Empirical Paper

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Competitive potential vs. the competitive position of the high-tech sector in European Union countries

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Abstract:
Despite a considerable body of research and gathering information on advanced technologies, there is still a study gap concerning its importance from the perspective of international competitiveness. Therefore, a question arises: what affects the competitive potential and how does it contribute to the competitive position of the high-tech sector in European Union (EU) countries? For this reason, a study was taken up to evaluate the competitive potential and competitive position of the high-tech sector in EU countries. Defining the competitiveness, competitive potential, and competitive position in the industry was the starting point for the analysis. Further, selected indices were used to evaluate the competitive potential and to establish a competitive position. The synthetic competitiveness index was also calculated. The study identified the decisive factors having an impact on the competitive potential and competitive position of the sector and the relationship between them.

Keywords: competitiveness, competitive position, competitive potential, European Union, high-tech sector
JEL Classification: O1, O3

1 Introduction

Now, at a time of continuous and dynamic changes in the business environment, a particular role in the process of building and consolidating the competitiveness of the economies, sectors, and enterprises is played by entities in the high-tech sector. They are regarded as the main accelerator of structural transformations and functional changes of contemporary economies. This is because companies in the high-tech sector base their operation on knowledge (technological, personalized, and codified), with an important role in them also played by the R&D base and innovations. High-tech companies strive to acquire and effectively use the resources in their possession. These operations stimulate the sector growth; they make it competitive, modern, and profitable. Many authors [Getzner, 2002, pp. 287–306; Throsby, 2010, pp. 32–57; Potts, 2011, p. 147; Madrak-Grochowska, 2015, pp. 7–21] have emphasized that it makes knowledge-based sectors, consisting mainly of high-tech industries and technologically advanced services, increasingly important globally. This is confirmed by empirical data. The high-tech sector was responsible only for 5% of the global industrial output in the 1970s. Currently, it has a 20% share in global trade, and this figure is growing. This was also confirmed by data for the sector in European Union

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(EU) countries. There were 998,075 high-tech companies in 2016 and 1,106,186 (10% more) in 2018. Total employment increased by 7% during that time.[1] It shows that the activities in this sector were attracting increasing attention, both globally and in EU countries. Moreover, the share of high-tech products in total exports is taken as one of the parameters of national economic competitiveness [Kruk and Waśniewska, 2017, pp. 337–352]. For this reason, the high-tech sector is a topical and important object of scientific considerations and it is analyzed with increasing thoroughness. This was the premise for undertaking research aimed at answering the question: What influences the competitive potential and how does it contribute to the competitive position of the advanced technology sector in the EU countries? The research was based on data for 2016–2018.

A competitiveness-related evaluation of the high-tech sector should primarily cover the competitive potential and the method of its use. Comprehensive studies of the high-tech industry prove the importance of simultaneously achieving diversity and cost advantage [Spanos et al., 2004, pp. 139–165; Hughes et al., 2010, pp. 1–21]. Studies of the competitive strategy of the high-tech sector in Sweden and Finland emphasize the important issue of the high-tech sector evolution to the mature phase, which improves the efficiency and use of cost structures [Gabrielsson et al., 2016, pp. 141–153]. Studies of the competitive potential in EU countries were conducted by Łada [2020, pp. 60–73]. They showed high-tech companies in the Netherlands, Italy, and Germany to have the highest competitive potential. These countries are also the leaders when international competitive position is considered [Juchniewicz and Łada, 2020, pp. 31–41]. The Netherlands and Germany are also countries in which the high-tech export index is among the highest, contributing significantly to the high and stable competitive position of these countries. This was confirmed by the findings of a study conducted by Martin et al. [2017, pp. 527–543]. The authors suggest that high-tech companies can increase export efficiency owing to the advantage of their competitive position. According to Martin et al. [2017, pp. 527–543], the position advantage of high-tech companies can be developed by adapting marketing capabilities to the competitive strategy. Li et al. [2017, pp. 24–33] studied high-tech companies in various regions of China. They point out that the high-tech industry plays an increasingly important role in national development due to the features of intensive technology and high added value. They emphasize the boosting impact of efficiency increase on the overall competitiveness improvement in the industry.

These considerations show that high-tech industrial competitiveness is multidimensional and depends on various factors. This has encouraged the conduction of a study in which the summary method was applied to analyze all of its aspects. Simple features describing the competitive potential and competitive position were taken as variables and are described in detail in the methodology section. The data for all EU countries in the 2016–2018 period are presented in the article.

Considerations in the paper are arranged in the following sequence. The literature review presents and compares the existing definitions of competitiveness on the mesoeconomic level (from the point of view of the economic growth characterizing the industry or region). The theory behind the factors affecting competitiveness (competitive potential and competitive position) was also discussed. The relationship between factor-based competitiveness (competitive potential) and result-based competitiveness (competitive position) was then analyzed, and the study methodology was described and the study findings were discussed. The paper ends with conclusions and suggestions for future research.

