

# ICT INDUSTRY R&D IN HUNGARY

ADRIENN FEKÓ<sup>1</sup>

## Abstract

*In this article, the Hungarian ICT Industry related research and development is analysed. The developments and characteristics of the sector are described on one hand on the available statistics and on the other hand on interviews taken with the representatives of leading ICT companies in Hungary. In this short paper in order to have a larger database, we use a more aggregated definition of ICT sector according to European Commission DG JRC, IPTS (NACE rev.1.1). The main objectives of the paper are: to present the main characteristics of the sector and to explore the main causes of relatively low R&D activity of the ICT sector.*

**Keywords:** *research and development, information and communication technologies, ICT-manufacturing, ICT R&D, Hungary,*

## Introduction

The ICT sector is one of Hungary's most dynamic sectors but the related R&D activity is relatively low compare to the EU-27 average, however it increased in the last few years. This short paper focuses on ICT R&D activity of the ICT Manufacturing sector of Hungary and presents the main characteristics and the related R&D activity of the sector. We explore the causes of the low R&D activity of Hungary's ICT Manufacturing sector.

The literature distinguishes two categories in the field of internationalisation of R&D<sup>2</sup>: the 'asset-exploiting' and the 'asset-augmenting' strategies. In case of the 'asset-exploiting' strategy, the main aim of the affiliate is to create localised, market-oriented knowledge which helps firms to adapt existing technologies and products to foreign markets and to boost the overall revenue they generate from these assets<sup>3</sup>. The definition of the 'asset augmenting' strategy covers that situation when the R&D and innovation activities of MNEs abroad focus on creating the kind of technological and scientific knowledge that may find application in the whole enterprise group. However asset-exploiting strategies still prevail, asset-augmenting strategies are gaining importance<sup>4</sup> and we can find examples for asset-augmenting strategies in Hungary as well.

In Hungary in the early 90s a number of multinational companies have begun setting up research and development centres.

The typology of foreign R&D units according to Archibugi&Pietrobelli are the following:

- Centre-for-global: a single 'brain' located within the company headquarters concentrates the strategic resources and distributes impulses to the 'tentacles' (that is, the subsidiaries) scattered across host countries. Even when some overseas R&D is undertaken, this basically focuses on adapting products to the needs of the local users.

- Local-for-local: Each subsidiary develops its own technological know-how to serve local needs.

- Local-for-global: This is the case of TNCs (transnational companies) that, rather than concentrating their technological activities in the home country, distribute R&D and expertise in a variety of host locations.

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<sup>1</sup> ICEG European Center, (e-mail: afeko@icegec.hu)

<sup>2</sup> see also Cantwell and Mudambi 2005; Narula and Zanfei 2005

<sup>3</sup> EC, 2010a

<sup>4</sup> le Bas and Sierra, 2002

The R&D data of the Hungarian ICT companies is not available in many cases, thus we prepared personal interviews with the representatives of the leading ICT Industry companies in Hungary. It was separate research on ICT R&D in manufacturing and in software, however intertwined to a large extent.

## THE MAIN CHARACTERISTICS OF ICT INDUSTRY R&D IN HUNGARY

### Methodology of the research

The methodology of the paper involves on one hand the available statistics and on the other hand company interviews taken with the representatives of leading ICT companies in Hungary.

The ICT Sector definition is based on OECD ICT sector definition (ISIC Rev. 3.1.), but due to the lack of detailed data for those categories we used an aggregated definition of the ICT sector<sup>5</sup> according to DG JRC-IPTS, European Commission. We used the following NACE codes (NACE rev 1.1):

Manufacturing:

30: Manufacture of office, accounting and computing machinery

32: Manufacture of radio, television and communication equipment and apparatus

33: Manufacture of medical, precision and optical instruments, watches and clocks

Services:

64: Post and telecommunications

72: Computer and related activities

The paper concentrates only on the NACE 30, 32, 33 of Manufacturing and NACE 64 of Services, without NACE 72 (because the Software sector is another separated part of the research)

