Chapter 2
The Hungarian ICT Sector: A Comparative CEE Perspective with Special Emphasis on Structural Change

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2.1 Introduction

ICT is highly associated with technological development in organizations, companies, regions and countries (EC 2009; Edquist 1997; Lundvall 1992). It contributes to economic and productivity growth with the following effects (OECD 2004): evidence in Denmark, Ireland, Sweden, the USA and the UK shows that ICT investments raised labour productivity acting as capital goods; technological progress in the ICT sector contributes to more rapid multifactor productivity (MFP) growth in the ICT sector; the rapid diffusion of and increased use of ICT in the economy increases overall efficiency.

Regional development is also affected by ICT sector; the related investment can differ across regions within the same country; ICT takes its effects through different channels (Barrios et al. 2008). Technical progress takes place mainly in high-tech sectors; the higher the weight of ICT producing industries in total output, the higher the impact on economic growth via multifactor productivity improvements. ICT capital accumulation provides productivity gains in industries that use ICT and have the largest shares of ICT in total capital. ICT accelerates general technological progress by incorporating horizontal set of technologies. The latter particularly means that all sectors can potentially benefit through knowledge spillovers caused by the presence of ICT industries within the region.

The countries in Central and Eastern Europe (CEE) entered a transition period and faced the challenges of globalization during the same period of time. During the 1990s, accession to the European Union, economic growth and modernization became increasingly crucial objectives for facing the challenges of both transition and globalization. Thus, one must consider two processes when analyzing the dynamics of ICT industry in CEE; foreign direct investment (FDI) and multinational enterprises (MNEs) became decisive in shaping the national and regional innovation systems in outstanding industries (Inzelt 2003; Radosevic 2002). The concentration of industries brought new folds of regional differences related to the presence of ICT (Jakobi 2005).

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This chapter analyses the Hungarian ICT sector from a comparative CEE perspective. In the second section, we introduce the status of the ICT industry of CEE countries. This is followed by a description of the effect of ICT on structural upgrading in the region. In the fourth section, we give an overview of the Hungarian ICT policy. The conclusions will be drawn in the final section.

2.2 Current Status and Latest Development of the ICT Industry in CEE

The ICT sector and in particular ICT services are concentrated spatially. This is due to the high knowledge-intensity of the sector that makes localization and urbanization economies and spatially given knowledge and technological spillovers prevail (Jacobs 1969). The knowledge-related agglomeration economies are especially important in the case of ICT services; these can be provided at a large distance and therefore concentrate in large cities (Lengyel 2012). Thus, the ICT sector shares an important part in the specialization of the richest regions of the EU15, while the ICT clusters in the EU10 still do not match this specialization level (Barrios et al. 2008). Concentration in ICT prevails on a higher degree than in medium-tech industries such as the automotive industry (Szalavetz 2012).

Here, we introduce the main country level trends of ICT industry in CEE according to the structure of the sector, the growth in production and foreign trade of ICT manufacturing. After these we show how big the major regional hubs in EU10 countries are compared to the ones in old member states. In the end of the section, we illustrate the Hungarian ICT market in the European and CEE context.

2.2.1 ICT Sectors in CEE from 1995 to 2004

There is a huge gap between EU15 and EU10 countries employment volumes of ICT sector. In the table below, one can observe the employment structure at country and ICT sub-sector levels over the period from 1995 to 2004 (Table 2.1). A substantial share of total ICT employment is located in the EU15 (88.3%); this has also increased slightly over the period 1995–2004. Meanwhile the share of ICT employment in the EU10 decreased slightly, going from 12.6% in 1995 to 11.7% in 2004.

The decrease in the proportion of employment in the new member countries between 1995 and 2004 is probably a reflection of an overall decrease in the percentage of their share of employment in all sectors of the economy. This period is considered the late phase of transition during which time intense economic restructuring was experienced in the new member countries, and the ICT sector has been no exception to this process (Havas 2006). The big state-owned companies went bankrupt or were privatized, which led to a general portfolio cleaning in many

Table 2.1 Share of employment in ICT in the CEE countries, 1995 and 2004 (%)

	NACE 30		NACE 32		NACE 33		NACE 64		NACE 72		Total ICT		Total economy	
	Office, machinery, computing		Radio, television and com. eq.		Medical precision and optical instr.		Post and telecom		Computer services					
	1995	2004	1995	2004	1995	2004	1995	2004	1995	2004	1995	2004	1995	2004
CZ	1.9	4.9	2.4	4.0	2.9	3.2	2.8	2.4	1.8	1.4	2.6	2.4	2.9	2.4
HUN	0.6	3.9	2.1	9.4	2.0	2.0	2.6	2.2	0.8	1.2	2.0	2.6	1.9	2.0
PL	1.9	2.9	5.9	3.4	4.8	4.3	6.4	5.9	1.5	2.0	4.8	4.0	6.6	5.5
SVK	0.9	1.8	1.4	1.5	1.2	0.9	1.3	1.1	0.7	0.5	1.1	0.9	1.3	1.1
EU15	93.8	85.4	85.1	78.7	87.3	87.9	84.6	86.2	94.3	94.1	87.4	88.3	84.9	86.9
EU10	6.2	14.6	14.9	21.3	12.7	12.1	15.4	13.8	5.7	5.9	12.6	11.7	15.1	13.1
EU25	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: Author's edition after Barrios et al. (2008), p. 13

sectors (Lengyel and Cadil 2009). Indeed, the decrease in the CEE employment share in total European employment is less pronounced in the ICT sector than in the rest of the economy (see Table 2.1). There are even cases of increase of CEE share in certain countries and sub-sectors, where cost-efficiency and relatively well-educated labour attracted foreign-owned firms (Barrios et al. 2008). Due to the investments of MNEs, EU10 countries tend to have gained employment shares in the manufacturing ICT sub-sectors, with the exception of the medical, precision and optical instruments sectors (NACE 33).

Thus, the CEE countries—and particularly the Czech Republic and Hungary—are somehow exceptions among the new member states; employment in ICT manufacturing performed a notable rise in the manufacturing of office machinery and telecommunication equipment (NACE 30 and NACE 32). The share of Hungary in the total EU employment in the manufacturing of radio, television and communication equipment rose from 2.1% in 1995 to 9.4% in 2004. The Czech Republic has almost 5% of total EU employment in the manufacturing of office, machinery and computing. Slovakian employment in ICT manufacturing increased slightly, while the change in the Polish employment share increased only in NACE 30, while decreasing in all other ICT manufacturing sub-sectors.

2.2.2 Development of ICT Manufacturing in CEE Countries, 2000–2008

In this part, we use the OECD STAN database to analyse growth in production volumes of the ICT manufacturing industry in CEE countries over the 2000–2008 period. The data are available at country level and include NACE 30, 32, 33 sectors. Euro values were calculated from national currency values at the exchange rate on the 1st of January for each year. Slovakia is an exception, because data were available directly in euro (Table 2.2).

Though data were not available for Hungary in 2008, the country has clearly stood out in CEE in terms of the gross output of ICT manufacturing over the decade. The Hungarian volume double the value in Poland. Hungary also overperformed the Czech Republic in this sense; however, the Czech output grew dynamically. ICT manufacturing performed at a much lower level but has grown quickly in the Slovak Republic (Table 2.3).

