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Knowledge-intensive exports of CEE and developed nations – driven by foreign or domestic capital?

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Abstract

Knowledge-based economy became the prevailing paradigm of the nations' development and thus their competitive advantage foundations. Important role in the international recognition of country development is the growth of knowledge-intensive exports. Studies show that in the most developed nations high-tech exports plays crucial and rising role. As a result developing nations should maximize their efforts to increase exports of the knowledge-intensive products to follow the pattern of developed countries. However, growth of high-tech exports is often driven not by domestic resources but by foreign capital. The aim of the article is twofold. First, to present the growth of high-tech exports in CEE countries in comparison to developed countries. Second, to analyze what is the involvement of foreign capital in high-tech exports with the sub-industry breakdown. To perform a study research sample consisting of total 14 nations was formed. Analysis referred to the 2007-2015 years. Data derived from the Eurostat database (NACE Rev. 2 as high-tech industry classification).

Keywords: knowledge-intensive exports, high-tech, foreign capital, knowledge-based economy, CEE nations

JEL codes: F18, O14

INTRODUCTION

Knowledge-based economy became the dominant paradigm in the theory of economic development that emerged in the 1980s (Harris, 2001). Moreover, since the early 1990s, there is observed a strong orientation on the economic development which is based on innovation and high-technology, both in developed and developing economies. According to OECD (1996), knowledge-based economies are economies which are directly based on production, distribution and use of knowledge and information, with an important role given to information, technology and learning in economic performance. In comparison to traditional industries, high-tech industries require better employee skills, higher education, higher R&D investment and more intensive knowledge and technology. Researches (Dorfman, 1983; Huggins, 2004) suggest that the development of high-tech industries contributes to the promotion of the regional and national economic prosperity. Knowledge-based economy is product of economic globalization, market competition and increase in the flows of information. Major capital of organizations are not only equipment, material and physical assets, but it is also (or first of all) knowledge (Jafari, Akhavan, & Akhtari). According to Landvall (2000), in the knowledge-based economy the main attention would be driven to creating knowledge, new products and services and to use human intellectual capacity to create new ideas (Mortazavi & Bahrami, 2012). As Powell and Snellman (2004) state, the products and services of a knowledge-based economy are based on knowledge-intensive activities that consequently lead to the development of technology and science, as well as its rapid obsolescence (known as the process of shortening the product life-cycle). Therefore the key component of the knowledge-based economy is a greater dependency on intellectual abilities than on physical inputs or natural resources. As Stiglitz (1999) states knowledge and information are the main productions of today's economy. In these circumstances, growth based on knowledge-intensive industries, fostered by investments in a broad range of knowledge-based capital, is crucial to increase long-term living standards (OECD, 2013). As a result driving forces, such as increase in the knowledge intensity of national economy, make it inevitable to move towards knowledge based economy (Houghton & Sheehan, 2000). Specifically, adopting the crucial role of knowledge-intensive industries as the base for growth of knowledge-based economy has resulted in increased public policy attention for science, technology and innovation (Smith, 2002). Similarly states Clarke (2001) who argues that notion and further analyses of knowledge-based economy have become a vital subject in the discussion concerning nations' economic development and public policy.

One of the international recognition of a nation shift towards knowledge-based economy are the increasing values of high-tech exports¹. As the country abilities to produce and find customers abroad grow up, macroeconomic technology indices should reflect that positive trend. There may be several reasons for that: modernization, FDI inflow, increase of R&D expenditures, favorable law enhancing innovativeness or general public policy frameworks aimed at boosting country technological level. Empirical data indicate that the growth of exports of high-technology products significantly surpasses

¹ In this paper Author associates the term of high-tech exports with knowledge-intensive exports and will use these two notions in the article interchangeably.

the average growth of trade in recent years. As a result share of high-tech products in total exports and trade grows (Minska-Struzik & Nowara, 2009). However, important question arise: to which extent rising high-tech performance in exports is attributed to national or foreign entities?

The aim of the paper is twofold. First, to state, if in CEE nations high-tech exports with the sub-categories division is performed mostly by domestic or foreign enterprises. Second attempt was to compare the ratios of foreign capital involvement in CEE and developed nations.

The research method adopted for this study are: comparative analysis and tools of descriptive statistics.

The structure of this paper is the following: Section 1 is introduction, Section 2 provides the literature review and data on the role of high-tech exports in domestic economy. Section 3 sets out the methodology used in the study. Section 4 outlines the results which is followed by Section 5 pointing to conclusions and limitations of the study, along with the future lines of research.

