well as vehicle components. The company takes considerable efforts in research and development as well as in innovation activities (*RÁBA* 2018).

Based on these long traditions in vehicle production, the region of Győr has been dominated by Audi Hungaria Plc. – a production site of AUDI AG – since 1993. Principal economic activities of Audi plant in Győr incorporates engine and passenger car production, tool engineering, engine and car development activities, production technology and logistics as well as quality assurance (*AUDI* 2018). Audi Hungaria, the world's largest engine factory, with its more than 12 thousand employees 2017 functions as the leader firm of Győr Automotive Industrial District (*AUDI* 2017). It has been accompanied by subsidiaries of several multinational supplier firms with considerable R&D and innovation competencies, placed at the top of the supplier hierarchy. Regarding knowledge issues, Audi Hungaria has built up close cooperations with Széchenyi István University located in Győr, where Audi Hungaria Faculty of Automotive Engineering – comprising four departments – was established (*Czakó* 2014, *SZE AHJK* 2018). Students can take part in dual education. Next to this, Research Center of Vehicle Industry, an autonomous research unit of the university also strengthens research and development activity related to vehicle industry with Audi Hungaria listed among their partner organisations (*SZE JKK* 2018).

However, cooperation between Audi Hungaria and local small- and medium-sized enterprises has still been not typical. The leader firm purchases only 7% of its component needs from Hungarian companies, while the proportion of Hungarian supply is much higher in case of other OEMs located in Hungary (Mercedes-Benz Manufacturing Hungary Ltd. 23%, Hungarian Suzuki Plc. 30-40%.) (*HIPA* 2016b). At the same time, Hungarian supplier firms can be found at the bottom of the supplier hierarchy, at Tier 3 level or lower (*Czakó* 2014). Most of the Hungarian firms have no chance to be Tier 1 supplier, because of several reasons. Only a few of them produce final products, and next to capacity and labour force problems, they are also lonely. Without cooperation, they are not able to promote their interest and have not enough power against large multinational companies. Hungarian government aims to integrate both leader firms and Hungarian SMEs increasingly into the domestic economy. Strategic agreements were signed with industrial actors to stimulate investments, increase the number of Hungarian supplier firms, encourage research and development cooperations, as well as improve the communication between economic actors and the government (*HIPA* 2016b).

Trust and reliability play a key role in strategic supply agreements, especially in the automotive industry, where Just-In-Time and Just-In-Sequence systems are typically used. Thus, the leader firm usually chooses the most reliable large companies to develop and supply modules and components for their production. These choices are based unequivocally on strong trust, but what is the situation from Hungarian SMEs located in the Győr Automotive Industrial District regarding knowledge and confidence? Which experiences do they have regarding knowledge flow and trust?

According to the company survey, in case of which 87% of respondents were Hungarian small- and medium-sized enterprises located in the Győr Automotive Industrial District, only weak knowledge flow can be perceived in the district. Knowledge flow inside industries is considered stronger than those between industries *(table 1).* About half of the respondents stated that access to knowledge is a motivational factor for them to cooperate with suppliers or customers, i.e., to build up vertical collaborations. At the same time, almost one-third of the respondents are ready to cooperate with competitors to access knowledge *(table 2).* Thus, vertical collaborations are considered more important in the district than horizontal ones. In Hungary, domestic firms are typically lonely; they do not have enough information about each other, even if they worked in the same industry. However, they should cooperate horizontally to obtain some larger projects. Together they could have a better chance to enter or upgrade in the supplier hierarchy (*HIPA* 2016b).

Table 1. Types of knowledge flow

Types of knowledge flow	Knowledge flow			Knowledge does not flow	Together
	only inside the industry	only between industries	both inside and between industries		
Pure knowledge transaction (N=208)	30 (14,4%)	6 (2,9%)	10 (4,8%)	162 (77,9%)	208 (100%)
Informal, free knowledge flow (spillover) (N=212)	41 (19,3%)	7 (3,3%)	12 (5,7%)	152 (71,7)	212 (100%)

Source: own construction according to the company survey

Table 2. Motivational aspects of accessing knowledge

Does access to knowledge motivate the firm to	Yes	No	Together
1. cooperate with customers	*115*	*113*	*228*
2. cooperate with suppliers	*113*	*114*	*227*
3. cooperate with competitors	77	148	225
4. cooperate with higher educational institution/research institution	48	176	224
5. win over workforce from other companies	38	186	224
6. enter a cluster organisation	23	200	223