Large differences are apparent across the CEE countries in terms of foreign trade. Similar to its gross output, Hungary stands out in the region in volume of export and also in the volume of import; these values are at least ten times larger than is the case in the Czech Republic and Poland. The trade balance was positive through the whole period only in Hungary and showed an upgrading trend. However, the high value of export is accompanied by high import values; thus, the large share of export is probably import-related and is likely due to foreign-owned firms. Unfortunately, data on a company level for all CEE countries were unavailable, and

Table 2.2 Gross output at current prices, 2000–2008 (million Euro)

	2000	2002	2004	2006	2008	Growth 2000–2008 (%)
Czech Republic	10,427	17,447	21,527	30,974	44,328	325
Hungary	20,601	22,025	30,310	37,487	n.a.	81
Poland	10,546	13,568	12,434	19,118	n.a.	81
Slovakia	3,133	3,824	5,918	12,066	15,333	389

Source: Author's calculation, OECD STAN database

Table 2.3 Export and import of goods at current prices, 2000–2008 (million Euro)

		2000	2002	2004	2006	2008	Over production (%) 2008
Czech Republic	Export	7,377	13,360	18,917	26,878	37,084	83
	Import	10,838	14,942	18,508	26,153	34,366	77
	Balance	−3,461	−1,582	409	724	2,719	
Hungary	Export	141,177	170,174	237,375	316,127	n.a.	97[a]
	Import	134,235	161,212	203,060	263,410	n.a.	81[a]
	Balance	6,942	8,962	34,315	52,716	n.a.	
Poland	Export	4,830	7,753	8,353	15,108	23,893	79[a]
	Import	12,874	14,596	14,684	23,674	33,006	125[a]
	Balance	−8,044	−6,842	−6,330	−8,566	−9,112	
Slovak Republic	Export	2,300	3,114	5,660	13,352	20,273	132
	Import	3,873	5,431	7,159	13,173	18,721	122
	Balance	−1,573	−2,317	−1,499	179	1,552	

Source: Author's calculation, OECD STAN database
[a]Indicator for year 2006, respectively

we also found no statistics concerning ownership structure of ICT firms in all CEE countries. In another paper related to current research, however, it was shown that the cluster formation is highly associated with foreign-owned firms in Hungary (Lengyel 2012). We will illustrate cross-country differences with the help of value added and intermediate inputs in Sect. 2.3.

The trade balance has become positive in the Czech Republic over the decade, and the same happened in the Slovak Republic to a lesser degree. We expect that the relatively high value of Czech ICT manufacturing export also depends on imports, as is that case in Hungary. The increasing Polish export of ICT manufacturing industry has not succeeded in outperforming the growing demand for import ICT goods, and the trade balance remained negative.

2.2.3 Regions

Employment in the ICT sector tends to be rather concentrated geographically around the so-called blue banana of Europe (Southern UK, the Benelux and Denmark, Ile-de-France, the Western regions of Germany and the North of Italy).

Table 2.4 Regions of ICT concentration in EU10 countries

Region	ICT sector			All sectors			GDP per capita
	Rank	Share of EU ICT employment	Cumulated shares	Rank	Share of EU total employment	Cumulated shares	
Közép-Magyarország (HU)	12	1.29	1.29	40	0.65	0.65	97.5 (120)
Mazowieckie (PL)	14	1.24	2.52	13	1.04	1.68	73.7 (194)
Praha (CZ)	29	0.82	3.34	92	0.38	2.06	150.8 (12)
Slaskie (PL)	47	0.53	3.87	27	0.78	2.84	54.7 (227)
Lietuva (LT)	50	0.50	4.37	30	0.71	3.56	49.0 (235)
Slovenija (SI)	53	0.49	4.86	74	0.45	4.01	79.9 (179)
Severovychod (CZ)	50	0.46	5.32	106	0.35	4.36	61.1 (218)
Jihovychod (CZ)	66	0.41	5.73	88	0.38	4.75	64.7 (210)
Wielkopolskie (PL)	71	0.38	6.11	45	0.61	5.36	52.3 (231)
Dolnoslaskie (PL)	74	0.37	6.48	75	0.45	5.31	49.6 (234)

Source: Barrios et al. (2008), p. 17

However, the ICT industry is also concentrated in some of the regions in the new member states. We show here the main ICT regions in terms of employment shares in total EU employment of the EU10, most of these are located in CEE countries. Malta, Kozep-Magyarorszag (HU), Mazowieckie (PL) and Praha (CZ) are the regions that emerged in the new member countries (Barrios et al. 2008).

Table 2.4 above displays the share in total ICT employment of the top ten NUTS2 regions located in the EU10 in terms of share in EU ICT employment. Most notably, Praha (CZ), Közép-Magyarország (HU) and Nyugat-Dunántúl (HU) appear to be relatively highly specialized in ICT activities among all member states. ICT industries can potentially play an important role in industrial specialization and, thus, for regional development in those regions. The specialization indexes in these CEE regions are higher than in bigger hubs of ICT in EU15 countries (Barrios et al. 2008). It is worth noticing that despite the dominance of the Hungarian ICT manufacturing, only one region (Közép-Magyarország) is present in the EU10 countries. Nyugat-Dunántúl is also specialized in ICT, but this region is small according to the volume of employment and has not entered the list in Table 2.4. The Czech and Polish ICT sector is more spread over their country: more regions are in the top ten.

The regional evolution of an industry prevails through different channels in which the location of MNEs and the establishment of SMEs play decisive role (Boschma and Fenken 2006). While MNEs act as gatekeepers between the global and local economy, the dynamics in SME creation is likely to report on the occurrence of knowledge spillover in a region. The following statements are based on maps in the appendix of the report on regional performance of the European ICT industry (Barrios et al. 2008).

The location pattern of MNEs in ICT industry differs according to manufacturing ICT sub-sectors. The manufacturing of office machinery and computers sector has attracted a growing number of multinationals to Poland, Slovakia and the Czech Republic since the early 2000s, although MNEs tended to favour locations in UK, Irish, Dutch and German regions before the 2000s. Hungary lingers behind in MNE attraction, which is probably due to the fact that these firms located their sites to the country in the 1990s. Central and North-West Hungary and West Poland seem to have been more attractive for MNEs in television and communication equipment; medical precision and optical instruments mostly went to Poland. The ICT service sub-sector is still attracting MNEs to invest in the core regions of EU; if these were going to new member states, they would likely to choose their locations in the capital regions.

The location of new SMEs is similar to the case of MNEs, but small companies tend to be much more dispersed geographically than multinationals (Barrios et al. 2008). New SMEs in ICT manufacturing sub-sectors have been numerous in the regions located in the EU10, in particular in Czech regions and to some extent in Poland. Hungary did not perform well in SME establishing in ICT manufacturing. Only six SMEs were formed in the 1995–2000 period and even fewer, only three in the 2001–2004 period in television and communication equipment sub-sector. The number of new SMEs in medical, precision and optical instruments was seven from 1995 to 2000, and new SMEs have not been registered later. The SME creation in ICT services is much more dynamic in the Czech Republic and Poland than in Hungary. Only few companies were established in post and telecommunications, but a higher number in computing services in Budapest. However, this growth does not come anywhere near the Czech and Polish dynamics.

2.2.4 The Hungarian ICT Market and Market-Related Indicators in EU Countries

One might find the domestic Hungarian ICT market much smaller than the value of foreign trade. This is due to the activity of multinational firms that have located their sites there because of the relatively cheap and well-educated labour. These companies are not embedded in the local economy; they produce for the global market and are the main drivers of the Hungarian ICT export.