LITERATURE REVIEW

Gripsrud (1990) described export intention as the motivation, attitude, beliefs, and expectancy about export contribution to the enterprise growth. Nowadays, in most countries a common objective is to find ways to increase exports. This can be achieved by encouraging exporting firms to export more or by inducing non-exporters to start international sales. Firms involvement in export activities not only increases the performance of growth-oriented domestic firms engaging in export but also the economic performance of a country (Julian & Ali, 2009). Thus the growth of a nation's exports has positive effects on individual firms as well as on the development of the entire economy (Julian & O' Cass, 2004). Exporting is of crucial economic importance to nations and their firms highly involved in international sales, as exports improve profitability, capacity utilization, trade balances and increase employment (Ahmed, Julian, Baalbaki, & Hadidian, 2006). According to Terpstra and Sarathy (1994) exporting can help individual firms to achieve a competitive advantage, improve their financial position, increase capacity utilization and raise technological level. Additionally, Sullivan and Bauerschmidt (1990) defined other motives for exports that are: capability to easily modify products for external markets, increasing competition in the domestic market, new information about sales opportunities in foreign markets, adverse domestic market rules, opportunity to decrease the power of domestic customers, management expertise and providing a hedge against an economic slowdown. Moreover increase in international marketing experience (which is an inevitable part of international sales) could improve domestic competitiveness, possibility to extend the domestic product life cycle, export incentives offered by home country, opportunity to reduce unutilized inventories, short-term profits, chances to use obsolete equipment outside the country (according to Posner imitation lag theory), reduction of tariffs abroad, availability of profitable logistics (to ship products to foreign markets more effectively), decline in the value of currency relative to foreign markets (thus increasing the turnover in domestic currency), eased export regulations in foreign countries and the receipt of unsolicited orders from foreign customers. Growing globalization of the world economy and the widespread approach that increased exports positively impact society has stimu-

lated research in this area. As domestic economies are under the strong influence of global changes and technological progress, attention has been put to the analyses stressing the importance of boosting exports of knowledge-intensive goods and services. According to Minska-Struzik (2012) exports stimulates the process of technology diffusion and increases the productivity growth because of the *learning by exporting* effect. Great values and shares in total exports of high-technology reflect from one hand the shift to the knowledge-based economy (as a contemporary development paradigm) and technological progress in the entire economy, and from the other hand enable to achieve competitive advantage of a nation. Development of knowledge-based economy and increasing high-tech exports should be crucial for CEE countries which after the years of successful transformation, as a next step in the process of catching-up developed nations should target their efforts at fostering high-technology firms and industries. As Ratajczak-Mrozek (2008) suggests knowledge-based enterprises are perceived as main factors of the economy growth and development. The ISIC rev. 3 OECD (2011) standard states that high-tech industries include five industries: pharmaceuticals, aircraft and spacecraft, electronic and telecommunication equipment, computers and office equipment, medical equipment and meters². In the table 1 there have been presented absolute values of high-tech exports in CEE countries during the years: 2007-2015.

Table 1. High-tech exports in CEE nations (mln EUR, 2007-2015)

Nation	2007	2008	2009	2010	2011	2012	2013	2014	2015	Δ%
Bulgaria	:	:	:	:	:	794	:	869	1 069	34,6%
Czech Republic	12 628	14 115	12 331	16 123	19 193	19 665	18 431	20 168	22 030	74,5%
Estonia	628	638	450	912	1 780	1 769	1 835	1 968	1 795	185,8%
Croatia	585	640	570	619	559	691	750	686	824	40,9%
Latvia	280	319	294	344	633	706	876	1 057	1 065	280,4%
Lithuania	918	1 048	689	945	1 136	1 333	1 435	1 596	1 730	88,5%
Hungary	14 857	14 928	13 235	15 668	16 861	13 959	13 205	12 088	13 511	-9,1%
Poland	3 108	4 950	5 585	7 289	6 963	8 594	10 274	13 122	15 250	390,7%
Romania	1 035	1 819	2 389	3 670	3 992	2 838	2 766	3 376	4 000	286,5%
Slovenia	1 015	1 205	1 033	1 167	1 322	1 303	1 405	1 449	1 695	67,0%
Slovakia	2 133	2 516	2 358	3 216	3 779	5 164	6 230	6 436	6 647	211,6%
Total	37 187	42 178	38 934	49 953	56 218	56 816	57 207	62 815	69 616	

Source: own calculations based on Eurostat.

In 2015 (latest data available) the largest high-tech exports among CEE countries were observed in: Czech Republic (22 bln EUR) and Poland (15,3 bln EUR) followed by Hungary (13,5 bln EUR), while the smallest values were found in Croatia (0,8 bln EUR), Latvia and Bulgaria (both 1,1 bln EUR). Except Hungary all CEE nations reported growth of high-tech exports during the studied nine years with the greatest values recorded by Poland (391%), Latvia (281%) and Slovakia (212%). Among the largest high-tech exporters in CEE there can be also observed its different share in total exports (table 2).

² This approach has been proposed by Hatzichronoglou (1997) and is based both on direct R&D intensity and R&D embodied in intermediate and investment goods. Subsequently some revisions to the initial concept have been undertaken (see: OECD (2011)).

