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The Serbian Knowledge Economy – A private business perspective

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3 Abbreviation

bn.	billion
cf.	compare
EU	European Union
EUR	Euro
FDI	Foreign direct investments
HT	High technology manufactures
ICT	Information and communication technology
IT	Information technology
KE	Knowledge economy
LT	Low technology manufactures
MT	Medium technology manufactures
NIS	National Innovation System
OECD	Organisation for Economic Co-operation and Development
PP	primary products
R&D	Research and Development
RB	Resource-based products
RCA	Revealed comparative advantage
RDI	Research, Development and Innovation
Rep.	Republic
SIEPA	Serbia Investment and Export Promotion Agency
SITC	Standard International Trade Classification
USD	United States Dollar

4 Introduction and Background

Traditional growth theory focuses on the factors of capital, labour, as well as materials and energy. Since these factors exhibit diminishing returns to scale – at least according to neo-classical theory – long-term macroeconomic growth is possible only when production functions incorporate technology and knowledge, and influence into total factor productivity.[2] Empirical and analytical studies show that the economic growth of industrialised countries in the 20th century was mainly driven by human capital and knowledge.[3] In contrast to other production factors, investments in knowledge have shown increasing – rather than decreasing – returns to scale.[4] These findings suggest the need for new frameworks and strategies for qualitative and smart growth.

Considering a growing competitive environment, technological competitive advantages become increasingly important, as neo-Schumpeterian growth models a la Aghion et al illustrate.[5] Research, development, and innovation (RDI), as well as fast adaptation/diffusion are, in the mid- and long-term, crucial factors for competitiveness. Additionally, in the concept of "the knowledge economy," human capital is regarded as complementary to investments in RDI and adaptation. The stimulation of private business RDI and the improvement of framework conditions for private RDI are at the top of national RDI policy agendas worldwide. Thereby, the supply of highly qualified personnel is often acknowledged as being a significant key to success.

Incorporating modern information infrastructure, a policy agenda supporting human capital, as well as knowledge dissemination into a framework of an effective innovation system, the concept of "knowledge economy" emerged.[6] The World Bank asserts: „A knowledge economy (KE) relies on knowledge as the key engine of economic growth. It is an economy in which knowledge is acquired, created, disseminated, and applied to enhance economic development. Intuitively, conditions for a knowledge-based development process would seem to include an educated and skilled labour force, a dense and modern information infrastructure, an effective innovation system, and an institutional regime that offers incentives for the efficient creation, dissemination, and use of existing knowledge."[7] However, there is no coherent definition of the term "knowledge economy." Instead, the conceptual weaknesses of this widely-used metaphor has been revealed during the last years.[8] In this paper an empirical approach is proposed to identify economic sectors which "acquire, create, disseminate, and applie" the knowledge base of Serbia and hence, have potential for economic growth in Serbia apart from low labour costs.

While the neoclassical standard model predicts convergence between the industrialised and the catching-up economies, the concept of the knowledge economy allows to offset this tendency through shifting outwards the technology frontier. In order to "catch-up," an early paradigm shift towards a "knowledge-based economy" or "knowledge

2 OECD (1996) S. 10.

3 cf. Abramowitz (1990); Barro (1991); Mankiw et al. (1992); Adams (1990).

4 OECD (1996) S. 11.

5 Aghion, P., Howitt, P. (1998) and Aghion, P., Howitt, P. (1992).

6 According to the Chen & Dahlman (2005) the four pillars of the Knowledge Economy are: 1. An economic incentive and institutional regime, 2. Educated and skilled workers, 3. An effective innovation system, 4. A modern and adequate information infrastructure.

7 World Bank (2007), p. 23.

8 cf. Smith (2000) S. 4.

society"[9] is of special interest for emerging countries. The implications fit to Serbia as an example of a latecomer transitional economy mainly for two reasons: Serbia reached official candidate status of the EU at 12 October 2011 and hence should adopt the European developments associated with the Lisbon Strategy. Furthermore, Serbia has faced sharp increases in its wage level since 2000.[10] In order to reach a comparable Western European income level, Serbia could no longer ride the horse of international wage competitiveness. The knowledge-based economy can lay the ground for economic success in Serbia.

In order to operationalize the rather inclusive and extensive definition and to make the concept of the knowledge economy deployable for empirical research within the Serbian context, knowledge economy sectors are defined as sectors that extensively exploit one country's knowledge base (defined in the widest sense, e.g. know-how, technology) as a factor of production. Even though other approaches often take primarily R&D-intensive sectors into consideration,[11] bearing the objectives of this study in mind, and taking the specific Serbian context into account (i.e. as a transition economy), a sole focus on R&D-intensive sectors would fall short of providing substantial empirical insights.

Based on the World Bank definition, this study will contribute towards the development of strategies establishing a knowledge economy in Serbia from the private sector perspective. As a first step, industries and services were identified which have particular strategic importance for the Serbian economic development, because they are part of and they use the country's knowledge base. In the second part, various stakeholders out of these industries provide their insights into the various aspects of Serbia's knowledge economy. Information and inside views are provided about remaining gaps, as well as roadblocks or bottlenecks that persist which inhibit the development and exploitation of the existing knowledge base in Serbia.

9 cf. Smith (2000) S. 2.

10 Đekić (2010) p. 335.

11 OECD (1999) and OECD (2005).

5 The Serbian Knowledge Economy

Consequently to the definition of “knowledge economy” and following Smith (2000), no specific industry sector restrictions are applied within this study. High-tech industries and R&D institutions are not the only RDI-system stakeholders that generate competitive advantages. All industries, including the traditional ones like agriculture, may generate competitive advantages by absorbing and using new technologies and implementing new processes. The imbedded knowledge in these cases does not originate from intramural R&D, but rather from knowledge and technology transfer. However, absorbing and utilising new technologies also in traditional industries potentially facilitates increasing competitive advantages.

In order to prepare a list of economic sectors rely on the Serbian KE a three step approach was applied. Firstly, in order to resist in a world economy with increasing global competitiveness, the sector need to reveal current or potential future comparative advantages. Thus, sectors were analysed where Serbia has more exports than imports.

In a second step, sectors, which have managed to attract disproportional high amounts of foreign direct investments were identified. It is assumed that international investors base their decisions – besides the anticipated return on investment and other data – on detailed information about the local knowledge base and qualifications of the potential work force when searching for investment opportunities. Additionally, FDI are known as an important mediation channel for international knowledge spillover and thus further stimulate the knowledge potential of the identified sector.

Thirdly, the concept of clusters was deployed and regional concentrations of production were identified. Due to geographic proximity and similarities concerning concepts, clusters are characterized by intensive cooperation and knowledge exchange. Besides knowledge spillover between complementary and mutually supportive industries, they typically reveal interlinking and networking activities amongst companies, research institutions, and public agencies. The existence of clusters hence is a critical requirement for the knowledge potential of the sector.

Revealed comparative advantage (RCA)

In order to identify international competitive advantages of particular industries, revealed comparative advantages (RCAs) were calculated.[12] The theoretical consideration behind this is that a country will specialize in the production of those commodities for which it has a comparative advantage based on its technological (Ricardo)[13] or relative (Heckscher-Ohlin)[14] factor endowments.