The consolidated IT market includes transactions only between consumers and suppliers, while cumulated IT market also involves transactions among IT firms. Consequently, the cumulated IT market is a wider category. Euro values in the following tables were calculated from average HUF/Euro exchange rates in 2006 (264 HUF = 1 Euro) and 2007 (253 HUF = 1 Euro).

IT services present the biggest field of consolidated IT market followed by hardware and software products. Transmitted IT hardware—transaction among IT firms—also has a big share in the cumulated IT market. All these fields grew from 2006 to 2007. The domestic market of telecommunication services exceeded the whole IT market in terms of turnover. However, this sector stagnated from 2006 to 2007; the growth one can observe in euro values in Table 2.5 was influenced by the strenghtening HUF.

Micro companies with 1–9 employees accounted for 15.7% of the total turnover (Table 2.6). The turnover volume decreased in companies with 1 or 2 employees and grew slightly in firms with 3–9 employees. Small-sized IT firms had the biggest share of the market (31.6%) and managed to grow at an average pace. Medium-sized companies came in for a smaller share (27.8%), but they were on a shifting wave. Big companies shared 25% of the market and performed at an average speed of growth.

Other indexes connected to the market, like favourable demand for innovation and product competition, reflect cross-country differences in CEE, just as

Table 2.5 The domestic Hungarian ICT market by product categories, 2006 and 2007 (million Euro)

Product categories	2006	2007
IT hardware	871	914
IT software	345	376
IT services	924	1,044
Consolidated IT market	2,140	2,334
Transmitted IT hardware	663	704
Transmitted IT software	117	150
Transmitted IT services	254	300
Cumulated IT market	3,174	3,488
Telecommunication services	3,417	3,501
Total	6,598	6,988

Source: NFGM (2009), p. 7

Table 2.6 Structure of the consolidated ICT market by company size categories

Number of employees	Million Euro	Share (%)	Annual growth (%)
1–2	61	2.6	−3.5
3–9	305	13.1	1.0
10–49	737	31.6	4.2
50–249	648	27.8	7.2
250–	583	25.0	4.3
Altogether	2,334	100.0	4.4

Source: NFGM (2009), p. 10

Table 2.7 Market indexes related to innovation in selected European countries

	Favourable demand[a]	Product competition[b]	Effectiveness of IPR system[c]	Existence of industry-related policies[d]
Finland	0.83	0.61	3.4	2.49
The Netherlands	0.89	0.74	4.4	0.41
France	0.86	0.71	3.7	0.83
UK	0.91	0.86	3.9	2.07
Belgium	0.77	0.71	3.8	0.41
Germany	0.89	0.77	4.0	0.00
Austria	0.94	0.66	4.1	0.83
Sweden	0.79	0.21	3.8	0.41
Denmark	0.93	0.75	3.8	3.32
Spain	0.70	0.64	3.5	1.66
Portugal	0.45	0.71	2.5	0.00
Italy	0.86	0.60	3.7	0.00
Hungary	0.81	0.60	3.3	0.00
Poland	0.78	0.41	2.7	0.41
Czech Republic	0.82	0.61	3.0	0.24
Slovakia	0.79	0.66	2.4	0.00

Source: Wintjes and Dunnewijk (2009), p. 116

[a]Proportion of firms for which uncertain or lack of demand is not a problem for innovate

[b]Index of product market competition

[c]IPR protection index taken from Gwartney et al. (2006)

[d]Number of policies specially oriented at ICT firms (compared to European average)

policy-oriented indexes do (the effectiveness of IPR system and the existence of industry-related policies). In Table 2.7, we give an overview of selected EU countries in order to compare CEE countries with the ICT sector in leading economies.

The favourable demand for innovation in CEE countries is in the second range in Europe; the share of firms for which demand is not important to innovate is higher in leading countries, but the gap between old and new member states is small. Eighty-one percent of firms are not affected by demand in their intention to innovate in Hungary; the share of these firms is similar in the Czech Republic and a bit lower in Poland and Slovakia. Similarly, product competition varies on a wide spectrum across EU countries, and CEE does not lag behind except in the case of Poland.

The effectiveness of IPR system is significantly lower in CEE countries than in the old member states (Table 2.7). This factor has a huge effect on the level and growth of the innovation in ICT (Wintjes and Dunnewijk 2008). The existence of industry-specific policies oriented to give support to firms in the ICT industry is also significantly associated with the index of innovation performance. Thus, the lack of policy in Hungary and Slovakia may cause the low level of innovation in ICT; this will be elaborated in Sect. 2.3. On the other hand, one might argue that the dynamics in the Czech Republic and Poland in MNE and SME location was the result of their effective ICT policy.

2.2.5 Conclusion

The output of the Hungarian ICT sector stood out from the Central European region over the 2000s. We showed in this section that this is due to the intense export activity of multinational firms of which production is heavily built on imported goods. The domestic market is on a lower level than foreign trade. The Hungarian ICT sector concentrates in Central Hungary, as regions were not able to attract MNEs to a similar degree as the Czech and Polish regions did. Neither was SME formation effective in the Hungarian regions; consequently, knowledge spillover is not likely to occur from MNEs to the local economy.

The Hungarian index of level of competition in the ICT market is below the European average but has a similar degree as in other CEE countries. The IPR protection in Hungary is also below the level of leading economies but exceeds its neighbours in the region. We observed that Hungary is losing the advantages it had in the beginning of the decade, with the ICT sector growing more dynamically in the Czech Republic and in some aspects in Poland as well. The argument on this will be further elaborated in the next section.

2.3 Contribution of ICT Industry to Structural Upgrading in CEE

The previous section described the state of the industry in CEE countries in general. We intend to show the contribution of ICT to structural upgrading in this section. Thus, we analyse the volumes and changes of value added and labour costs, R&D and patent activity and the ICT-related socio-cultural characteristics of CEE countries.

2.3.1 Value Added and Labour Cost Per Capita in the ICT Manufacturing of CEE Countries, 2000–2008

We continue our argument from Sect. 2.2 discussing how foreign-owned firms determine production in the Hungarian ICT sector and what follows from this for the local economy. First, we analyse cross-country differences concerning the share of value added in the output and labour cost in the CEE region.

The volume and share of value added in the production vary on a small scale across the four CEE countries we analyse (Table 2.8). The Hungarian value added in absolute terms has been the highest in the region; Hungary has taken Poland over in this sense. Value added over production has been stable in Hungary: it was only 14% in 2000 and has grown to 16% by 2006. The Czech ICT manufacturing has also evolved to this structure after the volume of intermediated inputs almost

Table 2.8 Volumes of value added and intermediate inputs at current prices and share over production in ICT manufacturing of CEE countries, 2000–2008 (MN Euro, %)

		2000		2002		2004		2006		2008	
		Vol.	%	Vol.	%	Vol.	%	Vol.	%	Vol.	%
Czech Republic	Inputs	8,141	78	15,094	87	18,556	86	27,009	87	39,592	89
	Val. add	2,286	22	2,353	13	2,970	14	3,965	13	4,736	11
Hungary	Inputs	17,813	86	18,868	86	25,205	83	31,565	84	n.a.	n.a.
	Val. add	2,788	14	3,157	14	5,106	17	5,922	16	n.a.	n.a.
Poland	Inputs	7,379	70	10,083	74	9,546	77	14,977	78	n.a.	n.a.
	Val. add	3,167	30	3,485	26	2,887	23	4,141	22	n.a.	n.a.
Slovak Republic	Inputs	2,331	74	2,949	77	4,795	81	10,044	83	12,911	84
	Val. add	802	26	875	23	1,123	19	2,022	17	2,421	16

Source: Author's calculation on OECD STAN database

Table 2.9 Wages over labour cost (%) and labour cost over total employment at current prices (Euro) in ICT manufacturing in CEE countries, 2000–2008

		2000	2002	2004	2006	2008
Czech Republic	Wages/labour cost	75	75	75	74	75
	Labour cost/employment	5,174	6,838	7,856	9,934	12,250
Hungary	Wages/labour cost	71	74	76	76	n.a.
	Labour cost/employment	7,370	7,653	8,553	10,191	n.a.
Poland	Wages/labour cost	86	87	87	n.a.	n.a.
	Labour cost/employment	8,864	10,742	7,569	10,218	n.a.
Slovak Republic	Wages/labour cost	76	76	78	79	n.a.
	Labour cost/employment	6,392	7,003	7,845	9,047	10,198

Source: Author's calculation on OECD STAN database

doubled from 2000 to 2002. ICT in Poland seems to have had a higher share of value added in the production due to a lower level of inputs. The output of Slovakian ICT depends more and more on the inputs, while output and its factors are on a lower level in absolute terms.