Table 2. Share of high-tech exports in total exports in CEE nations (% , 2007-2015)

Nation	2007	2008	2009	2010	2011	2012	2013	2014	2015	Δpp
Bulgaria	:	:	:	:	:	3,8	:	3,9	4,6	0,8
Czech Republic	14,1	14,1	15,2	16,1	16,4	16,1	15,1	15,3	15,4	1,3
Estonia	7,8	7,5	6,9	10,4	14,8	14,1	14,9	16,3	15,4	7,6
Croatia	6,5	6,7	7,6	7,0	5,8	7,2	7,9	6,6	7,1	0,6
Latvia	4,6	4,6	5,3	4,8	6,7	6,4	8,0	9,7	9,8	5,2
Lithuania	7,3	6,5	5,8	6,0	5,6	5,8	5,8	6,6	7,5	0,2
Hungary	21,3	20,2	22,2	21,8	20,9	17,3	16,3	14,5	15,2	-6,1
Poland	3,0	4,3	5,7	6,0	5,1	6,0	6,7	7,9	8,5	5,5
Romania	3,5	5,4	8,2	9,8	8,8	6,3	5,6	6,4	7,3	3,8
Slovenia	4,6	5,2	5,5	5,3	5,3	5,2	5,5	5,4	5,9	1,3
Slovakia	5,0	5,2	5,9	6,6	6,6	8,2	9,6	9,9	9,8	4,8
Mean	7,8	8,0	8,8	9,4	9,6	8,8	9,5	9,3	9,7	

Source: own calculations based on Eurostat.

In 2015 greatest shares of high-tech exports in total exports were found in the case of greatest (Czech Republic, Hungary) and one of the smallest (Estonia) high-tech exporters. In contrary exports of Bulgaria and Slovenia are at least high-tech oriented nations among CEE countries what is suggested by low absolute (less than 1,7 bln EUR) and relative (less than 6% share in total exports) values of high-tech exports. In addition dynamics of changes of both values belonged to the lowest in the analyzed group of countries. There should be stated that CEE nations are perceived as developing countries, however there seems to be important to compare their results with the developed nations. In table 3 there has been presented growth of high-tech exports in developed nations during the same analyzed period.

Among the developed nations in 2015 Germany (177 bln EUR), Netherlands (102 bln EUR) and France (98,5 bln EUR) were the largest high-tech exporters. In most developed nations there was observed increase in the absolute value of high-tech exports, however the frequency was smaller than in CEE nations³. Comparing the CEE high-tech exports it should be stated that its total value (69 bln EUR) accounts for almost half of Germany high-tech exports and equals to the respective value in United Kingdom. However, from the studied group of developed nations there were countries with lower high-tech exports than greatest high-tech exporters from CEE regions (Czech Republic and Poland). These were: Greece (1,2 bln EUR), Portugal (1,9 bln EUR), Luxembourg (3,1 bln EUR), Finland (3,8 bln EUR), Denmark (9,2 bln EUR) and Spain (13,9 bln EUR). In these countries high-tech exports play relatively smaller role what is shown in the table 4.

Low absolute values of high-tech exports were reflected in the low shares of high-tech exports in total exports and were smallest in South Europe countries: Greece (4,6%), Portugal (3,8%), Spain (5,4%) and Finland (7,0%). There was also observed a relatively more frequent decline of the share of high-tech exports in developed nations (6 – Denmark, Ireland, Luxembourg, Portugal, Finland and United Kingdom) than in CEE countries (1 - Hungary).

³ In developed nations 3 countries (out of 16) reported decline, while in CEE nations only 1.

Table 3. High-tech exports in developed nations (mln EUR, 2007-2015)

Nation	2007	2008	2009	2010	2011	2012	2013	2014	2015	Δ%
Belgium	20 839	21 801	23 362	25 840	26 256	29 724	30 740	34 725	36 966	24,4%
Denmark	8 786	8 515	8 315	6 762	7 442	7 748	7 723	8 238	9 161	4,3%
Germany	125 210	122 304	112 641	133 195	142 503	155 222	155 251	160 429	176 963	41,3%
Ireland	22 820	20 756	18 351	16 642	18 296	18 807	18 368	19 567	26 617	16,6%
Greece	847	1 061	979	975	1 007	885	715	1 002	1 195	41,1%
Spain	7 832	7 966	7 793	9 119	10 583	11 447	13 025	12 606	13 683	74,7%
France	68 061	73 621	68 681	80 611	80 010	88 614	89 223	90 637	98 446	44,6%
Italy	21 890	21 936	19 849	22 091	24 224	24 800	25 929	26 759	28 442	29,9%
Luxembourg	5 507	6 220	6 413	4 354	3 863	3 974	3 037	2 818	3 063	-44,4%
Portugal	2 615	2 467	1 159	1 130	1 314	1 492	1 609	1 739	1 885	-27,9%
Netherlands	73 455	70 089	65 621	80 538	82 324	95 779	89 559	94 330	102 168	39,1%
Austria	13 266	13 358	11 509	13 620	14 272	16 594	18 786	19 270	19 507	47,0%
Finland	11 508	11 365	6 250	5 241	4 538	4 165	3 464	3 731	3 786	-67,1%
Sweden	16 360	16 463	13 730	17 322	18 533	17 236	16 463	16 004	17 072	4,4%
United Kingdom	54 179	49 585	48 511	55 481	59 703	64 106	62 941	59 377	69 322	27,9%
Total	453 175	447 507	413 164	472 921	494 868	540 593	536 833	551 232	608 276	

Source: own calculations based on Eurostat.