Information is limited regarding studies on the ICT R&D in Hungary and also the statistical data are not complete. Due to this, we used statistical data to describe the general trends, but the main characteristics of the activity in the field of ICT Industry R&D in Hungary are underpinned by company interviews. We prepared a list of the largest ICT Industry firms in Hungary based on various sources such as the list of the largest ICT companies, consulted membership lists of relevant associations, articles of economic newspapers, balance sheets, etc. We selected the most important actors and interviewed them. Two categories of the companies were: (1) biggest ICT manufacturing and telecommunication companies with R&D activity, and (2) smaller corporate players, owned by Hungarian private persons. The information gained from the interviews is supplemented by data from other, publicly available sources, such as the balance sheets, the data of the Budapest City Council<sup>7</sup> Registry Court, websites of the given companies and newspaper articles.

The main limitations of our methodology

- Lack of statistical data on R&D in most of the cases.

- Statistical data are not detailed enough (we used a more aggregated definition of ICT Industry sector).

- Regarding the interviews, we had problems of capturing middle sized companies, who are not mentioned among the top players, but on the other hand, they are also not belonging to the group of the most dynamic, fastest growing smaller sized companies to which the media pays special attention. Thus we might have missed some of the medium sized firms in Hungarian ICT Industry R&D.

- The “ininterestedness” of certain companies to register R&D, in spite of the fact that their activities belonged in essence to that group of economic activities. We tried to capture them, but our means were limited.

The main aim of this paper is to analyse the main characteristics of ICT Industry R&D in Hungary and to explore the most important reasons of the low R&D activity in this field.

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<sup>5</sup> EC, 2010b: p 129

### The main features of the Hungarian ICT sector

However ICT sector is one of Hungary's most dynamic and innovative sectors, the related R&D activity is relatively low. We explore the main reasons of this paradox.

**Table 1. ICT R&D expenditure/GDP indicator**

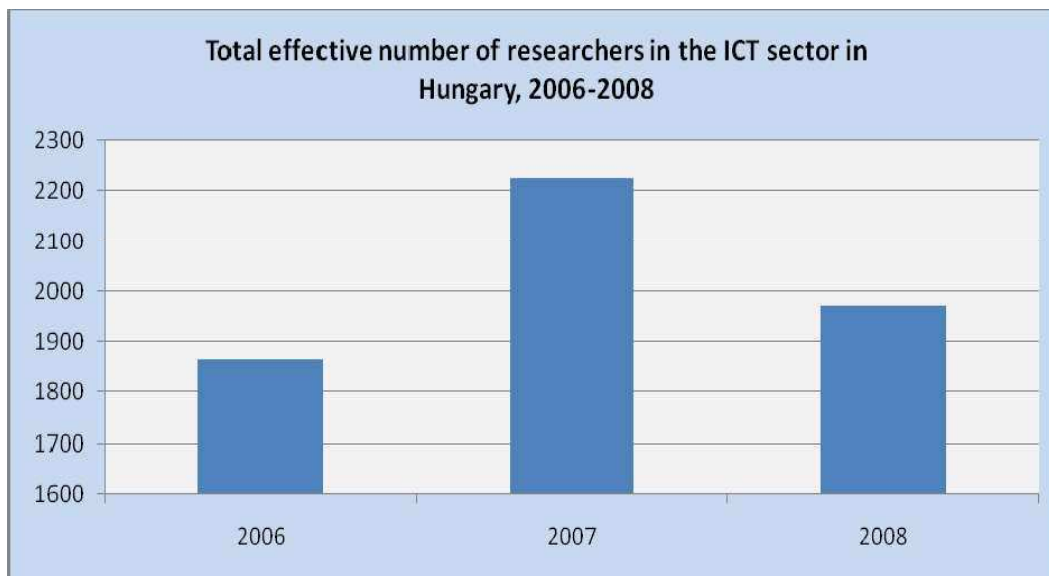
ICT R&D expenditure/GDP (%)	2006	2007	2008
Hungary	0,059	0,067	0,053

Source: CSO, Hungary, DG INFSO

The ICT R&D expenditure proportion in GDP is very low in Hungary, it is approximately 0,05%, in contrary in the EU-27 it is approximately 5% between 2006-2008.