Table 1: Development of Serbia's export-import patterns, 2005 and 2010, RCA

	PP		RB		LT		MT		HT		Others		total (USD thousand)	
	2005	2010	2005	2010	2005	2010	2005	2010	2005	2010	2005	2010	2005	2010
Exports , in % of total	15	20	30	27	33	26	17	19	4	7	1	1	4 481	9 793
Imports, in % of total	22	12	19	16	16	16	32	25	10	11	0	19	10 459	11 769
													total external trade (Exports + Imports), in %	
All countries	-38.0	45.9	45.7	50.0	71.0	50.2	-64.8	-27.9	-86.5	-49.1	94.8	-256.9	100	100
EU27	72.9	79.5	44.2	40.7	70.6	77.7	-109.4	-41.8	-153.6	-48.4	-76.6	-359.6	56	69
Former-Yugoslavia countries	72.5	17.0	0.9	5.4	6.5	24.4	-36.0	8.5	-39.6	30.0	32.5	-482.8	17	23
Russian Federation	-298.5	-107.5	65.9	127.6	332.6	349.0	167.8	116.4	482.2	234.7	-258.6	-604.8	13	12
China	-258.6	11.5	6.7	126.5	7.0	45.7	37.1	-27.8	-52.4	-77.6	399.2	-427.3	3	6
USA	215.1	214.6	126.3	5.6	-75.8	-114.9	-154.0	-28.2	-336.7	-50.7	256.2	47.4	2	2
Germany	124.2	108.7	107.6	56.5	107.6	92.8	-140.5	-64.7	-97.0	19.1	-56.1	-573.9	11	13
Italy	66.5	184.7	54.1	12.2	50.9	54.9	-144.3	-76.6	-195.1	-158.2	-297.6	-275.3	11	12
United Kingdom	277.4	316.6	138.5	129.8	50.7	70.2	-222.6	-152.0	-315.1	-53.1	-184.9	-581.8	2	2
Bulgaria	-148.3	-116.9	20.7	45.5	72.5	117.2	10.6	125.5	-130.1	87.0	97.2	-226.6	2	4
Romania	39.6	74.9	-44.5	43.1	91.6	50.6	-78.4	-43.4	27.0	-160.9	97.3	-594.8	3	6
Rep. of Bosnia and Herzegovina	79.4	35.0	-30.0	-50.9	-11.6	23.4	56.0	120.6	37.2	66.5	49.3	-566.9	7	8
Republic of Macedonia	-30.5	-16.7	24.2	45.9	10.5	-14.5	-16.5	-4.7	-45.3	15.1	199.8	-467.1	3	3
Republic of Montenegro	-	-98.1	-	71.8	-	86.6	-	207.3	-	-6.2	-	-430.9	-	4

PP: Primary Products; RB: resources based products; LT: Low technology manufactures, MT: Medium technology manufactures; HT: High technology manufactures. Others: Gold, Coins und unclassified goods (SITC4 code: 999). Sources: Serbian National Bank, authors' calculations. Classification according to Lall (2000): technological classification of exports.

The RCA indicator represents the proportion of exports in industry *i* relative to its share of imports in the same industry. Therefore, the comparative advantage will be revealed by a more-than-proportional net export compared to total trade or, in the case of a negative trade balance, by a less-than-proportional net import in a given industry. Thus, RCA-values greater than zero indicate a comparative advantage.

The analyses are based on commodity trade data by Standard International Trade Classification (SITC) in its 4th revision from the Statistical Office of Serbia. Instead of using individual commodities, these were aggregated to groups using the classification system from Lall (2000). Lall classified trade data by the incorporated technology

12 Balassa (1965).

13 Ricardo (1817).

14 Heckscher & Ohlin (1991).

levels and distinguished between four product groups: PP primary products; RB resource-based manufactures; LT Low-technology manufactures; MT Medium-technology manufactures; HT High-technology manufactures.[15]

Table 1 shows the development in Serbia in international trade between 2005 and 2010. Exports grew over this period by 118%, and imports by 13%. The biggest change in the trade pattern occurred in the primary sector. There, the export proportion increased by 5% and the import proportion decreased by 10%. Since 2005, the Serbian economy has stabilized and the export of primary products, traditionally strong in Serbia, increased. Facing a comparative disadvantage in 2005 in the primary sector, Serbia has regained its advantage (RCA: 46).

The biggest share in exports originates in the resource-based sector, where Serbia has a worldwide comparative advantage (RCA: 50). The same applies for the low-tech sector, the second largest export sector of the Serbian economy. The medium-tech and high-tech sectors could increase their shares in exports between 2005 and 2010,[16] and the medium sector's proportion in imports decreased by 7%. In both sectors, Serbia has competitive disadvantages. Regarding some trading partners, however, Serbia's export-import ratio is better in these product groups than in total. Compared to Bulgaria, Russia, and all of the neighbouring former Yugoslav Republics, Serbia has comparative advantages in the medium- and high-technology sectors.

Serbia's exports are to a large extent products with little further processing: in 2011, 21% of exports are agricultural products and 16% are basic metals. The next important export sectors are: chemicals and chemical products (6%), rubber and plastic products (6%), electrical equipment (6%), machinery and equipment (6%), fabricated metal products (5%) and machinery and equipment (5%).

In *Table 2*, the development of the export-import patterns of the medium technology sector is disaggregated in three subsectors: automotive products (MT1), process industries (MT2) and engineering products (MT3).[17] Only in MT3 (engines, motors, industrial machinery, pumps, switchgear, ships, watches) does Serbia seem to have comparative advantages (positive RCA. In automotive products, Serbia still has a negative RCA but with a positive tendency since 2005. In medium-technology process industries (synthetic fibres, chemicals and paints, fertilizers, plastics, iron, pipes/tubes), Serbia has a negative RCA which additionally reveals a small decrease since 2005. Nonetheless, a big part of exports falls into this category.

15 A description of each of the groups can be found in Lall (2000) p. 342-343.

16 By far the largest exports in the high-tech sector had had medicaments (SITC 542) with 29% share of the whole high-tech sector, it had grown about 93% between 2005-2010 which had been less than the average growth of exports about 119%. The increase of export shares between 2005 and 2010 from 4 to 7 percent in the high-tech sectors had been mainly rooted to increasing exports in *Rotating electric plant and parts thereof* (SITC4 Code 716), *Telecommunications equipment* (SITC4 Code 764) and *Electrical machinery and apparatus* (SITC4 Code 778). Other groups with substantial growth in exports but still rather small share had been: *Monitors and projectors,reception apparatus for television* (SITC4 Code 761), *Office Machines* (SITC4 Code 751) and *Aircraft and associated equipment* (SITC4 Code 792).