Table 4. Share of high-tech exports in total exports in developed nations (% , 2007-2015)

Nation	2007	2008	2009	2010	2011	2012	2013	2014	2015	Δpp
Belgium	6,6	6,8	8,8	8,4	7,7	8,6	8,7	9,8	10,3	3,7
Denmark	11,7	10,7	12,3	9,3	9,3	9,4	9,3	9,9	10,7	-1,0
Germany	13,0	12,4	14,0	14,0	13,5	14,2	14,3	14,3	14,8	1,8
Ireland	25,7	24,3	22,1	18,9	20,3	20,7	20,9	21,3	24,0	-1,7
Greece	4,4	5,0	5,5	4,6	4,1	3,2	2,6	3,7	4,6	0,2
Spain	4,2	4,2	4,8	4,8	4,8	5,0	5,4	5,2	5,4	1,2
France	16,7	17,6	19,7	20,4	18,7	20,0	20,4	20,7	21,6	4,9
Italy	6,0	5,9	6,8	6,5	6,4	6,4	6,6	6,7	6,9	0,9
Luxembourg	32,9	35,6	41,9	30,7	25,8	27,1	21,9	19,5	19,7	-13,2
Portugal	6,8	6,3	3,7	3,0	3,1	3,3	3,4	3,6	3,8	-3,0
Netherlands	18,3	16,2	18,4	18,6	17,2	18,8	17,7	18,6	20,0	1,7
Austria	11,1	10,8	11,7	11,8	11,2	12,8	14,2	14,4	14,2	3,1
Finland	17,5	17,3	13,9	10,0	8,0	7,3	6,2	6,7	7,0	-10,5
Sweden	13,3	13,2	14,6	14,5	13,8	12,8	13,0	12,9	13,5	0,2
United Kingdom	16,8	15,4	19,0	17,7	16,4	17,4	15,5	15,6	16,7	-0,1
Mean	13,7	13,4	14,5	12,9	12,0	12,5	12,0	12,2	12,9	

Source: own calculations based on Eurostat.

To sum up developed leaders in high-tech exports outperform significantly CEE countries in terms of absolute values, however not all developed nations report greater high-tech exports than CEE leaders. Moreover, high-tech exports orientation (perceived as a share) is on average greater in developed nations than in CEE countries. However, CEE nations report on average much higher growth of the high-tech exports than developed nations (table 5).

Table 5. Largest growths of high-tech exports in CEE and developed nations (% , 2007-2015)

CEE		Developed nations	
Poland	390,7%	Spain	74,7%
Romania	286,5%	Austria	47,0%
Latvia	280,4%	France	44,6%
Slovakia	211,6%	Germany	41,3%
Estonia	185,8%	Greece	41,1%

Source: own calculations based on Eurostat.

Much greater high-tech exports growths in CEE nations derive partially from the low base effect. Largest high-tech exports in 2007 (initial study year) in the group of CEE nations with greatest growth amounted to 3,1 bln EUR, while in the developed nations sample there were only two countries with lower absolute value of high-tech exports (Portugal and Greece). In fact, Greece recorded one of the largest growth of high-tech exports what contributes to above conclusion.

Analysis conducted above points out also two important aspects. First, development of knowledge-based economy is observed and reflected in the structure of exports (as emerge and rising share of high-tech products in total exports). Second, developing nations are gradually increasing their position in the international labor division in the knowledge-intensive industries what is a positive phenomenon. However, above presented macroeconomic data do not provide full picture related to the performance of the domestic economy development. Important aspect is the level of utilization of national capabilities while performing internationally. Thus the questions that should be asked are following:

- Q1:** Is the high-tech exports driven by domestic or foreign entities?
- Q2:** Which subcategories of high-tech exports are mostly dependent on foreign capital?
- Q3:** Is the dependency on foreign capital greater in CEE or developed nations?

Answers to above questions will help to understand better the phenomenon of the growth of high-tech industries and exports in nations, especially to which extent are the changes in fact driven by foreign resources. Such analysis will help to understand better the role of national capabilities in the process of development of high-tech exports.

RESEARCH METHODS

Sample selection

Study consisted of two groups of nations: Central and Eastern Europe countries and European developed nations. Both samples encompassed only chosen countries what derived from the fact that data on domestic and foreign capital involvement in high-tech exports were limited. As a result five CEE nations have been included in the study (Czech Republic, Lithuania, Poland, Romania and Slovenia). In contrary second group was formed by nine developed nations (Austria, Belgium, Finland, Germany, Netherlands, Norway, Portugal, Spain and United Kingdom).

Methods, sources of data and time extent

In both groups of countries knowledge-intensive exports have been determined according to the OECD methodology for classifying high-technology. Data concerning domestic and foreign capital involvement in exports have been gathered with the help of Eurostat database. Eurostat adopted OECD technology classification (transforming it to NACE Rev. 2), however naming high-technology industries differently. As a result following industries from the Eurostat database have been identified as high-tech:

- manufacture of basic pharmaceutical products and pharmaceutical preparations,
- manufacture of computer, electronic and optical products,
- manufacture of other transport equipment,
- information and technology.