Wages over labour costs inform us about the share of wages that the employees earn in overall labour expenses. The remaining part contains the incremental expenses the companies must pay for social security purposes (Table 2.9).

Cross-country differences prevail first of all in wage/labour cost rates. In the overall ICT manufacturing, the wage of Polish employees accounts for 86–87% of total labour costs, while this share in the Czech Republic and Hungary was only 75–76%, respectively, and 79% in Slovakia for 2006. However, the differences in absolute volume of labour cost per employee seem to equalize in the region. The labour cost per employee has grown dynamically in the Czech Republic over this period, while the strong Zloty made the Polish employees relatively expensive in 2002.

We interpret the case of Hungary as revealing that ICT employees have become relatively expensive over the decade; this trend is even more strengthened by the big share of social welfare costs. One might expect that these differences result in a relatively competitive Polish ICT sector. Actually, this was underlined by R&D

managers of multinational ICT companies located in Budapest (eg. Nokia Siemens Networks) as a huge disadvantage of the Hungarian ICT sector (Barta et al. 2007). According to them, it is much easier to recruit software engineers in Poland where the employees can take almost the double salaries as in Hungary (reduced by income taxes).

2.3.2 ICT Innovation in CEE: R&D and Patenting

The state of innovation in the ICT sector reports on the future dynamics the industry might follow (Lindmark et al. 2008). Thus, we describe cross-country differences in the level of innovation performance and business expenditure on R&D (BERD) and government expenditure on R&D (GOVERD) in the ICT sector. The benchmarking of competitiveness and innovation performance in the ICT sector usually relies on indicators of patenting, total factor productivity and market advantage (Wintjes and Dunnewijk 2008).

Index of patenting advantage has been constituted from the number of EPO patent applications per employee in the ICT industry as the proportion of the total number of EPO patent application in this industry across all countries per employee.

Index of market advantage means a total export volume per employee in the ICT industry divided by total exports in the whole industry per employee.

Total factor productivity has been calculated from value-added data at constant prices, number of hours worked and value of capital stock at constant prices (Crespi and Patel 2007).

Built on these indicators, two composite indexes of innovation performance were established in the report. The first captured the static performance calculating the average levels of the three indicators between 2000 and 2003. The second index reflects the dynamics and includes changes in these variables between 1990 and 2003 for each country. These indexes are presented in the table as they were reported in the report (Wintjes and Dunnewijk 2008).

The leading countries in ICT innovation level in the period 2000–2003 were Finland and the Netherlands followed by France, the UK, Belgium, Germany and Austria. Individual indicators of innovative performance are included in the main index that was used for listing the countries. For example, the overall leadership of Finland in the ICT sector is based on a strong performance with respect to all three indicators (patent advantage, market advantage and total factor productivity).

CEE countries are at the other end of the spectrum, with low levels of innovation performance: Slovakia, Czech Republic, Poland and Hungary (Table 2.10). These countries perform on a much lower level of EPO patent applications; the negative level of the index concerning total factor productivity even made the innovation index negative. Hungary stands out in terms of market advantage; the export from the country is highly specialized in ICT products. The index (total exports per employee in ICT sector divided by total export per employee in the whole industry)

Table 2.10 Country-level benchmarking of innovative performance in the ICT industry, 1990–2003

	Index level of innovation	Patenting advantage	Market advantage	Total factor productivity	Index of growth in innovation performance
Finland	0.75	2.33	2.94	3.66	0.79
The Netherlands	0.58	1.93	4.50	1.50	0.74
France	0.48	0.91	0.82	3.97	0.20
UK	0.47	0.66	1.11	4.15	0.28
Belgium	0.46	0.72	2.26	3.29	0.32
Germany	0.45	1.75	1.11	1.94	0.67
Austria	0.41	0.99	1.49	2.61	0.49
Sweden	0.25	1.55	1.66	−0.46	0.57
Denmark	0.23	1.04	1.30	0.37	0.62
Spain	0.13	0.27	0.50	0.84	0.28
Portugal	0.11	0.05	0.66	0.96	0.38
Italy	0.06	0.49	0.39	−0.30	0.22
Hungary	−0.13	0.12	1.69	−2.66	0.35
Poland	−0.19	0.04	0.19	−2.53	0.20
Czech Rep.	−0.54	0.05	0.60	−7.24	0.19
Slovakia	−1.18	0.03	0.20	−15.08	0.14
Ireland		0.45	7.68		
Greece		0.18	0.22		
USA	0.50	0.97	0.56	4.19	0.35
Japan	0.43	1.45	1.24	2.20	0.18
Average	0.17	0.76	1.83	0.02	0.38

Source: Wintjes and Dunnewijk (2009), p. 63

had the fourth highest level in Europe. However, this export is mostly due to MNEs, as we argued earlier (Lengyel 2012). The fact that total factor productivity is low leads us to the statement that MNEs have located their low-value-added activities to the country.

Figure 2.1 was constituted from the first and last column of Table 2.10 and shows that growth of ICT innovation and innovation performance correlate to a high degree, but some of the countries of high innovation performance (France, Japan, the UK, the USA) have been growing at rates well below the median. Clustering of countries according to the two axes shows that Hungary and Poland belonged to average European level of performance and growth in ICT innovation in the 1990–2003 period. Slovakia and Czech Republic had low values for both innovation indexes at this time.