The effective number of researchers in the ICT sector was 1865 persons in 2006, it increased in 2007 up to 2225 persons, but in 1998 it decreased in Hungary. In the EU-27 ICT sector represents only 3% of total employment<sup>6</sup>.

**Figure 1. Total effective number of researchers in the ICT sector in Hungary, 2006-2008**

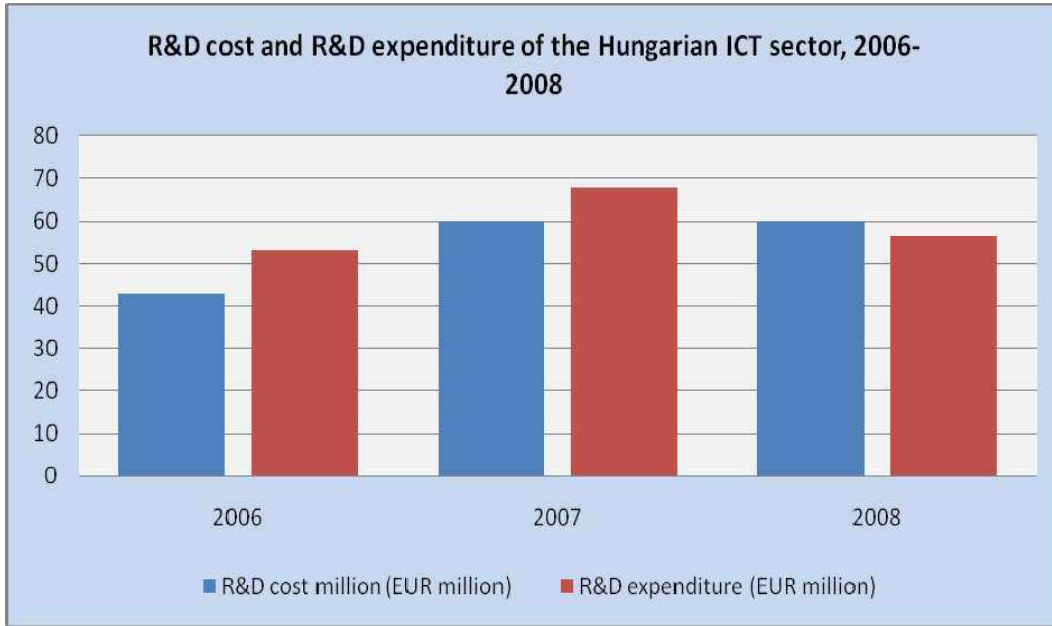


Source: CSO, Hungary

The R&D expenditure of the ICT sector increased between 2006 and 2007 and decreased between 2007 and 2008. The R&D cost also increased in 2006 and stagnated in 2007 and in 2008. The ICT R&D expenditure amounted to EUR 56,56 million in 2006 and the ICT R&D cost amounted to EUR 60,07 million in 2008.

<sup>6</sup> EC, 2010b:31

Figure 2. Total effective number of researchers in the ICT sector in Hungary, 2006-2008