Analysis referred to the total exports (including Intra- and Extra-EU exports) of goods only. Note that services (*Knowledge-Intensive Business Services*) were not the subject of this study. All sectors have been analyzed in terms of foreign and domestic capital involvement in each country. Study was conducted for the latest year available – 2015. Foreign enterprise has been defined according to the approach of data provider⁴. Unfortunately, in the Eurostat database there were some data classified as *Unknown* which referred to the quantity and value of high-tech exporters. In some cases the quantity and/or value described as *Unknown* was so large (sometimes even 90% of total high-tech exports) that some nations had to be excluded from the study in order not to provide incorrect results⁵.

RESULTS

Study was conducted in two steps. In the first step there have been determined the total number of high-tech exporting enterprises with the industry and country breakdown. Second step consisted of the analysis of the value of high-tech exports in both studied groups. Analysis has been conducted in four industries classified as high knowledge-intensive. Table 6 presents the results of domestic and foreign enterprises in the basic pharmaceutical products and pharmaceutical preparations industry.

In 2015 in CEE nations the greatest number of high-tech exporting enterprises was observed in Poland – 111, out of which 83 were domestic and only 28 foreign ones what implies that in terms of quantity of enterprise, the involvement of foreign capital in Polish high-tech exports amounted to 25,2%. On average CEE nations reported 32,8% share of foreign capital in high-tech exports. In contrary, developed nations reported on average higher involvement of foreign capital (46,8%), however studied sample was in this case much more diversified (Netherlands was in fact the country with greatest share of foreign enterprises in high-tech exports – 92,9%). In contrary, the absolute values of high-tech exports have been shown in table 7.

⁴ Eurostat defines *foreign control* as follows: “Foreign control shall mean that the controlling institutional unit is resident in a different country from the one where the institutional unit over which it has control is resident.”

⁵ Exclusion criterion utilized in the study was the share of the *Unknown* position in total exports exceeding 5%.

Table 6. Manufacture of basic pharmaceutical products and pharmaceutical preparations (quantity, 2015)

Country	Number of enterprises	Domestic owners	Foreign owners	% foreign capital
CEE (mean)				32,8%
Czech Republic	42	22	20	47,6%
Lithuania	10	7	3	30,0%
Romania	53	38	15	28,3%
Poland	111	83	28	25,2%
Slovenia				
Developed nations (mean)				46,8%
Belgium				
Germany				
Spain	244	180	64	26,2%
Netherlands	112	8	104	92,9%
Austria	60	40	20	33,3%
Portugal				
United Kingdom				
Norway	23	15	8	34,8%
Finland				

Source: own calculations based on Eurostat.

Table 7. Manufacture of basic pharmaceutical products and pharmaceutical preparations (value thd EUR, 2015)

Country	Total exports	Domestic owners	Foreign owners	% foreign capital
CEE (mean)				82,4%
Czech Republic	921 483	138 959	782 524	84,9%
Lithuania	41 487	4 439	37 047	89,3%
Romania	378 341	140 419	237 921	62,9%
Poland	1 514 891	111 514	1 403 376	92,6%
Slovenia				
Developed nations (mean)				74,2%
Belgium	11 535 761	1 635 178	9 708 227	84,2%
Germany	37 350 181	18 756 277	18 166 139	48,6%
Spain	6 085 212	1 841 643	4 243 568	69,7%
Netherlands	6 272 926	65 377	6 207 549	99,0%
Austria	4 448 356	1 002 321	3 446 034	77,5%
Portugal	587 323	172 879	390 936	66,6%
United Kingdom	13 734 091	6 483 729	6 898 997	50,2%
Norway	1 407 094	30 128	1 376 965	97,9%
Finland				

Source: own calculations based on Eurostat.

As stated before CEE nations in terms of quantity of foreign firms reported a relatively low dependency of foreign capital in the exports of basic pharmaceutical products and pharmaceutical preparations, however in terms of absolute value, the average involvement of foreign enterprises amounted to 82,4% with the greatest values attributed to

Poland (92,6%) and Czech Republic (84,9%) what in fact provides opposite results. In developed nations foreign capital ratio is also greater in terms of values than in terms of quantity but lower than in CEE nations. To sum up, export of basic pharmaceutical products and pharmaceutical preparations both in CEE and developed nations is strongly dependent upon foreign capital.

Second industry analyzed among the high-tech exports was manufacture of computer, electronic and optical products (table 8).

Table 8. Manufacture of computer, electronic and optical products (quantity, 2015)

Country	Number of enterprises	Domestic owners	Foreign owners	% foreign capital
CEE (mean)				23,9%
Czech Republic	269	167	102	37,9%
Lithuania	80	71	9	11,3%
Romania	194	108	86	44,3%
Poland	882	786	96	10,9%
Slovenia	168	143	25	14,9%
Developed nations (mean)				28,3%
Belgium				
Germany				
Spain	799	753	46	5,8%
Netherlands	605	48	557	92,1%
Austria	358	299	59	16,5%
Portugal				
United Kingdom				
Norway	163	135	28	17,2%
Finland	289	260	29	10,0%

Source: own calculations based on Eurostat.