17 Lall-classification of medium-technology (MT) products was applied (Lall 2000).

Table 2: Development of Serbia's export-import patterns in Medium technology manufactures, 2005 and 2010, RCA

	MT1		MT2		MT3		External trade (USD thousand)	
	2005	2010	2005	2010	2005	2010	2005	2010
Exports , in % of total MT	6	9	49	39	44	52	750	1 864
Imports, in % of total MT	20	16	38	45	42	39	3 344	2 962
							total trade (Exports + Imports), in %	
All countries	-178.0	-87.1	-39.8	-43.2	-58.8	2.1	100	100
EU27	-235.4	-91.4	-65.8	-69.2	-124.4	-2.6	70	81
Former-Yugoslavia countries	-1.9	154.0	-22.5	-5.8	-51.9	4.3	14	21
Russian Federation	26.5	-10.7	36.3	-30.0	377.9	324.8	4	4
China	-12.1	-78.1	-383.0	20.9	64.8	-58.4	3	5
USA	-211.1	-224.7	-486.0	-284.1	-100.8	22.1	3	2
Germany	-226.1	-176.2	-105.8	-208.3	-125.5	12.1	20	20
Italy	-240.0	-37.2	-57.2	-39.8	-220.0	-138.3	11	12
United Kingdom	-220.5	-338.0	-239.8	-190.3	-213.4	-92.0	2	2
Bulgaria	-173.6	-7.5	58.6	162.0	-89.0	51.9	1	1
Romania	-291.6	-25.1	-25.9	-1.1	-88.9	-169.4	4	4
Republic of Macedonia	-106.2	48.9	-19.1	-40.9	24.8	91.5	2	3
Rep. of Bosnia and Herzegovina	43.8	194.3	108.6	121.0	20.6	111.4	4	5
Republic of Montenegro	-	424.5	-	218.4	-	171.7	-	3

MT1: automotive products, MT2: process industries, MT3: engineering products. Sources: Serbian National Bank, authors' calculations. Classification according to Lall (2000): technological classification of exports.

Foreign Direct Investment (FDI)

It is assumed that foreign investors base their decisions, besides the anticipated return on investment and other data, on detailed information about the local knowledge base and qualifications of the potential work force when searching for investment opportunities. Against this background, present FDI provide one proxy for the global competitiveness of sectors and regions. Hence, economic sectors that attracted FDI also reveal strengths of Serbian knowledge economy.

Table 3: Serbia's foreign direct investments by branch of activity, inflows, in 2004 -2010, in thousand EUR

No.	BRANCH OF ACTIVITY	2004	2005	2006	2007	2008	2009	2010	2004 to 2010	% of total
1.	Agriculture	7 716	9 357	9 306	15 086	38 227	21 025	10 991	111 708	1
2.	Fishing			29	40	77		5 068	5 214	0
3.	Mining and quarrying	1 815	247	1 901	24 228	19 564	404 926	4 201	456 882	3
4.	Manufacturing	239 857	250 483	789 329	366 341	388 478	532 890	337 884	2 905 262	20
4.1	Food products and beverages	78 241	52 307	61 381	96 800	100 362	228 790	53 888	671 769	5
4.2	Manufacture of tobacco products	62 022	35 078	34 714	6 891	1 259			139 964	1
4.3	Textile yams and fabrics	1 600	8 652	26 078	48 998	37 627	28 131	4 334	155 420	1
4.4	Wearing apparel and fur	1 020	833	7 849	4 786	741	89	10 124	25 442	0
4.5	Manufacture of leather and leather products	1 324			652	228	200	915	3 319	0
4.6	Wood and products of wood and cork	12	74	5 450	8 984	17 844	28 161	16 045	76 570	1
4.7	Pulp, paper and paper products	2 466	5 837	5 329	6 938	4 895	304	280	26 049	0
4.8	Publishing, printing and reproduction	2 566	4 550	5 098	5 879	6 090	3 336	7 229	34 748	0
4.9	Coke and oil derivatives	1 046	651		18 380	11 685	6 778	31	38 571	0
4.10	Chemicals and chemical products	11 540	15 455	525 781	15 929	11 255	4 667	9 924	594 551	4
4.11	Rubber and plastic products	32 307	20 995	16 285	28 967	19 653	36 830	7 311	162 348	1
4.12	Other mineral products	1 026	19 008	11 547	18 215	8 955	5 567	9 215	73 533	1
4.13	Basic metals	13 002	15 614	18 777	10 066	114 996	59 027	175 068	406 550	3
4.14	Metal products, machinery excluded	24 789	46 491	7 668	12 218	17 288	10 610	13 988	133 052	1
4.15	Other machinery and equipment	890	2 766	21 306	24 360	6 330	4 576	7 033	67 261	0
4.16	Manufacture of office, accounting and computing machinery	269	8	86	780	1 604	401	54	3 202	0
4.17	Other electrical machines and appliances		4 114	6 149	7 434	451	9 118	8 969	36 235	0
4.18	Radio, TV and other communications equipment	199	274	5 222	100	431	1	36	6 263	0
4.19	Production of fine optical instruments	832	115	19 105	1 099	292	684	1 168	23 295	0
4.20	Motor vehicles and trailers	209	85	4 803	30 068	13 915	101 045	3 635	153 760	1
4.21	Manufacture of other transport equipment		648	1 640	4 530	4 303	1 256	5 157	17 534	0
4.22	Furniture and related products	222	15 945	3 287	9 644	7 519	2 905	1 470	40 992	0
4.23	Recycling	4 274	983	1 776	4 625	755	417	2 009	14 839	0
5.	Electricity, gas and water supply	56	497	785	919	2 346	4 717	8 135	17 455	0
6.	Construction	14 695	10 852	25 525	130 574	55 584	28 105	29 080	294 415	2
7.	Wholesale and retail trade, repair	282 885	292 394	369 212	200 785	275 946	222 194	193 509	1 836 925	13
7.1	Wholesale and repair of motor vehicles and motorcycles	58 663	44 771	19 466	18 176	45 163	24 684	10 150	221 073	2
7.2	Wholesale trade and commission trade	218 626	219 321	250 048	168 469	199 378	153 308	119 281	1 328 431	9
7.3	Retail trade, except vehicles; repair	5 596	28 302	99 698	14 140	31 405	44 201	64 077	287 419	2
8.	Hotels and restaurants	11 663	203	3 246	35 055	15 729	4 993	2 462	73 351	1
9.	Transport, storage and communications	11 898	9 576	1 232 714	507 472	168 095	118 475	74 918	2 123 148	15
9.1	Land transport and transport via pipelines	6 515	8 307	14 739	32 047	18 552	11 202	6 867	98 229	1
9.2	Water transport				200	1 315	204	161	1 880	0
9.3	Air transport							1 625	1 625	0
9.4	Supporting activities and travel agencies	3 940	514	7 340	19 551	6 851	3 532	2 468	44 196	0
9.5	Post activities and telecommunications	1 443	755	1 210 634	455 674	141 377	103 537	63 797	1 977 217	14
10.	Financial intermediation	83 727	499 969	1 561 665	824 664	861 035	156 313	284 684	4 272 057	29
10.1	Financial intermediation, except insurance and pension funding	75 331	488 643	1 521 114	792 600	557 830	74 810	249 914	3 760 242	26
10.2	Insurance and pension funding, except compulsory social security	8 066	11 194	40 319	29 698	298 705	79 872	28 084	495 938	3
10.3	Activities auxiliary to financial intermediation	330	132	232	2 366	4 500	1 631	6 686	15 877	0
11.	Real estate, renting and business activities	113 508	149 747	237 970	664 144	588 240	239 771	176 597	2 169 977	15
11.1	Real estate activities	43 113	11 843	71 180	285 973	224 676	147 787	98 459	883 031	6
11.2	Renting of machinery and equipment	47	2 393	1 054	2 541	6 392	1 211	3 836	17 474	0
11.3	Computer and related activities	597	1 649	1 491	3 139	14 916	5 856	3 355	31 003	0
11.4	Research and development	66	1 200	23 410	130	61	202	31	25 100	0
11.5	Other business activities	69 685	132 662	140 835	372 361	342 195	84 715	70 917	1 213 370	8
12.	Public administration and defence; compulsory social security	4 544	76 098	325		2 200	0	0	83 167	1
13.	Education			150	194	19	290	1 398	2 051	0
14.	Health and social work				325			40	365	0
15.	Other communal, social and personal service activities	3 564	3 939	1 403	76 381	18 395	18 305	9 703	131 690	1
15.1	Sewage and refuse disposal, sanitation and similar activities		60	274	5 904	3 147	6 065	273	15 723	0
15.2	Activities of membership organizations n.e.c.						46	4	50	0
15.3	Recreational, cultural and sporting activities	3 518	3 879	1 129	70 477	15 167	10 696	8 552	113 418	1
15.4	Other service activities	46				81	1 498	874	2 499	0
16.	Unclassified	15 746			2 184		58 474	44	76 448	1
I	TOTAL INVESTMENT BY NONRESIDENTS IN SERBIA (1-16)	791 676	1 303 362	4 233 561	2 848 392	2 433 935	1 810 480	1 138 714	14 560 120	100
II	TOTAL INFLOW FROM WITHDRAWING RESIDENT INVESTMENT ABROAD	11 980	28 961	57 740	166 970	96 326	58 457	33 374	453 808	
III	OUTFLOW FROM WITHDRAWING NONRESIDENT INVESTMENT IN SERBIA	-19 758	-35 236	-841 165	-335 794	-416 428	-400 420	-135 593	-2 184 394	
IV	INVESTMENT OF DOMESTIC CAPITAL ABROAD	-9 561	-46 819	-127 530	-858 736	-289 420	-96 044	-176 370	-1 604 480	
V	TOTAL (I + II + III + IV)	774 337	1 250 28	3 322 606	1 820 832	1 824 413	1 372 473	860 125	11 225 054	