Source: CSO, Hungary

#### ICT Industry BERD, production, export and import in Hungary

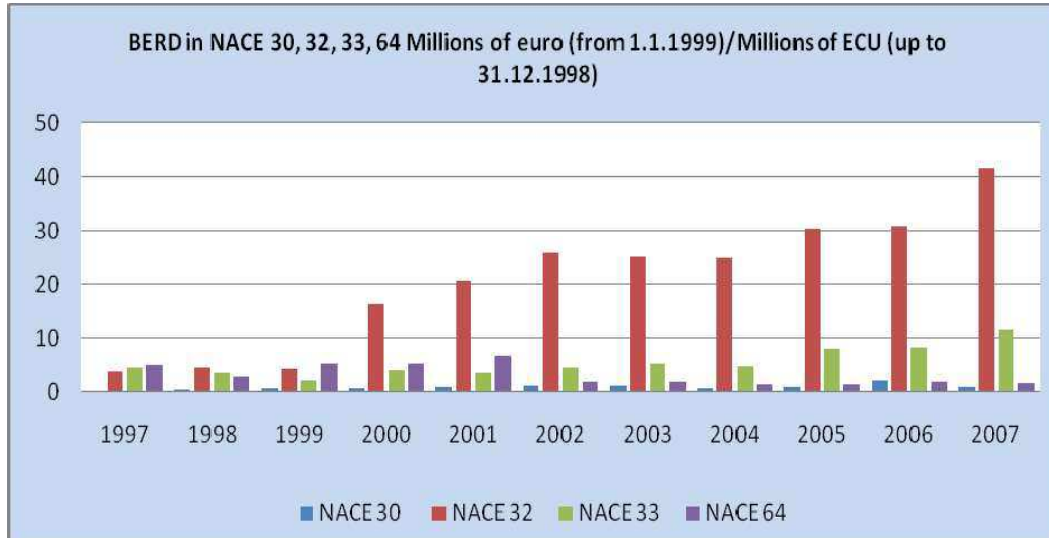
The internationalisation of R&D can be observed in Hungary as well. In the past few years numerous leading ICT industry multinational companies decided to transfer their R&D operations to Hungary. The main reasons of this process are the relatively cheap and relevantly skilled workforce of the country.

In Hungary in 2008 the business sector financed almost the half (48,3%) of the R&D activities<sup>7</sup>.

R&D expenditures in NACE 30, 32, 33, 64, have increased significantly between 1997 and 2007; mainly the BERD grew dynamically in these sectors.

<sup>7</sup> CSO, 2009

Figure 3. Business enterprise R&amp;D expenditure in NACE 30, 32, 33, 64 from 1997-2007

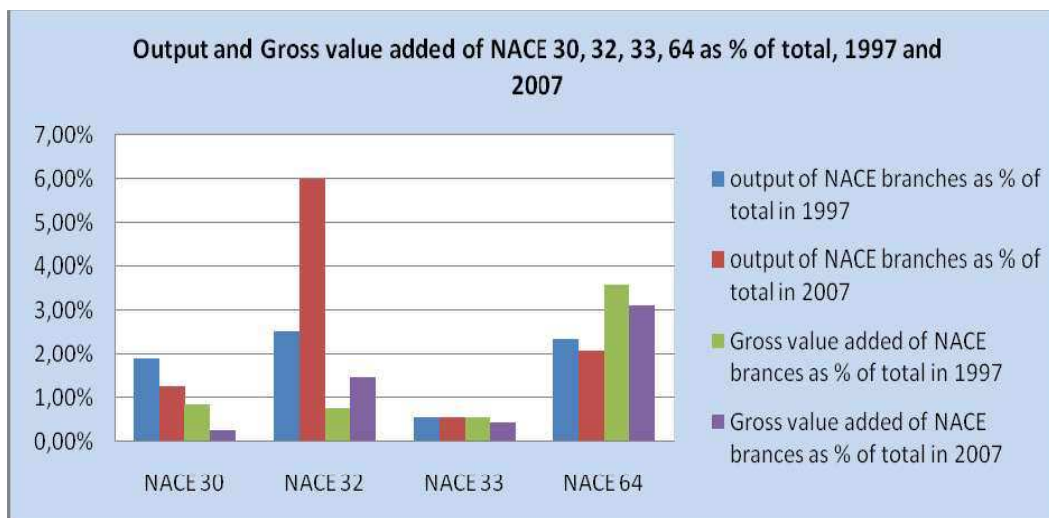


Source: Eurostat

ICT BERD gained importance between 1997 and 2007. ICT BERD (in NACE 30, 32, 33 and 64) was amounted to 11.27% of the business enterprise R&D expenditure of all branches and 5.67% of total R&D expenditures in 2007 in Hungary.