Source: own construction according to the company survey

According to the company questionnaire, lack of finance (both company and external sources), as well as the weak absorptive capacity of potential partner organisations are considered as most common discouraging factors of the knowledge-based process, cooperation and innovation perceived by Hungarian SMEs in the Győr Automotive Industrial District. As knowledge flow is weak in the district, also explaining factors are not strong; the leading two reasons are based on the answers of 21-26,7% of respondents. In addition to this, 17,5% of polled firms miss modern management knowledge and methods, 12% of them feel weak willingness of firms to transmit knowledge and 11,2% think that weak absorptive capacity of the surveyed firm can hinder knowledge flow, cooperation and innovation. Only ca. 8% of respondents mentioned

that lack of confidence could be a discouraging factor of the knowledge-based process, cooperation and innovation (*table 3*). Hungarian small- and medium-sized firms experience only a weak knowledge flow in the district, and at the same time, they are not able to identify embarrassing factors unequivocally.

Table 3. Discouraging factors of knowledge-based process and cooperation

	Discourages	Do not discourage	Total
Lack of finance (company level)	52	143	195
The weak absorptive capacity of the potential partner organisations	44	148	192
Lack of finance (external sources, applications)	39	147	186
Lack of modern management knowledge and methods	32	151	183
The weak willingness of the firm to transmit knowledge	21	154	175
The weak absorptive capacity of the firm	20	158	178
Lack of confidence in the potential cooperation partners	14	156	170
Lack of confidence derives from the negative experience of previous cooperation(s)	14	152	166
Corporate culture	8	159	167
Company's leadership approach	7	159	166

Source: own construction according to the company survey

Personal trust behind firms can also reflect additional valuable aspects. The poll finds that people living in Győr Automotive Industrial District put their trust first of all in their private sphere (family and friends). Colleagues (7,8) and employer (7,54) stay in the second place, while trust in clients and customers is considered as remarkably lower (6,66). Furthermore, confidence is stronger inside of firms than between them, which can be regarded as a normal phenomenon. However, it also raises interesting questions that respondents trust more in the inhabitants of their settlements than their clients and customers *(table 4)*.

Table 4. Level of people's trust in Győr Automotive Industrial District[4]

How strong is your trust in	N	Mean	St.Deviation
Family members	2989	9,28	1,28
Friends	2915	8,65	1,42
Colleagues	*2184*	*7,8*	*1,71*
Employer	*2149*	*7,54*	*1,91*
Inhabitants of the settlement	2920	6,71	1,63
Clients, customers	*1850*	*6,66*	*1,78*
People in general	2971	6,46	1,67

Source: own construction according to the citizen survey and Nárai 2014b

[4] Level of trust is measured by a scale ranging from 1 (weakest) to 10 (strongest).

Inside of workplaces, i.e., most firms, the majority of respondents share their knowledge, ideas and information with their colleagues; one-third of them with colleagues who are regarded as friends, and further one-quarter of them merely with colleagues. Sharing knowledge with chiefs shows a smaller proportion (21%), while about one-fifth of the questioned persons do not share their knowledge, ideas and information with anybody *(table 5).*

Table 5. Knowledge sharing at workplaces

At my workplace, I share my knowledge, ideas, information with…	Frequency (number of persons)	Frequency (%)
colleagues regarded as friends	305	33,2
colleagues	233	25,3
chiefs	196	21,3
nobody	186	20,2
Together	920	100

Source: own construction according to the citizen survey

5. Conclusion

The following facts and findings support the conclusion that Győr Automotive Industrial District is rather a satellite industrial platform than a hub-and-spoke district:

- the presence of the foreign leader firm Audi Hungaria;
- the importance of vertical knowledge flow (customer, supplier relation);
- the low share of Hungarian suppliers;
- the weak knowledge flow perceived by Hungarian firms inside the district;
- lack of unequivocally identified embarrassing factors;
- the lonely domestic enterprises with weak horizontal linkages.

Thus, also inefficient identification of factors discouraging knowledge flow, cooperation and innovation can be explained, because trust-based business cooperations are not characteristic inside of satellite industrial platforms.