Business R&D expenditure is a widely accepted measure of level of maturity in a given industry and country (Malerba 2002; Török et al. 2005). ICT BERD is heavily dominated by some of the largest economies in the EU, while the new member states (EU12) contribute only 2% (Fig. 2.2). Note that due to the use of purchasing-power parities, the Scandinavian countries Sweden, Finland and Denmark, which have high price levels, have a lower share than they would have under current exchange rates (18.1% together instead of 20.1%). Of greater importance, however,

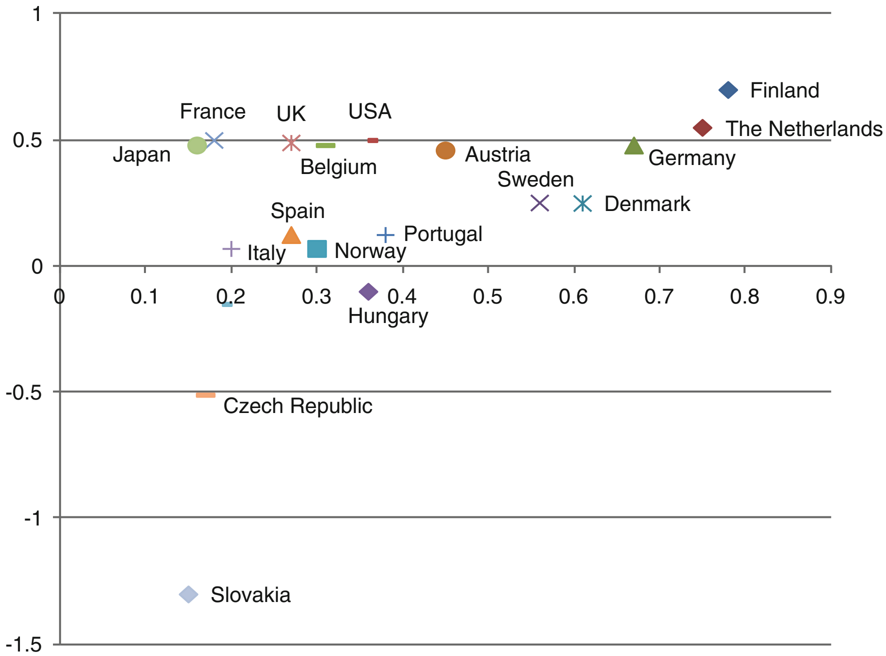

Fig. 2.1 Level and dynamics of innovation performance. Source: Wintjes and Dunnewijk (2009), p. 64

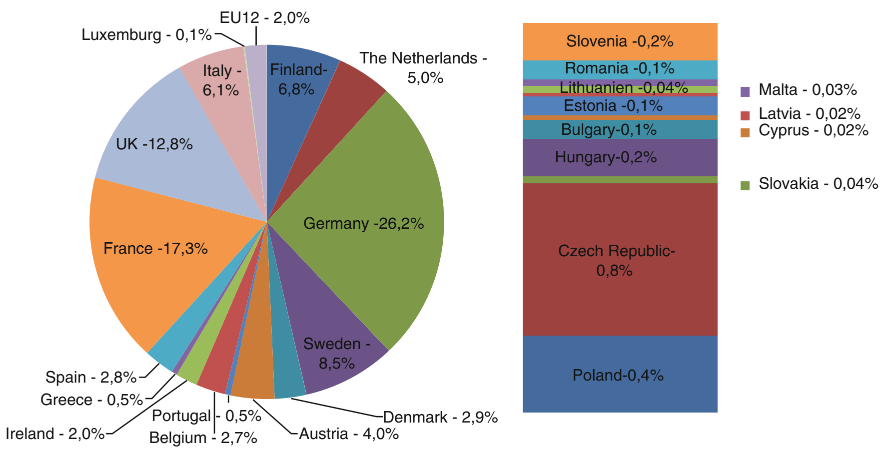

Fig. 2.2 Distribution of ICT business R&D expenditure in EU27 countries in PPP, 2005 (%). Source: Turlea et al. (2009), p. 41

the share of new member states has been doubled using PPP because of their generally lower price levels (Turlea et al. 2009).

It was pointed out several times that ICT was one of the leading areas of economic development and was concentrated in the most developed regions (reference). Consequently and not surprisingly, the ICT BERD is marginal in new member states compared to the whole EU. However, CEE country shares are interesting in our case. Czech Republic (0.8%) stood out according to the indicator and was followed by Hungary and Poland (0.4%). There was hardly any business R&D in the Slovakian ICT sector in 2005.

R&D employment (measured in full-time employment) follows a similar pattern as in the BERD distribution; Germany, Finland, France, Sweden and the UK made up 69% of the total EU volume (Turlea et al. 2009). The share of new member states is limited to 3–4%; however, large differences prevail among R&D personnel in ICT manufacturing and ICT services. Czech Republic is relatively strong in ICT services and was the 11th on the country list with a share around 2.5%. Czech Republic gained the second largest number of units in business ICT R&D employment (3,200 new jobs), which almost tripled the volume of the sectoral R&D base of the country.

Just like ICT BERD, ICT GOVERD is heavily dominated by the largest economies in the EU; Germany, France, the UK, Spain and Italy represent together 75% of European ICT GOVERD (Turlea et al. 2009). The new member states contribute only 3% to the total EU27 ICT GOVERD. This share is far below their economic weight but higher than their 2% share in ICT BERD. As with the share of new member states in the EU27 GOVERD, single CEE countries have a slightly higher share than in BERD. The Czech Republic accounts for 0.9%, which is higher than the share of Denmark or Greece. Hungary is the second in the region with 0.6%; Poland has a 0.5% share, and Slovakia made up 0.1% of the total EU27 ICT GOVERD (see Fig. 2.3).

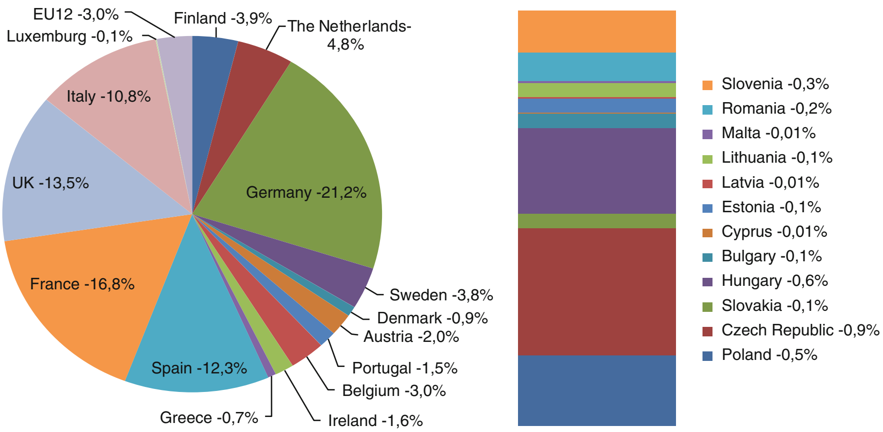

Fig. 2.3 Distribution of ICT GOVERD in EU27 countries in PPP values, 2005 (%). Source: Turlea et al. (2009), p. 48

These shares include ICT research performed by government establishments or universities and government financial support to ICT R&D that is performed in the business sector. Therefore, it provides a total picture of government participation in ICT R&D.

2.3.3 ICT-Related Socio-cultural Environment, E-Business Readiness and Interaction of ICT Companies in CEE Countries

The level of maturity of ICT sector in a given country is a dependent variable of several factors: the demand for ICT products and services, the international openness of the sector, human capital, etc. Foreign participation affects the ICT sector in CEE countries in terms of production and export volumes. However, according to our interviews with leading R&D centres of multinational companies in Hungary, foreign-owned companies are isolated from the local environment (Barta et al. 2007). These companies have very few local connections; the global network in which they take part requires in-depth preparedness from suppliers that local SMEs cannot fulfil. Consequently, foreign-owned firms and local SMEs might form separate spheres, and we expect that this symptom is stronger in CEE countries than in old member states. The fact that most of the MNE decisions are made in the company headquarters that are far from CEE countries strengthens the relevance of our assumptions.

However, knowledge spillovers occur not only along supply chains but also through the mobility of experts and new spin-off firms. The socio-cultural environment is important in the investigated countries, because the more mature the ICT culture, the higher demand one can expect for new ICT services. Similarly, the cultural environment favours new firm formation through the quality of human capital and the level of cooperation among agents. Consequently, the quality of socio-cultural environment helps the value added grow.