Authors calculations, Sources: National Bank of Serbia (in cash) and Statistical Office of the Republic of Serbia (in kind).

Serbia has attracted 11.2 billion EUR in FDI (net) between 2004 and 2010 (*Table 3*). After the crisis-induced sharp decline in 2009 and 2010, by 18% and 8% respectively, the Serbian National Bank estimates an increase in 2011 of 12.5%. For 2012, a further increase of 4% compared to the previous year is expected.

Industries that received the biggest FDI shares are financial intermediation (29%), real estate (15%), and transport, storage and communication (15%). Manufacturing accounted for almost 3 billion EUR, or 20% of total FDI. The biggest proportion, nearly one fourth of these investments, was invested into food production and the beverage indus-

try, 20% in the chemical and pharmaceutical industry, and 14% in the basic metals industry. Both in the motor vehicles industry and in the metal products (excl. machineries) industry, 5% of total FDI were invested.[18]

Economic Clusters of the Serbian Knowledge Economy

Identifying sectors with strong importance for the Serbian knowledge economy the concept of clusters as a third approach was deployed. Clusters describe the geographical distribution of companies and can be traced back to Thuenen,[19] Weber,[20] and Christaller.[21] The concept gained particular interest with the work of M. Porter, who initially explained the concept with the help of determinants of national competitiveness. According to Porter,

> "*Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate*."[22]

Usually, economic power is not equally distributed throughout the regions of a country. In contrast, economic activities are concentrated in some regions, while other regions only show few economic activities. The Serbian economy is highly concentrated in and around the capital city. The manufacturing industry, the biggest sector in terms of value added, is a bit more dispersed among the regions with one-third being located in the Vojvodina region. In addition, the financial and insurance sector is primarily focused in Vojvodina region with 60% off its total value added.

There are different methodologies for the identification of economic concentration in industry sectors.[23] The three-star analysis of regional clusters, developed by the *European Cluster Observatory*, is universally applied across the countries of the European Union. Meanwhile, some studies exist for a regional mapping of the Serbian economy.[24]

The European Cluster Observatory defines about 40 cluster categories.[25] The Observatory determines whether the level of employment in specified sectors of the economy, which belongs to the cluster categories in a certain region, has achieved a critical mass needed for specialization, in order to develop interlinking and netting effects that can generate positive economic effects.

Savić, et al. (2011) find that in all four countries analysed (Hungary, Romania, Bulgaria, Serbia), labour- and resource-intensive clusters prevail. One exception is the automotive cluster in the region of *Šumadija and Western Serbia,* comprising knowledge- and technology-intensive sectors of industry. *Šumadija and Western Serbia* is the region that received the highest number of stars in Serbia. The strongest cluster category is food processing, followed by construction, apparel, and metal processing. In the knowledge-intensive service sector, they found em-

[18] As already mentioned above, service industries like wholesale, real estate, and financial sectors have not been taken into account.

[19] Thuenen, von J.H. (1826).

[20] Weber, A. (1909).

[21] Christaller, W. (1933).

[22] Porter, M.E. (1998), p.197.

[23] Wolfe D. and Gertler M. (2004).

[24] Savić, N., Džunić, M., Brkić, I., Subotić, J., Djenić, M. (2011); Mijačić, D. (2011).

[25] DG Enterprise and Industry Report (2008).

pirical evidence that the Region of Belgrade as well as Southern and Eastern Serbia reached the one-star level in the IT-service sector.

Mijačić, D. (2011) used the results of the cluster-mapping analysis conducted by the EU-funded project *Support to Enterprise Competitiveness and Export Promotion* (SECEP).[26] According to Mijačić, D. (2011) there are three key observations for Serbia:

First conclusion: Belgrade, Novi Sad and occasionally Niš, are dominant in those cluster categories that are typically considered as service industries. These categories are comprised of: (1) Business Services, (2) Communication and Equipment, (3) Distribution Services, (4) Education and Knowledge Creation, (5) Entertainment, (6) Financial Services, (7) Hospitality and Tourism, (8) Information Technology, (9) Publishing and Printing, (10) Sporting, Recreational and Children's Goods, and (11) Transportation and Logistics.

Second conclusion: A number of cluster categories are insignificant in Serbia due to low levels of employment and/or a small number of registered companies: (1) Aerospace, (2) Analytical Instruments, (3) Automotive Components, (4) Fishing and Fishing Products, (5) Footwear, (6) Heavy Machinery, (7) Jewellery and Precious Metals, (8) Leather Products, (9) Medical Devices, (10) Oil and Gas Products and Services, (11) Power Generation and Transmission, (12) Textiles, and (13) Tobacco. Each of these cluster categories accounts for less than 1,000 companies.

Third conclusion: The remaining 14 categories are characterised by a greater concentration in Serbian districts and cities outside Belgrade, Novi Sad and Niš. These cluster categories include: (1) Agricultural Products, (2) Apparel, (3) Biopharmaceuticals, (4) Building Fixtures, (5) Equipment and Services, (6) Chemical Products, (7) Construction Materials, (8) Forest Products and Furniture, (9) Heavy Construction Services, (10) Lighting and Electrical Equipment, (11) Metal Manufacturing, (12) Plastics and Rubber, (13) Processed Food, and (14) Production Technology.