In the manufacture of computer, electronic and optical products there were much more enterprises both in CEE and developed nations in comparison to the manufacture of basic pharmaceutical products and pharmaceutical preparations. The largest quantity was observed in terms of Poland (882), what is interesting among all nations with available data that was the greatest number. Second country with the largest number of enterprises was Spain (799). Both in CEE and Developed nations (with the exception of Netherlands) domestic enterprises were prevailing. Mean quantity of foreign entities amounted to 23,9% in CEE countries and 28,3% in Developed nations, however similarly to the manufacture of basic pharmaceutical products and pharmaceutical preparations Netherlands was the country with the exceptional high involvement of foreign capital. Analysis of the computer, electronic and optical products exports in terms of values has been presented in the table 9.

Absolute values of the computer, electronic and optical products exports suggest that the involvement of foreign capital is much larger than simple analysis based on the quantity. In CEE countries mean value amounted to 72,1% while in Developed nations – 51,5% what on average is lower than in the case of basic pharmaceutical products and pharmaceutical preparations, however some nations recorded very high dependency on foreign capital, which were Czech Republic (91,3%), Romania (90,6%), Poland (88,5%)

and Portugal (85,9%). What is interesting, Lithuania was the country with the lowest share (17,8%) of foreign capital in the exports of computer, electronic and optical products what was lower than the lowest value in Developed nations (Spain – 28,4%). Great Britain, largest exporter among the two studied group recorded a 66,7% of foreign capital involvement in the exports of the analyzed category. Third analyzed high-tech industry was exports of other transport equipment (table 10).

Table 9. Manufacture of computer, electronic and optical products (value thd EUR, 2015)

Country	Total exports	Domestic owners	Foreign owners	% foreign capital
CEE (mean)				72,1%
Czech Republic	4 373 087	382 287	3 990 800	91,3%
Lithuania	217 834	179 158	38 675	17,8%
Romania	1 450 060	136 035	1 314 025	90,6%
Poland	5 809 180	670 187	5 138 993	88,5%
Slovenia				
Developed nations (mean)				51,5%
Belgium				
Germany				
Spain	1 446 606	1 035 811	410 795	28,4%
Netherlands	7 778 403	2 653 274	5 125 129	65,9%
Austria	3 581 976	2 108 214	1 473 762	41,1%
Portugal	888 756	115 327	763 785	85,9%
United Kingdom	1 446 606	1 035 811	410 795	66,7%
Norway	7 778 403	2 653 274	5 125 129	33,3%
Finland	3 581 976	2 108 214	1 473 762	39,5%

Source: own calculations based on Eurostat.

Table 10. Manufacture of other transport equipment (quantity, 2015)

Country	Number of enterprises	Domestic owners	Foreign owners	% foreign capital
CEE (mean)				24,2%
Czech Republic	116	86	30	25,9%
Lithuania	24	18	6	25,0%
Romania	67	35	32	47,8%
Poland	455	393	62	13,6%
Slovenia	51	46	5	9,8%
Developed nations (mean)				27,4%
Belgium				
Germany				
Spain	278	250	28	10,1%
Netherlands	313	37	276	88,2%
Austria	58	51	7	12,1%
Portugal				
United Kingdom				
Norway	174	150	24	13,8%
Finland	86	70	11	12,8%

Source: own calculations based on Eurostat.

The country with the most numerous exporting enterprises in the manufacture of other equipment in both groups was found in Poland (455), out of which majority were domestic firms (foreign capital involvement – 13,6%). Similar ratios were observed in Developed nations: Spain (10,1%), Austria (12,1%), Norway (13,8%) and Finland. On average there were observed similar values of foreign capital involvement in CEE and Developed countries, however in Romania and Netherlands ratios were significantly above average (47,8% and 88,2% respectively). Data on the exports of other transport equipment in terms of value have been presented in the table 11.

Table 11. Manufacture of other transport equipment (value thd EUR, 2015)

Country	Total exports	Domestic owners	Foreign owners	% foreign capital
CEE (mean)				57,1%
Czech Republic	1 484 543	756 659	727 884	49,0%
Lithuania	110 186	99 321	10 866	9,9%
Romania	1 367 224	134 325	1 232 899	90,2%
Poland	3 267 617	672 330	2 595 287	79,4%
Slovenia				
Developed nations (mean)				50,2%
Belgium				
Germany	50 810 744	7 428 993	42 310 883	83,3%
Spain	5 980 138	1 882 201	4 097 937	68,5%
Netherlands	4 048 585	2 735 915	1 312 670	32,4%
Austria	1 177 738	859 124	318 614	27,1%
Portugal	223 005	84 579	115 066	51,6%
United Kingdom	29 352 181	16 354 626	12 153 281	41,4%
Norway	2 095 598	1 115 434	980 164	46,8%
Finland				

Source: own calculations based on Eurostat.