Cultural capital, human capital, social capital and organizational capital have to be distinguished in order to measure the specific elements of the environment related to innovation and structural change. Cultural capital encompasses basic attitudes towards science and technology, other cultures, the level of risk taking, etc. The concept of human capital is used in many aspects and means human resources in science and technology and knowledge-intensive services, the provision of higher educated people and job-to-job mobility. The social capital index includes the cooperation behaviour of firms, the main information sources for innovation, level of trust, etc. The index of organizational capital reflects to the company's culture, routines, structure, morality and management styles.

According to these measures, CEE countries lag behind compared to the mean of EU25 countries (Wintjes and Dunnewijk 2008). The Czech Republic exceeds the mean only in terms of social capital, which is very similar in Slovakia, for which the social capital index seems to stand out in new member states. All the four indexes in Poland are far below the EU25 mean. The cultural capital is above the EU mean in

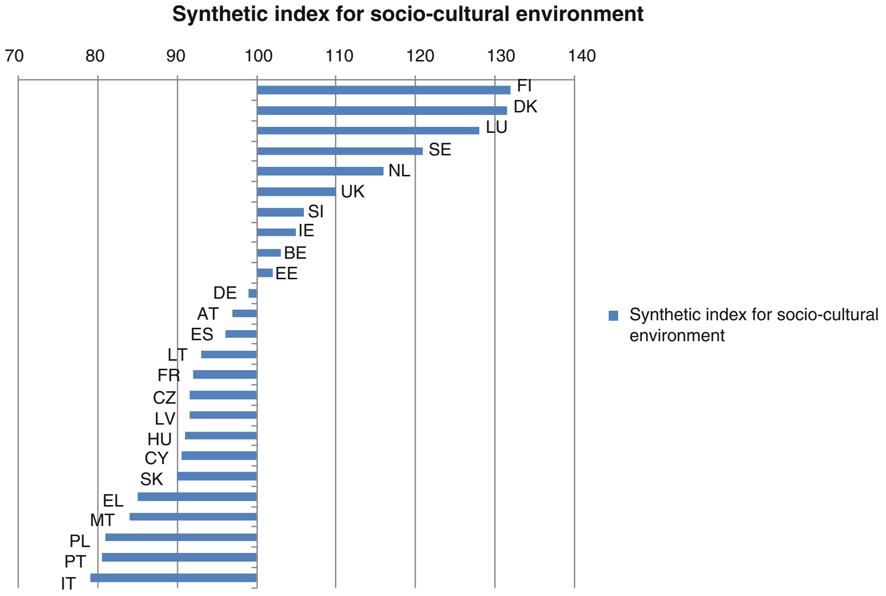

Fig. 2.4 Socio-cultural environment across EU25 countries. Source: Wintjes and Dunnewijk (2009), p. 69

Hungary, and the same occurs in social capital to a lower extent. However, human capital and organizational capital are under the EU25 mean.

The synthetized index for socio-cultural environment (Fig. 2.4) and also the cluster analysis prepared show that Czech Republic, Slovakia and Hungary constitute one block with Cyprus and Latvia and follow France and Lithuania at close quarters. Poland differs from these three CEE countries, because social networks are closed in the ICT industry. Thus, Poland relates much more to countries like Malta, Italy, Spain and Greece in terms of socio-cultural environment in ICT sector.

The e-business readiness appears to divide CEE countries differently than socio-cultural environment (Fig. 2.5). This index has been constituted from ICT adoption (% of companies that use internet opportunities) and ICT use (% of internet penetration in the population) indexes; it reflects on the state of general ICT demand and special internet-related ICT service supply. Most countries with high scores on the e-business readiness index are countries that have a strong socio-cultural environment. Hungary and Poland belong to the last cluster; share of internet users among citizens and companies is far beneath the EU27 mean, while these rated higher in the Czech Republic and Slovakia.

In our interpretation, both socio-cultural environment and e-business readiness indicators describe the opportunities that enable ICT innovations to prevail. Similar socio-cultural environment provides a similar ground for ICT innovation. As social networks are more closed in Poland, we expect that ICT innovations come off at a lower degree. However, Hungary lags behind according to e-business readiness that signs the low innovation expectations on ICT services. Another index shows the

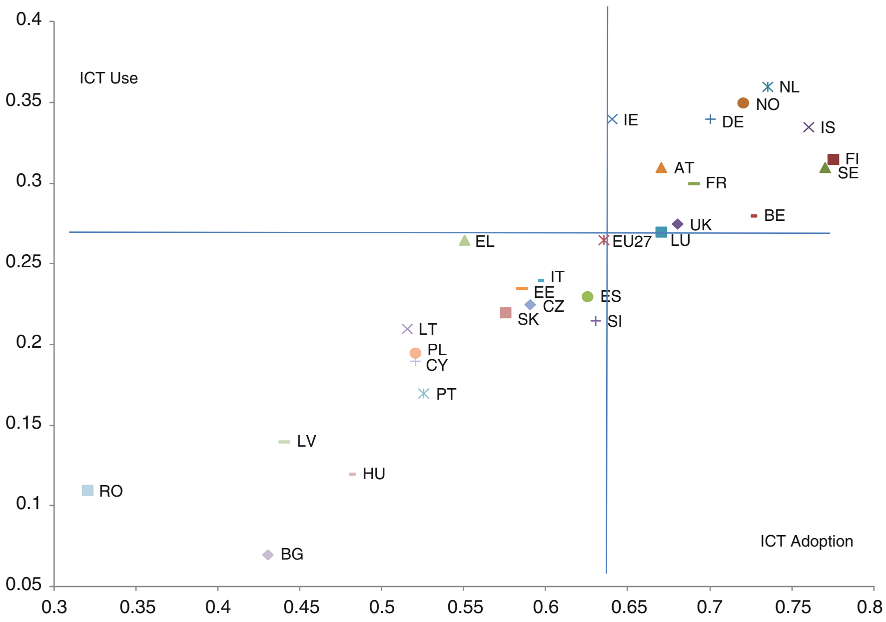

Fig. 2.5 ICT adoption and ICT use in EU25 countries by budget allocation weighting scheme. Source: Wintjes and Dunnewijk (2009), p. 70

proportion of companies that interact with universities to innovate in ICT. Hungary has a medium value compared to other CEE countries (Table 2.11). Thus, different aspects of agent interactions are embraced by the indicators described above.

The average size of ICT firms is the largest in Hungary among the selected EU countries just like the foreign participation in these sectors (Sweden and the Czech Republic have a similar rate in the latter index). Eighteen percent of Hungarian ICT firms are active in export or cooperate with firms outside Europe. This rate is low in EU comparison but is outstanding in CEE at the same time. Interestingly, the comparison of university-firm cooperation shows adverse contiguity; Hungary has a medium value in the region but exceeds most of the old member states.

To sum up, different aspects of innovation and R&D show slightly different results for our comparative study. For example, R&D expenditure is low in Slovakia, but they perform well in the e-business readiness indicator. However, the ICT dynamics in the Czech Republic prevail on a higher level, which is proved by almost every indicator.