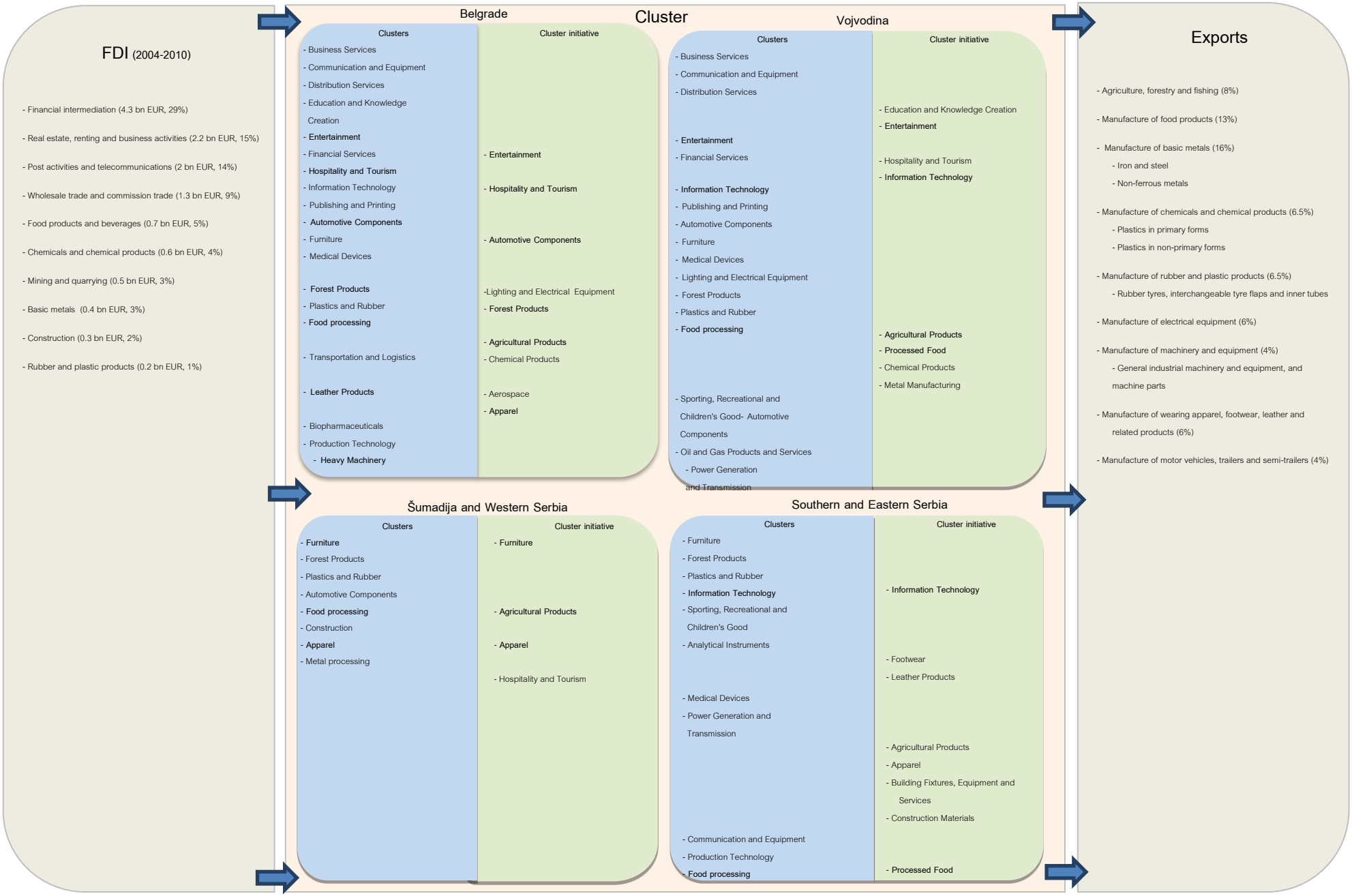
The results of the above-mentioned cluster studies have been summarised and reflected in *Figure 1*.[27] Using the cluster categories of the European Cluster Observatory, Figure *1* shows which industries are economically concentrated in each of the four regions of Serbia. Additionally, Figure *1* sets regional economic concentration against established cluster initiatives in Serbia (on the right hand side).[28] Industries are bolded when cluster initiatives match with concentrations of economic activity. Economic concentrations not supported by cluster initiatives show regional development potentials. Established cluster initiatives not covered by economic concentrations potentially harbour the risk of fruitless financial resources.

[26] http://www.secep.rs/, March 25, 2012.

[27] In addition to the two aforementioned studies, a presentation from the "Support to Enterprise Competitiveness and Export Promotion in the Republic of Serbia"-Cluster Workshop held on June 2010 in Belgrade was used.

[28] The information of existing cluster initiatives comes from a wbc-inco.net project (PL 212029: Innovation Infrastructures: Serbia; Dall, E., et al. (2011)) and a website on cluster initiatives published from the National Agency for Regional Development (http://klasteri.merr.gov.rs, March 25, 2012).

Figure 1: Cluster, cluster initiatives against the background of FDI and Exports in Serbia



Source: Authors' illustration.

Identifying important sectors in Serbia's knowledge economy

The export structure reveals the competitive advantage of the Serbian economy. Serbia's exports are to a large extent products with little further processing: 21% of exports are agricultural products and 16% are basic metals. The next important export sectors are: chemicals and chemical products (6%), rubber and plastic products (6%), electrical equipment (6%), machinery and equipment (6%), fabricated metal products (5%), machinery and equipment (4%), Manufacture of wearing apparel, footwear, leather and related products (6%) as well as Manufacture of motor vehicles, trailers and semi-trailers (4%).

As described above, FDI inflows in Serbia are mostly focused on economic activities that reveal rather limited technology and knowledge spill-over to other economic sectors in the country. The biggest part of FDI flows into typically market-seeking sectors like financial intermediation, real estate, wholesale and telecommunication. Another big part of FDI went into resource exploiting activities. Only little FDI is efficiency-seeking and flows into sectors where Serbia seeks to have international comparative advantages: automotive industry, chemicals/pharmaceutical industry and to a low extent into the textile/apparel industry.

Matching Serbia's export and FDI structure with the results of the cluster and cluster initatives anlayses there are five sectors where Serbia has the potential to overcome the situation of rather limited FDI inflow and decreasing international comparative advantages in labour and resource-intensive production, as well as to develop the capacities for knowledge- and technology-intensive production.[29] Further examination concentrats on these sectors which are most promising for the development of innovation-driven production processes and for attaining international competiveness by adopting modern production methods in Serbia. The sectors are:

1. agricultural industry and food production,
2. chemical products (incl. pharmaceutical products),
3. automotive industry,
4. ICT (incl. telecommunications) and
5. electrical equipment/electronics industry.

The selected sectors coincide with most of the key sectors identified by the Serbian Investment and Export Promotion Agency (SIEPA) as being appropriate to attract foreign investment:[30] automotive industry, agriculture and food industry, the ICT industry, pharmaceutical industry, textiles, and the electronics industry. SIEPA additionally focuses on the wood processing industry, business process out-sourcing/shared services industry, construction, real estate, and renewable energy.

Important companies

After identifying the economic sectors in Serbia with a strong involment and exploitation of the knowledge economy and good potential for the development of innovative production processes specific enterprises were identified in order to analyse their opinions regarding possibilities to foster advanced innovative production processes and the development level of Serbia's knowledge economy.

[29] The apparel industry could be in this list, but it was excluded because of the very low wage levels there.

[30] SIEPA (2012) p. 24ff.