Regarding the production only the NACE 32 sector could increase its share in output and value added. All the other analysed NACE sectors (30, 33, 64) lost some percentage point shares between 1997 and 2007. In 1997 the share of all the analysed NACE categories (30, 32, 33, 64) was 7.28% in total output, in 2007 this grew up to 9.81%. Their share in gross value added decreased between 1997 and 2007, from 5.67% up to 5.22%.

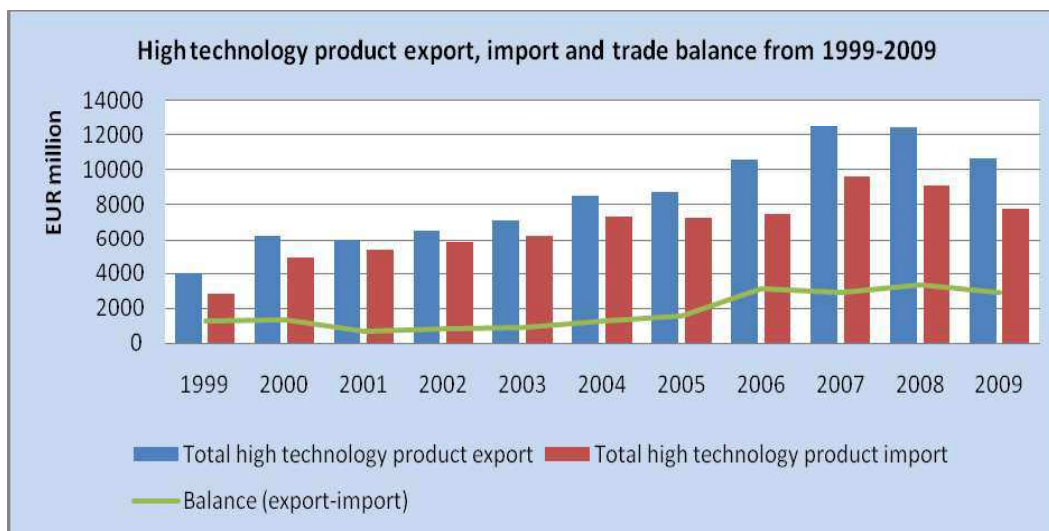
Figure 4. Output and Gross value added of NACE 30, 32, 33 and 64 as % of total



Source: CSO 2008

Figure 5 represents the Hungarian ICT Industry export and import to and from EU 27 in the 75, 773, 776, 76, 874 SITC categories according to SITC classification. Between 1999 and 2007 the high technology product export and import increased dynamically, in 2008 and 2009 the high-tech export and import started to decrease, due to the economic crises. The balance is also increased, stagnation can be observed in 2009.

**Figure 5. High technology product export, import and trade balance**



Source: Eurostat and United Nations (Comtrade database), own compilation

#### **ICT Industry R&D in Hungary, main characteristics and list of biggest spenders**

Table 2 shows our ICT Industry R&D company ranking based on the interviews and available data. Besides the actors of the ICT Manufacturing sector (IT hardware companies, system integrators, automotive companies), we have taken interviews with the representatives of ICT R&D service sectors, e.g. telecommunication (NACE 64). We had a longer list of several companies out of which we have taken interviews with 11 companies of the 13 presented in our estimated ranking. Our estimated ranking includes besides the foreign owned affiliates of the biggest ICT industry R&D spenders some smaller actors, companies with Hungarian private owners. In order to provide a real picture, we involved these companies as well.

Table 2. Ranking of ICT Industry companies in Hungary based on their R&amp;D spending