2.3.4 Conclusion

The Hungarian value added in ICT sector has been the highest among CEE countries over the decade, though its share in output was low. However, indicators

Table 2.11 Interactions among agents in ICT industry in selected EU countries

	Average size[a]	Foreign participation[b]	International orientation[c]	Cooperation universities[d]
Finland	4.04	0.01		0.55
The Netherlands	0.97	0.01	0.20	0.12
France	1.26	0.01	0.31	0.14
UK				0.12
Belgium	1.05	0.01	0.26	0.36
Germany	1.21	0.01	0.28	0.23
Austria				0.29
Sweden	0.95	0.03	0.28	0.13
Denmark		0.02	0.35	0.12
Spain	1.48	0.01	0.19	0.12
Portugal	0.83	0.01	0.41	0.17
Italy	2.25	0.01	0.09	0.11
Hungary	0.45	0.03	0.18	0.16
Poland	0.95	0.01	0.13	0.12
Czech Republic	0.74	0.03	0.07	0.21
Slovakia	0.50	0.01	0.10	0.24

Source: Wintjes and Dunnewijk (2009), p. 66

[a]Average size—the larger the index the smaller the average size of firms in the industry

[b]Proportion of companies that have a foreign office

[c]Proportion of firms that sell products to international markets and cooperate with firms outside Europe

[d]Proportion of ICT firms that cooperate with universities to innovate

reporting on the dynamics and opportunities for further growth reflect that the ICT sector in other CEE countries might be more competitive. ICT labour costs are lower in the Czech Republic and Slovakia, and the wages are still low due to high social welfare expenses and income taxes in Hungary.

ICT R&D values are also higher in the Czech Republic both in the private and the public sectors. Though Hungary had performed well and grew dynamically in the 1990s, the Czech innovation system is likely to overcome it. In particular, ICT service innovations are expected to prevail on a higher level in the Czech Republic because a higher share of people have access to the internet as do Czech companies. The university-industry relations in the Czech Republic are also stronger than in Hungary.

2.4 Policy Measures to Promote Expansion and Quality Upgrading in the Hungarian ICT Industry

In this section, we look through the parallels in the Czech and Hungarian innovation policies and the Hungarian ICT policy.

2.4.1 Innovation Policies and FDI Attraction in the Czech Republic and Hungary

Innovation policies have followed similar paths in the Czech Republic and Hungary (Havas 2006; Szanyi 2012). R&D expenditures of foreign-owned firms have become an important factor of innovation systems since the beginning of the 1990s. However, the Czech policy reacted faster than the Hungarian one (Lengyel and Cadil 2009). The first Czech policy was launched in 2000, while the innovation strategy was accepted only in 2007 in Hungary. The Czech system concentrated on the economical perspectives of R&D: FDI attraction had a major role in innovation policy. Universities were in the focus of Hungarian innovation policy. We argue that the main institutions of innovation systems had a decisive impact in the late 1990s on the development of the innovation system: the Ministry of Industry and Trade in the Czech Republic and the Ministry of Education in Hungary (Table 2.12).

Although Structural Funds could be attractive for MNEs' R&D in the Czech system, and national sources in Hungarian system, innovation policies were likely to play only a marginal role. The investment was attracted by inherited factors like the quality and scope of domestic R&D, capacity of public and private R&D institutions, universities, quality of human resources as well as the geographical availability.

2.4.2 The ICT Action Plan in Hungary

The Hungarian government accepted the ICT Action Plan in September 2009. This includes all the directions of appropriation of EU Structural Funds for the 2010–2013 period that relates to ICT demand and supply, to ICT industry and to socio-cultural environment and the like. The aim of the Action Plan is to strengthen the role of ICT sector in the economy in order to increase competitiveness, productivity, employment and provide equal chances for the whole economy. Numerical aims are to increase the volume of employment by 32,000 new jobs and reach 5–8% annual market growth by the year 2013. The aim structure, though, is quite diverse; 16 aims are named subordinated to three pillars. We look through these before introducing the concrete programmes:

- Pillar 1—Human capital
  - Aim 1: Safekeep the existing ICT jobs, training for ICT experts
  - Aim 2: Decrease the lack of ICT experts by making the software-engineering university programmes attractive, by enhancing the quantity and quality of graduated ICT workforce, by re-training programmes
  - Aim 3: Develop the IT knowledge transmission in the secondary and higher education

Table 2.12 FDI attraction in the Czech and Hungarian innovation policies

	Czech Republic	Hungary
Major institutions	Ministry of Industry and Trade Ministry of Education, Youth and Sport	1965–1999 National Committee for Engineering and Development 2000–2004 Ministry of Education 2004–2006 National Office for Research and Technology controlled by the Ministry of Education 2006–2008 NORT controlled by the Ministry of Economy
Legislation	2002—Act 130/2002 Coll. on the Support of Research and Development from Public Funds	2003—Act on Research and Technological Innovation Fund 2005—Innovation Act
Indirect incentives	2005—Deduction of tax base	2005—Innovation tax, deduction of tax base
Strategies	1999—Action Plan for Supporting the Competitive Ability of Czech Industry 2000—National Research and Development Policy 2005—National Innovation Policy 2004–2006 Operational Programme Industry and Enterprise 2007–2013 Operational Programme Enterprise and Innovation	1999—Innovation Strategy for Competitiveness 2000—Science and Technology Policy 2004–2006 Operational Programme Economical Competitiveness 2007—Innovation Strategy 2007–2013 Operational Programme Economic Development
Direct R&D related FDI attraction	2003–2008 Framework Programme for the Support of Technology Centres and Centres of Business Support Services	1999–2002 High-Tech Equipment Programme
Programmes for university cooperation	EU Structural Funds financed programmes: 2004–2006 sub-programmes INOVACE (innovation) and KLASTRY (clusters) 2007–2013 sub-programmes SPOLUPRACE (cooperation), INNOVACE (innovation) and POTENCIAL (potential)	1999–2005 Cooperation Research Centres 2005—Regional Knowledge Centres, Focus Sector Innovation Programme 2007–2013 Structural Funds

Source: Authors edition in close co-operation with Vladislav Cadil

  – Aim 4: Phase the demand for ICT experts and the university output
  – Aim 5: Enhance the level of motivation and the number of university entrants in the primary and secondary education

- Pillar 2—R&D and innovation

  – Aim 6: Develop the innovation culture, patenting activity, the openness for R&D applications in companies
  – Aim 7: Strengthen relationships among universities, research institutes and companies, build clusters, operate platforms
  – Aim 8: Help the dispersion of open-source softwares
  – Aim 9: Develop the R&D activity of ICT firms, re-structure R&D tenders in cooperation with the industry

- Pillar 3—Investment incentives, finance
  - Aim 10: Anticipate the breakdown threats for ICT companies with finance support
  - Aim 11: Enhance the investments of ICT companies by providing the finance conditions
  - Aim 12: Increase the venture capital and FDI attraction of ICT companies with special focus on the re-location of high-value-added activities that occur due to the financial crisis
  - Aim 13: Develop the entrepreneurial culture and marketing skills
  - Aim 14: Enhance the performance and exportability of knowledge- and technology-intensive ICT SMEs; develop the opportunities of the Hungarian software and ICT service export
  - Aim 15: Develop the accession infrastructure: NGA and wireless services
  - Aim 16: Liquidate the bottlenecks in telecommunication infrastructure

This complex aim system is further developed into actions and programmes that already contain the time frame and amount of resources (see Table in Appendix 1). The programmes are directly linked to the pillars we introduced before. Interestingly, 16 aims in the strategy are followed by 16 programmes. This means, in our interpretation, that the programmes are general, which enables flexible adaptation to current circumstances. If this is the case, one has to assume a certain degree of uncertainty in the ICT policy, because the aims of the programmes are too general.