Further evolution of the district depends on the development of Hungarian small and medium-sized enterprises, whether they be able to become supplier firms of Audi Hungaria or its large multinational supplier companies. To be successful, they have to compete with subsidiaries of capital-intensive foreign suppliers located in Hungary. They should supply components at lower prices than their competitors; to reach this goal, for Hungarian manufacturing firms are advised to carry out developmental activities (first of all product and production development) and innovation rather than cut down wages. OEMs are ready to involve supplier firms in developmental activities, because in this way, they can put new cars on the market more quickly; demand for developments appears at lower and lower level of the supplier hierarchy. Continuous innovation is necessary for manufacturing firms to stay within or upgrade in the supplier pyramid; supplier's developers should collaborate with customer's developers.

Another alternative for Hungarian enterprises can be to focus specifically on research and development activities, and in this way to become a so-called intellectual supplier. In case of success, a very high value added can be produced on which a long partnership can be based. Intellectual suppliers as well as manufacturing supplier firms being able to design and develop are less likely to be withdrawn or replaced with a cheaper company. Reliability is a crucial factor in both cases; a long history of good experience with a supplier can be an excellent basis of giving them more serious tasks (*HIPA* 2016b).

Hungarian SMEs do often not dispose of developmental units and are not able to finance developmental activities alone. However, in the frame of a collaborative program (TIER UP) supported by the Hungarian government, they can use the knowledge-base and knowledge infrastructure of seven higher educational institutions providing education in the field of vehicle industry (*HIPA* 2016b).

Hungarian small and medium-sized enterprises located in Győr Automotive Industrial District should recognise the importance of trust-based horizontal linkages and partnerships. Together they would be able to serve their customers better and could obtain larger projects as well; this can raise their chance to enter the supplier hierarchy. The attitude of Hungarian firms located in the district should also be changed, concerning openness, cooperation abilities and willingness for knowledge sharing and absorbing. Trust is an essential basis of these changes, level of which should be increased considerably in the district. Building up horizontal linkages (with other district firms and higher education or research institutions), as well as several vertical relationships with Audi Hungaria and its principal suppliers would lead to better embeddedness of the leader firm in the district. This would make a possible conversion of the district from satellite industrial platform into a hub-and-spoke district.

6. Summary

This study aimed to explore the role knowledge and trust play in industrial districts, as well as to investigate their characteristics and working mechanism. Interactive nature of knowledge creation process, as well as the importance of mutual norms, habits and understandings evolving in geographically bounded spaces, were stressed. Trust can be regarded as the driver of the collective learning process and also a necessary prerequisite of sharing tacit knowledge, which serves as a basis of innovations. Ideal types of industrial districts (Marshallian IDs) can be characterised by plenty of trust-based horizontal relations accelerating knowledge flow, collective learning and innovation process as well as reducing transaction costs. However, as a negative consequence, trust can lead to lock-in effects in the long run in case of neglecting external contacts and knowledge by district firms.

Because of this reason, typical Marshallian Industrial Districts went through fundamental changes in the 1980s to survive; they became more and more concentrated, both horizontally and vertically. Vertical concentration resulted in the emergence of dominant leader firm(s) in the district, disrupting or fundamentally changing the former systems of trust-based relationships, knowledge flow and equal distribution of SMEs to power. New types of industrial districts evolved. Leader firms can stream external knowledge and complex technologies into the district, but, at the same time, they are also interested in avoiding technological spillovers. Therefore, leader firms try to control knowledge flow and reduce the number of suppliers, choosing the most competitive and most reliable ones. There are very tight trust-based linkages between the leader firm and its suppliers, although these relations are also characterised by a high level of dependency.

In the automotive industry, hub-and-spokes districts are characteristic, however, in case of foreign leader firms (OEMs), often satellite industrial platforms evolve, where the leader firm and the local small- and medium-sized enterprises are not connected. Innovation in the automotive industry can be regarded as a collaborative work of car manufacturers and their technologically experienced Tier 1 suppliers. Only these large suppliers dispose of appropriate innovation competencies, whereas independent companies providing developmental services also appeared recently. From the beginning of the 1990s, subsidiaries of foreign OEMs followed by their multinational supplier firms started to appear in Central and Eastern European countries leading in world standard high technology and dynamising the regional economy of their location. Based on long traditions in vehicle production (e.g. RÁBA), the region of Győr has been dominated by Audi Hungaria Plc., a production site of AUDI AG, since 1993.