Ranking	Name of the company	Ownership structure	Sales (2008) in HUF thousand (thousand EUR <sup>2</sup> )	R&D spending in 2008 in thousand HUF (thousand EUR <sup>2</sup> )	Location of Headquarters in Hungary	Location of R&D centres, labs
1.	Audi Hungary Motor Ltd.	AUDI AG, Ingolstadt (Germany)	1 408 650 210 (5 606 568)	74 118 750 (295 000)	Győr	Győr
2.	Robert Bosch Electronics Ltd.	Robert Bosch Investment Nederland B.V. (Netherlands)	24 459 899 (97 353)	10 101 600 (36 000 <sup>1</sup> )	Hatvan	Budapest
3.	Nokia Siemens Networks Ltd	Nokia Siemens Network BV (Netherlands) (100%)	12 324 650 (49 053)	6 606 506 (2009) (26 295 <sup>1</sup> )	Budapest	Budapest
4.	Knorr Bremse Ltd.	Knorr Bremse Systeme für Nutzfahrzeuge GmbH (Germany)	31 012 000 (123 431)	3 268 141 (13 007)	Kecske-mét	Budapest Kecske-mét
5.	GE Hungary Ltd.	GE Holdings Hungary Ltd. (USA) (100%)	667 443 000 (2 656 490)	1 264 000 (5 031)	Budapest	Budapest, Budaörs, Oroszlány
6.	AVL Autókut Ltd.	AVL Holding GmbH (Austria)	1 356 251 (5 398)	1 085 000 (4 318)	Budapest	Budapest
7.	Magyar Telecom Telecommunications Plc.	MagyarCom (the 100% owner of MagyarCom is Deutsche Telekom A.G.)	500 804 000 (1 993 250)	721 000 <sup>1</sup> (2 870)	Budapest	Budapest
8.	NI Hungary Ltd.	Enterprise International Holding B.V. (Netherlands)	56 691 708 (225 639)	566 917 (2 256)	Debrecen	Debrecen

9.	Meditech Ltd	Hungarian private owners	445 089 (1 772)	280 931 (1 118)	Budapest	Budapest
10.	ThyssenKrupp Presta Hungary Ltd	ThyssenKrupp Presta München/ Esslingen GmbH (100%) (Germany)	2 187 077 (8 705)	200 000 (796)	Budapest	Kecske-mét
11.	ThalesNano INC	Hungarian private owners predominant-ly	1 410 136 (5 613)	86 229 (3432)	Budapest	Budapest
12.	BULL Hungary Information System Ltd.	BULL International SA France (France) (100%)	4 058 954 (16 155)	46 044 (183)	Budapest	Budapest
13.	Externet Plc.	Birdcom Consulting Ltd. (Hungary)	2 198 535 (8 750)	10 000 (40)	Szolnok	Budapest

<sup>1</sup> in 2009

<sup>2</sup> Average exchange rate in 2008: 251.25, in 2009: 280.6.

### The ownership structure, sales, headquarters and R&D centres

The dominance of the subsidiaries of multinational companies is significant in the estimated ranking; ten of the estimated first thirteen are foreign owned companies, and only three of them are Hungarian owned. Regarding the ownership structure the proportion of companies with Hungarian private owners in the list is only 23,08%, the remaining proportion involves company owners from Germany (30,77%), from Netherlands (23,08%), from USA (7,69%), from Austria (7,69%) and from France (7,69%).

Regarding the amount of companies's sales: Audi Hungary Motor Ltd is the first, GE Hungary Ltd is the second, and Magyar Telecom is the third in the ranking.

The location of headquarters of the biggest R&D spenders is predominantly Budapest, but we can find important ICT Industry companies' locations also in other Hungarian cities such as: Győr, Hatvan, Kecskemét, Debrecen and Szolnok.

The R&D centres and labs are usually at the same place where the headquarters are located.

### R&D spending

Many companies (predominantly in the software sector, but some of them also in the ICT Industry sector) declared that they do not have R&D, but further investigation revealed that their task involves R&D activities. We tried to deal with that problem, but understandably, our means were limited.

Among the biggest R&D spenders we can find Audi Hungary Motor Ltd, Robert Bosch Electronic Ltd and Nokia Siemens Networks Ltd.



### **Main characteristics of the Hungarian ICT Industry R&D**

The selected companies are from various ICT fields, but the dominance of telecommunication operators and automotive industry is typical. It can be explained by their rapidly growing R&D activity.