Two largest exporters of other transport equipment, Germany and United Kingdom reported an observable difference in the ratio on foreign capital dependency (83,3% in Germany, 41,4% in United Kingdom). In CEE countries, Poland as the largest exporter of other transport equipment reported high dependency on foreign capital (79,4%), however the highest involvement of foreign capital among two groups of nations was observed in the case of Romania (90,2%), what was greater than the highest ratio in Developed nations (Germany). What is interesting, as shown in the previous tables, Netherlands was the country with high foreign capital dependency in the high-tech exports, however in the case of the other transport equipment, this ratio was surprisingly low (32,4%).

Last analyzed industry was information and communication (table 11).

The country with the greatest number of the exporting enterprises in the information and communication industry was Netherlands among which vast majority were foreign ones (96,6%). Such high dependency on foreign capital was not observed in any of the analyzed nations, neither in CEE nor Developed countries. Romania was the second-largest nation in terms of the quantity of foreign owned firms, however with the much lower ratio (31,3%). On average Developed nations were more foreign capital dependent than CEE countries (29,9% vs. 19,1%), however due to the previously men-

tioned outstanding high ratios in Netherlands. Analysis of the values of the information and communication exports was conducted in table 12.

Table 11. Information and communication (quantity, 2015)

Country	Number of enterprises	Domestic owners	Foreign owners	% foreign capital
CEE (mean)				19,1%
Czech Republic	300	219	81	27,0%
Lithuania				
Romania	511	351	160	31,3%
Poland	2 328	2 127	201	8,6%
Slovenia	1 000	906	94	9,4%
Developed nations (mean)				29,9%
Belgium				
Germany				
Spain	4 871	4 569	302	6,2%
Netherlands	5 687	196	5 491	96,6%
Austria	2 050	1 874	176	8,6%
Portugal				
United Kingdom				
Norway	652	508	144	22,1%
Finland	521	433	83	15,9%

Source: own calculations based on Eurostat.

Table 12. Information and communication (value thd EUR, 2015)

Country	Total exports	Domestic owners	Foreign owners	% foreign capital
CEE (mean)				35,8%
Czech Republic	152 834	122 001	30 833	20,2%
Lithuania	39 382	18 855	20 527	52,1%
Romania	63 483	27 805	35 678	56,2%
Poland	412 943	229 188	183 755	44,5%
Slovenia	147 748	138 769	8 980	6,1%
Developed nations (mean)				46,5%
Belgium				
Germany				
Spain	766 054	691 974	74 080	9,7%
Netherlands	3 429 630	672 280	2 757 350	80,4%
Austria	338 443	222 591	115 852	34,2%
Portugal				
United Kingdom				
Norway	169 714	100 780	68 934	40,6%
Finland	160 067	51 462	108 383	67,7%

Source: own calculations based on Eurostat.

In 2015 Netherlands was the country with not only greatest absolute values of the information and communication exports (3,4 bln EUR), but also with the highest foreign capital ratios (80,4%) what puts Netherlands again as the most dependent on foreign

capital nation in high-tech exports among all analyzed countries. Second country with the largest dependency was Finland (67,7%) and third Romania (56,2%). On average CEE countries report lower dependency on foreign capital than Developed nations, however the reason behind that score is high ratio in terms of Netherlands.

Above analysis shows that involvement of foreign capital in high-tech exports varies not only in terms of countries but also with regard to sub-category. Ratios of the value of high-tech exports driven by domestic and foreign enterprises (value above 1 indicates that exports of high-tech products by domestic firms outperforms the one by foreign companies) in the total studied sample have been shown in the figure 1.

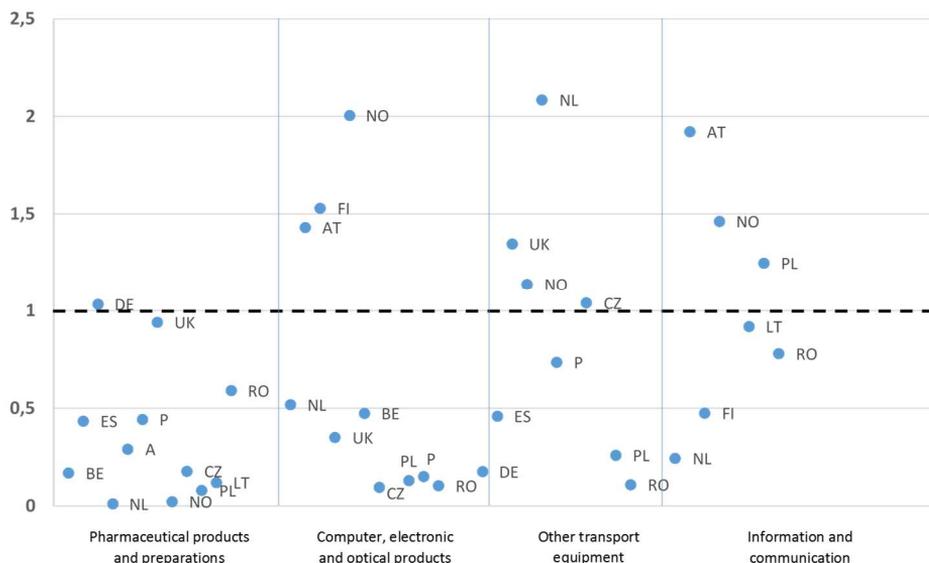


Figure 1. Ratios of high-tech exports driven by domestic and foreign enterprises – country and industry breakdown (value, 2015)