In Győr Automotive Industrial District, there is close cooperation between the leader firm Audi Hungaria and Széchenyi István University concerning both research and higher education. However, cooperation between Audi Hungaria and local small and medium-sized enterprises has still been not typical. Hungarian firms can be found at the bottom of the supplier hierarchy, or they are even not part of it. The research came to the result that Hungarian firms perceive only weak knowledge flow in the district. Vertical directions of knowledge transfer (customer, supplier relation) are considered more important than horizontal ones. Domestic SMEs in the district dispose of weak horizontal linkages and can not unequivocally identify embarrassing factors of knowledge flow, innovation and cooperation. These results support the conclusion that Győr Automotive Industrial District is rather a satellite industrial platform than a hub-and-spoke district.

Hungarian government aims to integrate both leader firms and Hungarian SMEs increasingly into the domestic economy. To reach this goal, Hungarian firms located in the district are advised to change their attitude concerning openness, cooperation abilities and willingness for knowledge sharing and absorbing. Trust is an essential basis of these changes, level of which should be increased considerably in the district. To be successful, Hungarian SMEs have to develop and focus on knowledge-based activities (innovation and developmental activities) and production of high added value. Building up horizontal linkages (with other district firms and higher education or research institutions), as well as several vertical relationships with Audi Hungaria and its principal suppliers would lead to better embeddedness of the leader firm in the district. This would make a possible conversion of the district from satellite industrial platform into a hub-and-spoke district.

References

Audretsch, D. B. (1998): Agglomeration and the Location of Innovative Activity. *Oxford Review of Economic Policy*, 14, 2, pp. 18–29.

AUDI 2018: https://www.audi.hu

Audi (2017): Éves Jelentés 2017. 25 év számokban. http://audihungaria2017-hu.audiportal.hu/hu/mult#infografika, downloaded: 4.5.2018

The Automotive Sector in CEE: What's next? Analysis by the Unicredit Group New Europe Research Network, 2007. December. http://www.docstoc.com/docs/88989545/The-Automotive-sector-in-CEE---Whats-next, downloaded 6.1.2012

Becattini, Giacomo–Bellandi, Marco De Propris, Lisa (2009): Critical Nodes and Contemporary Reflections on Industrial Districts: An Introduction. In: Becattini, Giacomo–Bellandi, Marco De Propris, Lisa (2009) (eds.): *A Handbook of Industrial Districts.* Edward Elgar, Cheltenham, UK, Northampton, MA, USA, pp. xv-xxxv.

Belussi, Fiorenza–Caldari, Katia (2009): At the origin of the industrial district: Alfred Marshall and the Cambridge School. *Cambridge Journal of Economics*, Volume 33, Issue 2, 1 March 2009, pp. 335–355, https://academic.oup.com/cje/article/33/2/335/1732562, downloaded: 03.03.2018

Boschma, Ron A. – Lambooy, Jan G. (2002): Knowledge, Market Structure, and Economic Coordination: Dynamics of Industrial Districts. *Growth and Change*, Vol. 33, pp.291-311.

Cai, Rong (2004): Trust and Transaction Costs in Industrial Districts. https://pdfs.semanticscholar.org/036c/d160a736b6ba9ae6701565f3b93cb9f4ee1a.pdf, downloaded: 04.04.2018

Clark, Jennifer – Huang, Hsin-I – Walsh, John P. (2009): A Typology of „Innovation Districts": What it means for Regional Resilience. Industry Studies Association Annual Conference 2009, Chicago, IL. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.538.8977&rep=rep1&type=pdf, downloaded: 05.05.2018

Cooke, P.–Laurentis, C.–Tödtling, F.–Trippl, M. (2007): *Regional Knowledge Economies. Markets, Clusters and Innovation. New Horizons in Regional Science*, Edward Elgar, Cheltenham, UK, Northampton, MA, USA.

Czakó Katalin (2014): Az Audi Hungaria Motor Kft. hatása a helyi gazdasági és társadalmi folyamatokra. *Tér és Társadalom*, 2014, 2, pp. 188-198.

Denzau, A. T., North, D. C. (1993): Shared Mental Models: Ideologies and Institutions. http://129.3.20.41/eps/eh/papers/9309/9309003.pdf, downloaded: 9.8.2008

Fortwengel, Johann (2011) Upgrading through Integration? The Case of the Central Eastern European Automotive Industry. *Transcience Journal* Vol 2, No 1.