For that reason, *Creditreform* data, i.e. the *Amadeus* database, were used to generate a list of the biggest 20 enterprises in each of these sectors with regard to their revenues. As a second step, 20 of the most successful enterprises were identified in each sector with regard to revenue per employee. At this stage, a filter was applied that only selects companies with a minimum of 20 employees.[31]

6 Methodology

For the further analysis tow existing concepts to grasp the idea behind a knowledge based economy were combined. Tow dimensions of the Worldbank definition of knowledge economy reveal close connections to the National Innovation System (NIS) approach. First, the definition contains the innovation system per se. It is let open if one definition includes the other or vice versa. So, from one viewpoint one can argument that the NIS approach contains the knowledge economy as well. Second, both concepts emphasise the actors (institutional regime) and their relationships and the supportive function of policy for the economic development. The central idea behind the NIS approach is that innovation and diffusion of technology are both an individual and a collective act. Within a NIS, individual firm dynamics,particular technology characteristics and an adoption mechanism each play a decisive role. Innovation is regarded as a systemic phenomenon. The NIS is “the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies” (Freeman, 1987: 1). The national education system, industrial relations, technical and scientific institutions, government policies, cultural traditions, and many other national institutions are just as fundamental for any company to innovate, as well as external international connections (Freeman, 1995). In both the NIS approach and the knowledge economy concept the dissemination of knowledge and/or innovation is of desicive role. This is garuanteed by a proper technical infrastructure (e.g. ICT infrastructure) as well as a proper institutuionell infrastrukcture.

To gather information as to where gaps within the NIS remain as well as persisting roadblocks or bottlenecks which inhibit the growth of the knowledge economy, companies out of the five identified sectors were interviewed. The aim was to evaluate the framework conditions for innovation and competitiveness, and to identify impediments that prevent Serbian companies from realizing their potential for growth in the knowledge based economy. Furthermore, solutions should be identified that help to overcome the existing obstacles and encourage innovation.

The OECD (1999) identified five aspects of conditions framing the innovation system in a narrow sense. These five aspects are: the macroeconomic and regulatory context, the communication infrastructure, the factor market conditions, the product market conditions, and the education and training system. In constructing the interview guide, those OECD dimensions were adapted and an interview guide to cover all of these aspects was designed:[32]

- Part 1: general information about the company,
- Part 2: innovation activities within the company,
- Part 3: information and communication infrastructure,
    - expenditures of IT technology,
    - and use of IT applications,
- Part 4: human capital,

31 A comprehensive overview of selected companies can be found in Rauch, M., Sommer-Ulrich, J., Stumpf, M. (2012), p. 33-53.

32 The whole interview guide could in the annex of Rauch, M., Sommer-Ulrich, J., Stumpf, M. (2012).

- quality of the educational system, and life-long learning,

- Part 5: framework conditions for innovation
  - demand, government procurement of advanced technology products,
  - regulation,
  - tax system,
  - openness, barriers to FDI, and barriers to exports.

The interview guide was semi-structured, including qualitative and quantitative questions. Additionally, it was adjusted during the interview process, as more knowledge accumulated from the interviewees. For that reason, not all questions needed to be answered. All companies were firstly contacted via e-mail and subsequently asked for a one-to-one appointment or phone interview.

A total number of 51 interviews were conducted in the period between 23 April 2012 and 13 June 2012. The final distribution of interview participants between the sectors was as follows: ICT 16 companies; agriculture 13 companies; automotive 8 companies; chemicals 7 companies; and electronics 7 companies (***Error! Reference source not ound.***). Interpretations of the interviewees' opinions should considerthat the sample was taken from the best performing companies within each sector, i.e. the most efficient companies regarding turn-over per employee.

The transcription was done with the help of MAXQDA-software for qualitative data analysis. Thus, relevant and interesting statements can be derived easier from the interview transcripts. A triangulation of the answers received from the different interviewees has been employed in the subsequent analysis. The basic principle of the triangulation of the interview data was based on the comparison of the meaning of the answers from at least three different interviewees, which could be interpreted as equal or similar in relation to a specific issue. This type of data has been reported as findings.

7 The Five Sectors View

General information about companies development

Figure 2 depicts the development of productivity and employment of the 51 interviewed companies. In contrast to the expectation that increasing productivity is going along with job cuts, most enterprises show up in the upper right quarter, where both productivity and employment are rising. Another group of companies experienced decreasing productivity but increasing employment. Only three companies – all of them in the agribusiness sector – experienced job losses but rising productivity, and two companies show decreasing productivity and employment. Even if there are some very good performing foreign-owned companies, they do not generally preform better than solely domestically owned companies. However, foreign-owned are the biggest, i.e. highest turnover, companies within their industry.

The 16 ICT companies are in general the largest in turnover of the interviewed companies. Many of them experienced enormous growth in employment over the last five years, and most of them are to some extend owned by foreigners.

The 13 agriculture companies evince a very mixed picture concerning their development of productivity and employment. Four of the interviewed companies experienced job cuts in the last years, but some of the companies could considerably increase their numbers of job instead and faced tremendous growth in productivity as well.

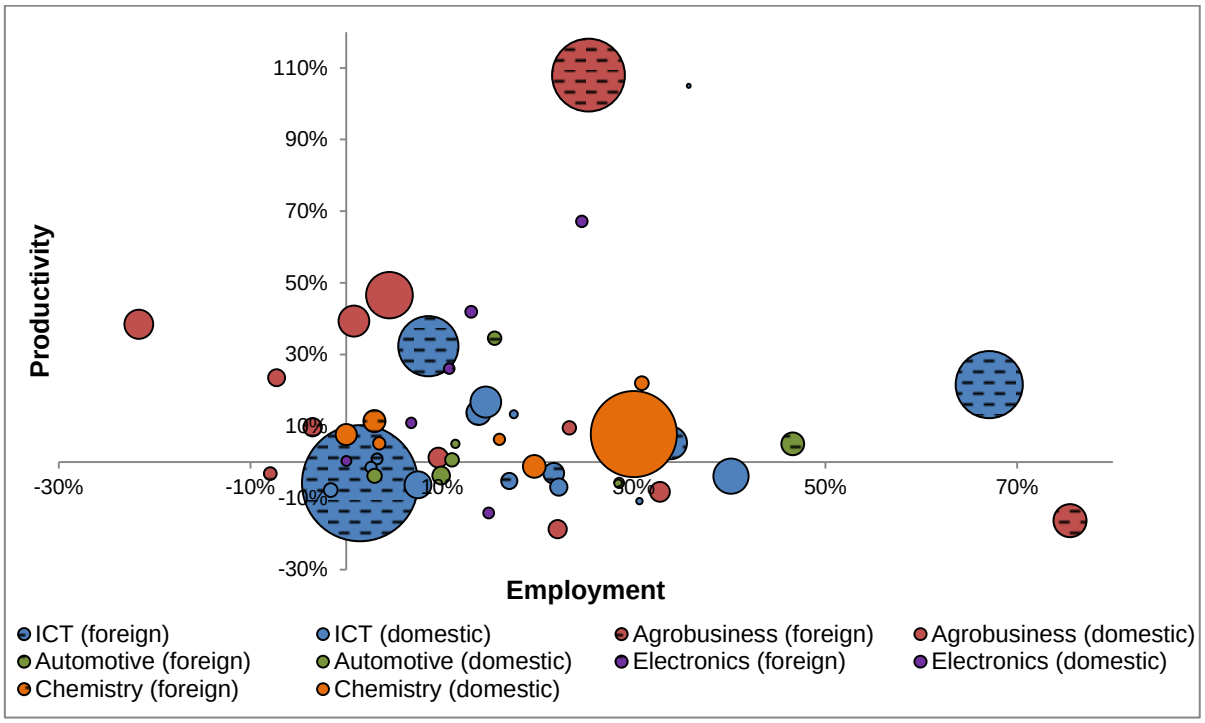
Eight companies are from the automotive sector, of which three are dominantly owned by foreign investors. Foreign-owned companies do better in terms of development in productivity and employment. However, none of the companies experienced job cuts during the last years (in average).