Notes: Position on the horizontal axis derives from the default order. In the case of six nations ratios exceeded the scale. These were: Lithuania (4,6 - Computer, electronic and optical products), Austria and Lithuania (2,69 and 9,14 - Other transport equipment), Spain, Czech Republic and Slovenia (9,3, 3,9 and 15,4 - Information and communication). Different quantity of countries in the high-tech sub-categories derives from the lack of data.

Source: own work based on Eurostat.

High-tech subcategory with prevailing involvement of foreign capital in exports are pharmaceutical products and preparations, followed by computer, electronic and optical products. In these two industries mean ratio of the high-tech exports drive by domestic and foreign capital amounted to 0,35 and 1,14 respectively. In the computer, electronic and optical products industry there was only one country (Germany) in which exports of high-tech driven by domestic capital exceeded the one driven by foreign ones. In turn, in the exports of computer, electronic and optical products there were four countries with ratios greater than one. Three of them belonged to the group of developed ones. Interesting phenomenon has been observed in the last two sub-categories of high-tech exports. Although the quantity of countries with prevailing foreign capital in exports was the same (six), mean ratios were significantly different (1,74 vs. 4,47 respectively). Moreover, in the

other transport equipment industry number of developed nations with prevailing domestic capital in exports was four (Norway (1,14), United Kingdom (1,35), Netherlands (2,08), Austria (2,7)) and two in terms of CEE countries (Czech Republic (1,04), and Lithuania (9,14)), however in the information and communication industry these numbers were the same for developed (Norway (1,5), Austria (1,9) and Spain (9,3)) and CEE nations (Poland (1,25), Czech Republic (3,9), Slovenia (15,5)). That implies that there are certain high-tech industries which exports are driven not by foreign but domestic resources.

CONCLUSIONS

This paper aimed to analyze the growth of knowledge-intensive exports of CEE and developed nations from Europe and to state what kind of enterprises (domestic or foreign) are prevailing in the high-tech exports.

First, it should be concluded that the absolute values of high-tech exports are much greater in developed nations than in CEE countries, however some developed nations reported smaller absolute values of high-tech exports than the CEE high-tech exports leaders (Czech Republic, Poland and Hungary). CEE countries on average outperform developed nations in terms of the dynamics of growth of high-tech exports. Moreover, in developed nations high-tech exports plays more important role than in CEE countries (measured by the share in total exports).

Second, in terms of the dependency on foreign capital, conducted analysis revealed that in the case of the quantity of the high-tech exporting firms in CEE countries only 25% of them are foreign, whereas in the studied developed nations the number is slightly higher – 27%. That may suggest that dependency on average in all analyzed high-technology sub-categories is low. Highest involvement of foreign capital was found in Netherlands in the information and communication industry where 96,6% of the firms were foreign, whereas lowest number of foreign entities was observed in Spain in the exports of computer, electronic and optical products – 5,8%. However, in the case of the value of the high-tech exports results are significantly different. High-tech exports is on average higher dependent on foreign capital in CEE countries than in developed nations (60,0% vs. 55,6%), however within the sub-industry breakdown there were important differences observed. Greatest mean dependency was found in the sub-category: basic pharmaceutical products and pharmaceutical preparations, followed by manufacture of computer, electronic and optical products and manufacture of other transport equipment. Least dependent exports on foreign capital was information and communication subcategory. This finding was observed both in CEE and developed nations. Greatest dependency was recorded by Netherlands in the sub-category of: basic pharmaceutical products and pharmaceutical preparations, whereas lowest in Slovenia. Thus it should be concluded that both in CEE and developed nations there are more domestic than foreign high-technology exporting entities (with the exception of Netherlands), however greater revenues from exports are generated by foreign firms. Second tendency is stronger in CEE nations than in developed ones (with certain exceptions in information and communication industry). Subsequently, that implies that strong growth of high-tech exports of the majority of CEE countries is the result of nations openness for foreign capital.

In summary, research has contributed to the field of high-tech exports with the sub-industrial background and foreign capital involvement. The paper's findings provide

country policy makers with the analysis of the current development of exports in high-tech industries what may help them to form national frameworks and guidelines for the innovation-based growth. As a limitation, the author points out that the analysis referred only to the certain CEE and developed nations what was the result of the lack of data referring to the foreign capital involvement. Therefore, the results should be tested in greater number of nations to check their validity and generalization possibilities. Especially interesting would be to analyze the influence of foreign capital involvement in high-tech exports on its competitiveness and state welfare.

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