Gelei, Andrea – Venter, Lóránt – Gémesi, Katalin (2011): A multinacionális vállalatok a járműgyártás iparágban. In: Chikán Attila (szerk): *A multinacionális vállalatok hatása a hazai versenyre és a versenyképességre*. BCE Versenyképesség Kutató Központ, Budapest. pp. 179–232. http://www.versenykepesseg.uni-corvinus.hu/fileadmin/user_upload/hu/kutatokozpontok/versenykepesseg/tanulmanyok_pdf-ben/Multik_egyben_elektronikus.pdf, downloaded 8.1.2012.

Hippel, E. von (1994): „Sticky Information" and the Locus of Problem Solving: Implications for Innovation. *Management Science* 40, 4, http://www.jstor.org/sici?sici=0025-1909(199404)40%3A4%3C429%3A%22IATLO%3E2.0.CO%3B2-M, downloaded: 9.2.2008.

HIPA (2016a): Automotive Industry in Hungary. Hungarian Investment Promotion Agency, 2016.

HIPA (2016b): Direkt beszállítói kézikönyv. Hungarian Investment Promotion Agency, 2016.

Humphrey, John – Schmitz, Hubert (2002) How does insertion in global value chains affect upgrading in industrial clusters? Institute of Development Studies, University of Sussex, Brighton, UK, cdi.mecon.gov.ar/biblio/docelec/dp3012.pdf, downloaded 23.1.2012.

HVG 2018 Megmenekült a szentgotthárdi Opel-gyár, online newspaper article, 2018.03.21. http://hvg.hu/cegauto/20180321_megmenekult_a_szentgotthardi_Opelgyar, downloaded 10.6.2018

Kinkel, Steffen – Zanker, Christoph (2007) *Globale Produktionsstrategien in der Automobilzulieferindustrie*. Springer, Berlin–Heidelberg, chapter 4, pp. 31–72.

Kremlicka, Robert – Mayer, Stephan – Bittner, Gerhard – Reich, Georg (2011) *Megatrends in der Automobilindustrie und ihre Auswirkungen auf den AC Centrope.* Wirtschaftsagentur, Wien.

Lengyel, Imre (2010): *Regionális gazdaságfejlesztés*. Versenyképesség, klaszterek és alulról szerveződő stratégiák. Akadémiai Kiadó, Budapest

Lux, Gábor (2014): Industrial Districts: Building Blocks of the Organised Economy. In: Somlyódyné Pfeil Edit (2014) (ed.): *Industrial Districts and Cities in Central Europe.* Monographies of the „Győr Automotive Industrial District as the New Trend and Means of Spatial Development" Research, No. 6, Széchenyi István University, Universitas–Győr Nonprofit Ltd. Győr, pp. 27–45.
http://gyik.sze.hu/images/Monogr%C3%A1fi%C3%A1k/Monografia_Angol_I_Industrial%20Districts%20and%20Cities.pdf downloaded: 05.02.2018

Marshall, Alfred (1961): *Principles of Economics*. 9th Edition, Macmillan and Co. Limited for the Royal Economic Society, London. Eredeti kiadás: Principles of Economics, Macmillan and Co., Limited St. Martin's Street, London, 1920.

Mészáros Anikó (2001): Kis információs társadalmi körkép. *Tudományos és Műszaki Tájékoztatás. Könyvtár- és információtudományi szakfolyóirat*, 48. évf. 5. sz.

Mistri, Maurizio – Solari, Stefano (2003): Behavioural rules in industrial districts: loyalty, trust and reputation. In: Belussi, F. – Gottardo, G. – Rullani, E. (2003): *The Technological Evolution of Industrial Districts*, Kluwer Academic Publisher, Boston, pp. 245–266.

Nárai, Márta (2014a): A Győri Járműipari Körzet gazdaságának kérdőíves vizsgálata. In: Lados Mihály (2014) (ed.): *A gazdaságszerkezet és vonzáskörzet alakulása.* A Győri Járműipari Körzet, mint a térségi fejlesztés új iránya és eszköze c. kutatás monográfiái 5. Széchenyi István Egyetem Universitas-Győr Nonprofit Kft. Győr, pp. 244–263. http://gyik.sze.hu/images/Monogr%C3%A1fi%C3%A1k/Lados_A%20gazdas%C3%A1gszerkezet%20%C3%A9s%20vonz%C3%A1sk%C3%B6rzet.pdf downloaded: 23.09.2017