Among the foreign owned companies there are formerly state-owned, privatised companies, for example Matáv, AVL Autokut or GE. The Magyar Telekom Telecommunications PLC was established in 1990 after the split into three firms of the Hungarian Post by the Hungarian Ministry of Transportation, Communication, Information and Architecture, under the name of Matáv Hungarian Telecommunication Company and it remained state owned until 1993. In 1993 the Hungarian Telecommunication Act entered into force and the privatization of Matáv has been launched. Today the majority owner of the company is MagyarCom, and Deutsche Telekom is 100% owner of MagyarCom. Similarly, AVL AUTOKUT is a result of privatisation, and part of the GE affiliate in Hungary was also established through the acquisition of a formerly state-owned company (Tungsram).

Based on the interviews the main motives of foreign companies to establish Hungarian affiliates in R&D are mainly the high quality expertise of Hungarian employees.

The main destinations where ICT R&D results in the case of the interviewed companies were exported are the following:

- Mother company and other affiliates of it (Knorr Bremse, Audi, AVL Autókut, NI Hungary);
- Domestic market (Magyar Telecom Plc, Bull Hungary Ltd, Externet,);
- Clients from all over the world (GE).

In the first group R&D results are mainly exported; export/sales ratio is between 70 to 100%. This underlines the vertical nature of these projects and the fact that R&D activities in Hungary are highly embedded into the "R&D-network" of the parent company.

R&D units of the second group are more of horizontal nature and carry out R&D mainly with the aim of adaptation of the products of the given company to the local market.

In the case of GE (third group), the Hungarian R&D unit can be considered as a globally oriented plant where certain R&D activities of the multinational company are concentrated.

The ICT R&D activities of the companies can be related to the production. Usually it can be observed that production centres could attract R&D (NI, Knorr Bremse, Audi). Based on the interviews in the case of Knorr Bremse the Budapest R&D centre became a stronghold for Knorr Bremse through allocating certain core R&D tasks here. In case of NI, manufacturing activity of the company takes place in Austin and in Debrecen, but the bigger proportion of the production (90%) is carried out in Hungary. At the time of establishment, the main profile of NI Hungary was hardware production, because Hungary offered cheap environment (cheap labour) to this activity. After the initial period of gaining experience, the Hungarian subsidiary could take over high value added activity from the parent company and from other European companies, because of the high quality of human resources. In 2001 manufacturing of loaded electronic boards has started in Debrecen and at the end of 2004 the production of the site represented 70% of NI total. Today 90% of production takes place in Hungary. This concentration of production to one site understandably brought over some related R&D as well.

We also examined some small firms which have Hungarian private owners, such as Externet Plc, ThalesNano Inc., Meditech Ltd. These companies are also important actors of the ICT R&D market. Their relative share in ICT R&D is low but they have outstanding results which are worth to mention.

As far as the geographical location is concerned, headquarters of the affiliates are mainly located in Budapest but certain R&D units or other units are hosted by cities near Budapest, or by bigger cities in the countryside.

## Conclusions

The main aim of this paper is to analyse the main characteristics of ICT Industry R&D in Hungary. Based on the company interviews it is most probable that R&D expenditures and the number of R&D employees in the sector are underestimated. Due to the fact that some companies have no interest in registering these neither at the Central Statistical Office nor in their balance sheets.

The most important actors in the field of ICT Industry R&D are the Hungarian subsidiaries of multinational companies (mainly from Germany, but there are actors also outside Europe), in the internationalisation of R&D process the high quality expertise of Hungarian employees is dominant. In the ICT Industry sector among the leader R&D spenders we can find only foreign companies, because it is difficult to Hungarian companies to appear among leaders. Strong concentration and structural duality can be seen: some foreign owned bigger companies (Audi, Robert Bosch, NSN, Knorr Bremse) provide the significant proportion of ICT Industry R&D spending in Hungary, Hungarian companies are only smaller players.

The increasing amount of ICT R&D in Hungary is related to the outsourcing/relocation of R&D activities of multinational companies, which is an international tendency.

Regarding the geographical location, the R&D centres are mainly located in Budapest, but in case of ICT Industry R&D there are centres also in other biggest cities, because the R&D is attracted by the production.

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