Two of the seven chemical sector companies are dominantly foreign owned, but they do not seem to perform significantly better than their domestically owned counterparts. One of the companies experienced decreasing productivity, and none experienced decreasing employment in the last few years.

In the electronics sector, there is only one dominantly foreign-owned company. Four companies can be found in the quarter of rising productivity and rising employment. Only one experienced decreasing productivity in the last years.

Nearly all of the companies assert that they sell their products to foreign markets. Only five companies – including companies from the agribusiness and the ICT sectors – did not engage in international commerce.

Figure 2: Development of productivity and employment between 2005-2010



Source: own depiction based on own calculations, turnover and employment data are taken from the Amadeus database. * For Telenor, VIP Mobile, Dunav Net, Cisco Serbia, Tenen, Uniprom and Azotara the period is adapted due to data availability. Information about ownership is obtained from interviews. All companies which are owned to more than 20% by foreign investors are counted as foreign owned. Size of bubbles represents turnover in 2010.

Innovation activities

Table 4: Important quantitative sector characteristics concerning innovation activities

	ICT	Agribusiness	Automotive	Chemicals	Electronics
Part B: Innovation activities within the company					
State that they are innovative:	87.50%	76.92%	87.50%	100.00%	85.71%
State that the Innovations are developed solely internally:	31.25%	15.38%	50.00%	71.43%	28.57%
State that the Innovation are new to the world	6.25%	0.00%	37.50%	0.00%	0.00%
State that the Innovation are new to the Serbian market	31.25%	30.77%	25.00%	42.86%	57.14%
State that they cooperate with institutes abroad	25.00%	23.08%	12.50%	14.29%	0.00%
State that they cooperate with universities abroad	25.00%	15.38%	0.00%	14.29%	0.00%
State that they cooperate with domestic institutes:	50.00%	38.46%	25.00%	28.57%	42.86%
State that they cooperate with domestic universities:	62.50%	38.46%	12.50%	85.71%	28.57%
Perform R&D activities in their company?	50.00%	38.46%	50.00%	85.71%	57.14%
Has the firm acquired external knowledge?	93.75%	38.46%	50.00%	14.29%	71.43%

Source: Authors'calculation based on interview results.

Across all sectors, most companies consider themselves as innovative. New knowledge is incorporated in companies in the form of new equipment, mostly bought from Western European countries. Therefore, it is not surprising that a large part of interviewees quoted that their innovations are new to the country. However, some companies (mostly out of the automotive sector, which is not surprising when their large export shares are taken into consideration), stated that they act at the edge of world knowledge.

Concerning in-house R&D activities, the companies differ significantly when inter-sectoral comparisons are taken into account. Especially the companies in the chemical sector (86%) in particular stated that they have their own R&D activities. Overall, the intramural investment in R&D is low, and expenditures correlate with firm size and branch.

With the slight exception of the automotive sector, all other sectors seem to cooperate with domestic universities and/or research institutions. Interviewees were asked to name their reasons for cooperation. Most of the answers,

however, did/could not distinguish between the reseaons like innovation, R&D, and human resource development. Furthermore, cooperation with those institutions depends on the individuals involved and how they cooperate with each other. Modes of cooperation appear to become fixed, without consideration given to new partners and/or possibilities. The theoretical knowledge at universities is considered as good. The main weaknesses which inhibit better cooperation with academia were identified by interviewees as:

- lack of up-to-date technology in universities,
- slow speed, and
- low administrative capabilities.

Asking about public support, most interviewees are not aware of any specific support programs to foster investment in research and development, technology absorption and innovation, or linkages between universities/research institutions and industry. In a few cases, interviewees mentioned that they are not eligible in any case, because they are not accredited as R&D-institutes and this is mandatory to take part in support programs.

Information and communication infrastructure

Table 5: Important quantitative sector characteristics concerning ICT infrastructure

	ICT	Agribusiness	Automotive	Chemicals	Electronics
Part C: Information and Communication infrastructure					
Invest in ICT?	100.00%	100.00%	100.00%	100.00%	85.71%
X percent of workforce (in average) uses computers regularly	99	13	20	25	50
State that the Serbian sector meet the needs of the companies in Serbia	43.75%	46.15%	87.50%	71.43%	42.86%
Buy foreign ICT infrastructure	31.25%	38.46%	50.00%	42.86%	42.86%
Regarding ICT, do you think you are more advanced than competitors?	31.25%	38.46%	37.50%	28.57%	42.86%

Source: Authors'calculation based on interview results.

Investment in ICT infrastructure lays the ground for efficient work procedures. Indeed, nearly all of the companies invest in ICT infrastructure but about half stated that the Serbian ICT sector couldn't meet the needs of their companies. Most of these companies hence buy foreign ICT infrastructure. Despite the fact that the most efficient companies were questioned regarding turnover per employee, only about one-third of the companies guessed that they are more advanced regarding ICT than their competitors. Most companies are not aware of any public support measures.

Human capital

Table 6: Important quantitative sector characteristics concerning human capital

	ICT	Agribusiness	Automotive	Chemicals	Electronics
Part D: Human Capital					
State that it easy to find appropriate qualified people.	43.75%	61.54%	62.50%	42.86%	71.43%
Serbian education system meets the needs of your company?	37.50%	38.46%	50.00%	42.86%	42.86%
Offer vocational training to their employees.	93.75%	92.31%	100.00%	100.00%	85.71%
Are involved in any kind of cooperation with local academic institutions/schools	50.00%	53.85%	50.00%	42.86%	28.57%

Source: Authors'calculation based on interview results.

Human capital is a key factor for economic growth, and is complementary to RDI activities. While most of the companies in the agribusiness, automotive, and electronics sectors state that it is easy to find appropriately qualified people, companies in the ICT and chemical sectors face larger problems in finding qualified employees. In these sectors, brain drain was named as a problem. However, nearly all companies offer vocational training, at least to train new employees. The question of whether the Serbian education system meets the needs of the company was answered twofold: In each sector, nearly half of interviewees stated it is good, and the other part stated it is inappropriate. Nearly all of the interviewees mentioned, that there is too little practical knowledge among school and

university graduates. Furthermore, the lack of existing management capabilities of students that would otherwise structure and control processes, cited the companies interviewed,hamper business development.

Framework conditions for innovation

Table 7: Important quantitative sector characteristics concerning framework conditions

	ICT	Agribusiness	Automotive	Chemicals	Electronics
Part E: Framework Condition					
Assess that the regulatory business is positive in order to support their business:	6.25%	23.08%	25.00%	28.57%	0.00%
State that the tax system support their business:	31.25%	23.08%	62.50%	14.29%	28.57%
Assess the Serbian import/export regime positive:	12.50%	23.08%	62.50%	42.86%	28.57%
State that running a business in Serbia is easy	6.25%	7.69%	25.00%	14.29%	0.00%
Assess the institutional environment to be positive	6.25%	7.69%	25.00%	28.57%	0.00%
Asses the Serbian system positive for covering their financing requirements	0.00%	38.46%	25.00%	42.86%	14.29%

Source: Authors' calculation based on interview results.