Nárai, Márta (2014b): Humán szükségletek alakulása Győrben I. – Alapszükségletek. In: Csizmadia, Zoltán–Tóth, Péter (2014) (eds.): *A helyi társadalom és intézményrendszer Győrben.* A Győri Járműipari Körzet, mint a térségi fejlesztés új iránya és eszköze c. kutatás monográfiái 4. Széchenyi István Egyetem Universitas-Győr Nonprofit Kft. Győr, pp. 154–181. http://gyik.sze.hu/images/Monogr%C3%A1fi%C3%A1k/Csizmadia-T%C3%B3th_A%20helyi%20t%C3%A1rsadalom%20%C3%A9s%20int%C3%A9zm%C3%A9nyrendszer.pdf downloaded: 11.01.2018

Nonaka, I. (1994): A Dynamic Theory of Organizational Knowledge Creation. *Organization Science*, 5, 1, pp. 14–37.

Nonaka, I.–Takeuchi, H. (1995): *The Knowledge Creating Company. How Japanese Companies Create the Dynamics of Innovation.* Oxford University Press, New York, Oxford.

North, D. C. (1993): The New Institutional Economics and Development. Washington University, St. Louis http://129.3.20.41/eps/eh/papers/9309/9309002.pdf; downloaded 16.07.2008

O'Callaghan, Ramon (2006): Knowledge Dynamics in Regional Economies: A Research Framework. In: Sprague, Ralph (2006) (ed): *Proceedings of the 39th Annual Hawaii International Conference on System Sciences*, IEEE Press, Washington, 1-10. pp.

Pavlínek, Petr – Ženka, Jan (2010) Upgrading in the automotive industry: firm-level evidence from Central Europe. – *Journal of Economic Geography.* No 4.

Pavlínek, Petr – Ženka, Jan – Žížalová (2010) Functional upgrading through research and development in the Czech automotive industry. XXIIsjezd České Geografické Společnosti Ostrava 2010, http://konference.osu.cz/cgsostrava2010/dok/Sbornik_CGS/Socioekonomicka_geografie/Functional_upgrading_through_research.pdf, downloaded 04.05.2012

Piritz Noémi (2013): A bizalmat befolyásoló tényezők vizsgálata az üzleti kapcsolatokban. Doktori disszertáció. Miskolci Egyetem Vállalkozáselmélet és Gyakorlat Doktori Iskola. http://midra.uni-miskolc.hu/document/16207/10815.pdf downloaded: 16.02.2018

Polányi M. (1997): A hallgatólagos dimenzió. In: Polányi M. (1997): *Tudomány és ember.* Argumentum Kiadó, Polányi Mihály Szabadelvű Filozófiai Társaság, 163–241. Original Edition: Polanyi, M. (1966), *The Tacit Dimension*, Doubleday&Company, Inc. Garden City, New York.

Robertson, Paul L.–Jacobson, David–Langlois, Richard N. (2009): Innovation processes and industrial districts. In: Becattini, Giacomo–Bellandi, Marco De Propris, Lisa (2009) (eds.): *A Handbook of Industrial Districts*. Edward Elgar, Cheltenham, UK, Northampton, MA, USA, pp. 269–280.

RÁBA 2018 http://www.raba.hu/vehicle/

Sándori Zsuzsanna (2001): Mi a tudásmenedzsment? http://mek.oszk.hu/03100/03145/html/index.htm; downloaded: 17.10.2007

Smahó, Melinda (2012): System of Knowledge Transfer in the Automotive Industry. In: *Vehicle Industry and Competitiveness of Regions in Central and Eastern Europe*. Széchenyi István University, Universitas-Győr Nonprofit Ltd. Győr, pp. 71-107.

Sofka, Wolfgang – Grimpe, Christoph – Leheyda, Nina – Rammer, Christian – Schmiele, Anja (2008) Sectoral Innovation Systems in Europe: Monitoring, Analysing Trends and Identifying Challenges. Sector Report – Automotive Sector. Mannheim, 8.5.2008.

SZE AHJK 2018 http://ahjk.sze.hu/kezdolap

SZE JKK 2018 http://jkk.sze.hu/fooldal

Vito, Albino – Garavelli, Claudio – Schiuma, Giovanni (1999): Knowledge transfer and inter-firm relationships in industrial districts: the role of the leader firm. *Technovation*, 1999, 19, pp. 53-63. http://www.academia.edu/22008829/Knowledge_transfer_and_inter-firm_relationships_in_industrial_districts_the_role_of_the_leader_firm downloaded: 25.02.2018