The amount of government support of each programme clearly underscores the importance of state intervention. Two types of funds are named in the programmes: EU Structural Funds (SF) and national funds; the Research and Technological Innovation Fund (RTIF) is of prime importance as national source. This fund was established by the Hungarian Innovation Act with the introduction of a new funding scheme based on a special innovation tax in 2004. According to the provision, every enterprise (except micro- and small enterprises) must pay 0.3% of its turnover into the RTIF. The direct R&D expenditures, both intramural and ordered from public R&D units, can be deducted from this tax. Furthermore, companies can deduct R&D expenditures from the tax base, and special expenses (R&D projects with universities) can be counted twice in this deduction. The other half of the funding comes from the Hungarian government, which contributes to the fund with an equivalent amount to the payments of the enterprises.

In the financing of ICT programmes, EU Structural Funds dominate at €319,600,000, of which €180,000,000 will be spent on ICT infrastructure. RTIF will share the support with €19,840,000. Categorizing the expenses, we found that ICT infrastructure will receive the highest value of support: €180,000,000 from SF and national indirect incentives that count for around 32,000,000 tax reduction per year. €93,600,000 will go to human capital development, and another €8,240,000 to enhance IT and entrepreneurial skills in SMEs. New job creation will be enhanced with €8,000,000. €16,000,000 is to help the export of ICT services through the whole planning period. ICT-related R&D will be assisted though excellence centres with €7,200,000. €500,000 will be spent on the coordination and planning of these actions.

2.5 Conclusion

Hungarian ICT manufacturing output has stood out in the Central European region over the 2000s. This is due to the intense export activity of multinational firms, which production is heavily built on imported goods. The domestic market is at a lower level than foreign trade. The level of competition in the Hungarian ICT market is below the European average but is on par with other CEE countries. The IPR protection in Hungary is also below the level of leading economies but exceeds neighbours in the region.

The Hungarian value added in ICT sector has been the highest among CEE countries over the decade, though its share in output was low. However, indicators of the dynamics and opportunities for further growth demonstrate that the ICT sector in other CEE countries might be more competitive. ICT labour costs are lower in the Czech Republic and Slovakia, and the wages are still low due to high social welfare expenses and income taxes in Hungary. Similarly, the country was not able to attract MNEs in the 2000s to the same degree as was the Czech and Polish regions. Neither was SME formation effective in the Hungarian regions; consequently, knowledge spillover is not likely to occur from MNEs to the local economy.

ICT R&D values are also higher in the Czech Republic both in the private and the public sectors. Though Hungary had performed well and grew dynamically in the 1990s, the Czech innovation system is likely to surpass it. In particular, ICT service innovations are expected to prevail at a higher level in the Czech Republic, because a higher share of people have access to the internet as do Czech companies. Consequently, Hungary might lose the advantages it had in the beginning of the decade, as the ICT sector continues to grow more dynamically in the Czech Republic and in some aspects in Poland as well.

Economic policy is likely to be responsible for the above outlined trends. For example, the Czech innovation policy reacted faster to the challenges of FDI attraction than the Hungarian one. The Czech system concentrated on the economical perspectives of R&D, and FDI attraction had a major role in innovation policy, while universities were the focus of Hungarian innovation policy. The Hungarian ICT Action Plan has a very complex aim system, though the concrete programmes might be too general. The plan concentrates half of the resource on ICT infrastructure building, which will probably have demand side effects. The programmes aim to strengthen the supply side of ICT industry with investing in human capital that will affect the industry over the long run. Entrepreneurial skills, export activity and R&D will have smaller shares from the pubic ICT resources.

Appendix 1: Programmes in the Hungarian ICT Action Plan

	Title	Time frame	Amount of resources	Fund	Output indicators
1.1	Analysis of the skills-gap and implement the results in the higher education and special education programmes	2009 Q4–2010 Q2	40,000 €	Labour market fund	Growth of number of students graduated in programmes that fit to industry needs
1.2	Re-training of IT experts	2010 Q1-	4,000,000 € per year	EU Structural Funds	2,600 participants in basic (70% graduation), 1,400 participants in advanced level programmes (80% graduation)
1.3	Re-training for employees who change career	2010 Q1-	1,200,000 € per year	EU Structural Funds	800 participants in basic (70% graduation), 200 participants in advanced level programmes (80% graduation)
1.4	Enhance the level and attractiveness of IT engineering education	2010 Q1–2013 Q4	4,000,000 € per year	EU Structural Funds	4% annual growth in university application; re-trained teachers, modernized curriculums
1.5	Enhance the conditions for IT expert supply in primary and secondary education	2009 Q4–2013	22,000,000 € per year	EU Structural Funds	Number of schools and pupils joined; number of teachers re-trained (8,000 per year)
2.1	Estimate and develop the entrepreneurial skills in SMEs	2009–2011	200,000 €	Research and Technological Innovation Fund	Growth in the ICT BERD; development in IPR; growth in the number of innovations
2.2	Entrepreneurial development and incubation programme for innovative SMEs	2009–2013	8,000,000 €	Research and Technological Innovation Fund	Growth in the number of innovative ICT SMEs
2.3	Development in ICT excellence centres	2010 Q1–2013	4,000,000 €	EU Structural Funds	Participating researchers (200 per year), participating institutes
2.4	Supporting open-source excellence centres	2009–2013	400,000 €	Research and Technological Innovation Fund and EU Structural Funds	Growth in the number of OSS centres; growth in the utilization of OSS in the public and private sector

	Title	Time frame	Amount of resources	Fund	Output indicators
2.5	Strengthen the international R&D performance of outstanding sectors	2009–2013	3,200,000 €	Research and Technological Innovation Fund	Growth in the number of successful international tenders, growth in the number of projects led by Hungarian partners
2.6	Phasing R&D tenders to the needs of outstanding sectors	2009–2013	20,000 €	Ministry for Development and Economy	Successful ICT tenders, participating firms
3.1	Promotion of seed capital to ICT sector	2009–2013	40,000 €	Research and Technological Innovation Fund	Growth in the number and volume of seed capital investments
3.2	Supporting new knowledge-intensive, high-value-added jobs	2009–2013	8,000,000 €	Research and Technological Innovation Fund and EU Structural Funds	Number of new jobs
3.3	Investment tax incentives for NGA infrastructure	2009–2013	About 32,000,000 € per year		Length of the network
3.4	Development in optical network	2009–2013	180,000,000 €	EU Structural Funds	Number of settlements where optical networks are available
3.5	Enhancement of software and ICT service export	2009–2013	4,000,000 € per year + 8,000,000 € per year	EU Structural Funds; bank loans	Share of ICT sector in total export; share of software and ICT service export in total ICT export
4.1	Principle of partnership	2009–2013	Finance is not needed	Ministry for Development and Economy	Number of ICT regulation project that contained impact analysis
4.2	Monitoring and ex-post evaluation of ICT Action Plan	2009–2013	40,000 €	Ministry for Development and Economy	Monitoring and evaluation report
4.3	Introduction of open-source softwares into the work methods of in the public sphere	2009 Q4-	Savings from the software licences	Ministry for Development and Economy	Number of computers covered by the programme

Source: Authors' edition after NFGM 2009

Appendix 2: Euro Exchange Rates of National Currencies in CEE on 1st of January

	2000	2002	2004	2006	2008
Czech Korún	35.98	31.53	32.42	29.09	26.50
Hungarian Forint	253.98	243.79	266.24	252.72	252.97
Polish Zloty	4.14	3.51	4.69	3.84	3.60
Slovakian Korún	42.28	42.53	41.54	37.83	33.55

Source: Authors edition after the historical exchange rates on https://www.xe.com

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