The institutional environment was one of the main impediments for Serbian companies. The majority of the interviewees stated that there are plenty of agencies supporting business, but nobody knows what exactly they are doing. So, interviewees ask for a more (pro-)active behaviour of these institutions. Furthermore, a lack of knowledge within and the inability and/or unwillingness to make decisions in agencies create red tape and administrative burdens. This finding is supported with statements that even corruption cannot solve time consuming processes. However, Siepa was singled out as an agency which functioned in a supportive way. The majority of interviewees have had contact with Siepa, however, in different fields such as export promotion, technology adoption, and grants for fairs and exhibitions.

Concerning regulatory challenges, many interviewees affirmed that the legal system develops in an appropriate direction. The process of convergence with European laws means a positive influence on the legal framework. It is not surprising that some interviewees claimed that the legal system is changing too rapidly. However, many interviewees complained that the implementation process is too slow; new laws are not well known in the administration, and some areas are not covered with supplementary laws. Subsequently, the entire implementation process is delayed. Thus, interviewees perceive a law enforcement problem and an inequality in its enforcement.

Nearly all interviewees stated that they are not personally involved in any form of corruption. Many interviewees, however,reported that there is still a big problem in public administration procedures. Most of the bigger companies said that they follow their own established anti-corruption standards. In contrast, nearly all companies – including multinationals with experience in other systems, complained about administrative bureaucracy. The following points of weaknesses compared to other countries were identified:

- there are overlapping authorities or no clear communication of tasks of one agency to the public,
- administration is regarded as very complicated, in the sense of much paperwork must be done, and
- processes are very slow.

The tax system was considered overall as suitable and business promotion. The main impediment was the fact that VAT has had to be paid in advance. Furthermore insufficient exemptions for investments, innovation as well as unequally applied laws were also mentioned.

In addition, the import/export regime is overall considered satisfactory, but there are some hindering aspects like time-demanding processes or bureaucratic challenges – especially regarding certification processes. Additionally, problems with how to treat non-material goods are named.

In order to satisfy their financial requirements, financial instruments other than bank loans are rarely mentioned. However the majority of interviewees try not to use bank loans because interest rates are too high (higher than profit rates), interest rates are also changing over time, making cost prediction not feasible at the time of signature. Therefore, companies try to finance investment projects out of their own profits.

Nearly all companies interviewed have no specific intellectual property rights (IPR). Some companies do have registered trademarks. However, especially in ICT companies, the interviewees believed that their products were so specific and tailored for customers that there was no need to seek intellectual property protection. However, in those cases where companies did seek to register IPR, they were satisfied with the Serbian system.

Asking the companies for recommendations to the Serbian government, the most pressing problem for companies was the devaluation of the Serbian dinar in the last months, followed by the desire to eliminate the administration challenges mention above. This should be supported by proactive work and better public communication practices by supporting agencies. With respect to policy issues, companies ask for better cooperation between different ministries and/or their responsible agencies. Furthermore, companies noted that they should be better integrated into the development of strategies and asked to have meaningful dialogue with the relevant authorities.

8 Summary

The paper identified international competitive advantages via the Serbian export/import structure of the Serbian government. The results show that Serbia's exports grew between 2005 and 2010 by 118%, and imports by 13%. The biggest share in exports originates in the resource-based sector, where Serbia has a worldwide comparative advantage. However some positive trends are shown in sectors with a medium- or high-technology level.

FDI inflows provide one proxy for the global competitiveness of sectors and regions. The biggest proportion, nearly one-fourth of foreign investments between 2004 and 2010, were invested into the food production and beverage industry, 20% in the chemical and pharmaceutical industry, and 14% in the basic metals industry.

The results, combined with an analysis of economic clusters and cluster initiatives in Serbia, resulted in the five sectors which possess high potential for developing and rely to a big extent on the knowledge economy in Serbia:

1. the agricultural industry and food production,
2. chemical products (incl. pharmaceutical products),
3. the automotive industry,
4. ICT (incl. telecommunications) and
5. the electrical equipment/electronics industry.

To get a qualitative assessment of Serbian knowledge economy, the concept of the National Innovation System was deployed to develop an interview guide. Fifty-one semi-structured interviews, including qualitative and quantitative questions, were conducted in order to provide insights into opinions about aspects of the knowledge economy in Serbia. The aim was to gather information as to where gaps remain, as well as persisting roadblocks or bottlenecks which inhibit the growth of the knowledge economy.

Table 8: Topics of interest within different sectors

	ICT	Chemicals	Agriculture	Electronics	Automotive
R&D activity/ networks					
mostly not aware of support programs		x	x	x	x
there is some cooperation with universities	x	x	x	x	
low technology of universities	x				
slow speed of universities		x			
low administrative capabilities of universities	x	x			
Human resources					
hard to find appropriate people	x	x			
lack of practical knowledge	x	x	x	x	x
low level of qualification	x	x		x	
brain drain	x	x			
Institutional environment					
... is perceived to be non-existent					x
"We have plenty but they do nothing and/or help nothing"	x		x	x	
Relevant Ministries					
Ministry of Finance	x	x	x		
Ministry of Economy	x	x		x	x
Ministry of Telecommunication	x				
Ministry of Environment		x		x	
Ministry of Agriculture			x		
Regulatory challenges					
legal system is good but problems with implementation		x	x		
fast changing laws, not applicable, grey economy	x	x	x		
coordination problem between authorities	x				
too much regulatory		x			x
foreign solutions	x			x	
problems of law enforcement	x		x	x	x
Main Bureaucratic Impediments					
overlapping authorities	x		x		
very complicated/ much paperwork	x	x	x	x	x
time demanding	x	x	x	x	x
Corruption					
corruption affects business	x	x/-	x	x	x
Tax system					
legal tax system is good	x		x	x	x
VAT is need to pay in advance	x	x		x	x
incomplete tax system			x		
not supportive/ no exemptions	x	x	x		
unequally handled	x		x	x	
Import/export regime					
overall satisfied with the system		x	x		
mixed picture				x	x
time consuming to get approvals	x	x			
problems with imports (except of materials)	x		x		
certified equipment from EU needs a local certification process	x				
Financing system					
banks loans are only mentioned financing instrument	x		x	x	x
too high interest rate	x	x	x	x	x
predominantly self-financing			x	x	x
IPR regime					
no use of IPR	x	x	x	x	x
IPR system meet the needs of the companies	x	x	x	x	
Recommendations					
stable currency	x	x	x		
tax payment in advance	x	x			
too high interest rate			x		x
simplify regulations and shorten processes (bureaucracy)	x	x		x	x
Infrastructure		x	x	x	x
more and better cooperation between ministries/agencies	x		x		
start dialog between industry and government	x			x	
need for proactive agencies	x		x		x

Source: Authors' illustration.

The results are that most of companies consider themselves as innovative. The innovations are generally viewed as new to their country. New knowledge is normally incorporated in companies in the form of new equipment, mostly bought from western European countries. Some companies, not surprisingly those with large export shares, stated that they act at the edge of world knowledge.

Concerning the Serbian ICT infrastructure, about one-half of the companies stated that the infrastructure as it stands could not meet the needs of Serbian companies. Most of these companies hence buy on foreign markets.

The answers of the company concerning the Serbian education system show ambivalent results: While the ICT and chemical sectors face problems in hiring appropriately qualified people, the other sectors do not to the extent of these latter two. However, nearly all of the interviewees criticised the lack of practical knowledge among graduates.

Table 8 gives a comparison of statements regarding framework conditions. Important aspects of the topics were chosen to show whether these topics are relevant in each of the sectors. That does not mean that single interviewees out of one sector do not share this view, but the sector at large (at least three of the interviewees) does not.

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