2 Literature review

Competitiveness is a multidimensional concept, which is demonstrated by a large number of its definitions in the economic literature. The diversity of the term's interpretations is a consequence of differing opinions on the sources of competitiveness and the value systems of the authors of individual definitions. For example, Listra [2015, pp. 25–30] points out that they are often used in discussions on business, public, economic, and social topics. One of the most frequently used definitions was proposed in a study prepared

1 https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=sbs_sc_sca_r2&lang=en

by the Organisation for Economic Co-operation and Development (OECD). According to this definition, competitiveness is the capability of companies, industry, regions, nations, or supranational regions for the long-term generation of income from production factors and for maintaining a high level of employment in the face of international competition [Hatzichronoglou, 1996, pp. 2–61]. The international aspect of competitiveness was also stressed by Sharpe and Banerjee [2008, p. 10], who define competitiveness as the ability of a company or a group of companies (within a mutually connected system) to acquire a share in a domestic or international market. This approach is shared by Zhang and London [2013, pp. 95–113], according to whom industrial competitiveness is a determinant of the industry results in the international market. According to Krugman [1994, pp. 28–44], competitiveness describes the ability of a sector or industry to design and sell its products at prices, quality, and other attractive features, which are more competitive than the parallel features of goods offered by the competitors. Lall [2001, p. 2] adds that competitiveness is the company's ability to cope better than other similar companies in terms of sales, market shares, or profitability. All of these definitions apply to competitiveness at the mesoeconomic level. Their common features include the reference to the international rivalry of business entities, the ability to use competitive potential, and a relatively high market share and profitability level. According to the authors, developing these elements stimulates competitiveness growth.

Both in the literature and practice of enterprises, the opinion that classical theories of competitiveness do not fully explain the mechanisms of building and strengthening competitive advantage is becoming popular. Therefore, since the beginning of the '90s of the 20th century, new theories of competitiveness have been created, in which more complex methods of acquiring and developing competitive resources and skills of enterprises are used [Wodecki, 2019, p. 7]. The most important early concepts include: the concept of cost competitiveness based on the effects of large scale production, standardization and experience effects, quality leadership, competition based on the company's market power, marketing concept of competitiveness, and cost leadership. The inspiration for creating new concepts of competitiveness was knowledge in the field of marketing, entrepreneurship, strategic management, innovation, and information technology [Wodecki, 2019, p. 8].

Studies of competitiveness and the importance of creative industry, which is linked to the high-tech sector, have been conducted by many researchers, who have stressed its continuous increase [Getzner, 2002, pp. 287–306; Throsby, 2010, pp. 32–57; Potts, 2011, p. 147]. Their analyses focused on the sector's links with an increase in GDP, population's income, unemployment rate, price index, and international trade. Krisiukėnienė and Pilinkienė [2020, pp. 28–37] stressed the rapid growth of employment, international trade, and added value in the sector. Studies conducted by Krisiukėnienė and Pilinkienė [2020, pp. 28–37] show an increase in the revealed comparative advantage (RCA) of the high-tech sector in 2004–2017 in France, Poland, Slovakia, Slovenia, and Spain. It indicates a significant share of the sector under study in the states' national economies. Łada [2020, pp. 60–73] conducted a study on the competitive potential of the high-tech sector and showed companies in countries with a strong and stable economy to have a higher potential, to be better developed, and to be better at coping with the new economic challenges. She saw labor productivity as the main factor affecting the competitive potential. The competitive potential of the sector under analysis was examined in a study conducted by Juchniewicz and Łada [2020, pp. 31–41]. The study findings show that the Netherlands and Germany were the leaders among the economies with the highest competitive position of the high-tech sector, and that the attractiveness of the sector grew in nearly all EU countries. The research conducted by Love et al. [2010, pp. 983–1004] and Pla-Barber and Alegre [2007, pp. 275–293] showed that innovative activities and high-tech sector exports were the main stimuli for the national economy increase. According to other studies, R&D expenditures are the key factor in determining the sector's innovative capabilities [Shefer and Frenkel, 2005, pp. 25–32; van Beers and Zand, 2014, pp. 292–312].

The choice of this research object necessitates defining the elements that affect the system of competitiveness, which includes the competitive potential and competitive position at the mesoeconomic level. According to Buckley et al. [1988, pp. 175–200], the competitive potential determines the method of competitiveness management and leads to specific competition results. On the other hand, the competitiveness position determines the size and quality of competitive potential and also affects the

method of competitiveness management. By introducing the terms of competitive potential and competitive position, Buckley et al. [1988, pp. 175–200] suggested certain measures used for competitiveness evaluation, while taking into consideration the analysis level. Apart from the RCA, they found the following to be useful in the competitive potential measurement: the cost competitiveness index, productivity index, price competitiveness index, and technological progress index. According to Buckley et al. [1988, pp. 175–200], the competitive position can be identified by means of the export specialization index, trade balance, export growth rate, and profitability index.

Therefore, there are many factors of competitive potential having an impact on the competitive position. An analysis of the relationships between these factors and the competitiveness results is a topical and important research problem. It is the need for such an analysis that has motivated the present study, whose aim, accordingly, it is to determine a causal relationship between the competitive potential and the competitive position of the high-tech sector in EU countries.

3 Research methodology

The high-tech sector, which combines production companies and service enterprises, was the study object. The classification used in the EU statistics was applied in the article. According to this classification, the high-tech industry includes manufacturing aviation equipment (NACE 35.331), manufacturing pharmaceutical products (NACE 24.4), manufacturing computers and office equipment (NACE 30), manufacturing radio, television, and communication equipment (NACE 32), and manufacturing scientific and precision instruments (NACE 33). High-tech services include postal services and communication (NACE 64), information technology (NACE 72), and research and development (NACE 73).[2]

The sector competitiveness was the study object. The article breaks the concept down into the following components: competitive potential and competitive position. Further, it provided the basis for the determination of the synthetic competitiveness index, which included these competitiveness dimensions. It enabled a comprehensive competitiveness evaluation of the sector under analysis on the community market and identified the factors that determine it.

The partial potential and position-related indices were adopted based on statistical and essence-related factors and the availability of data for analysis. The competitive potential was determined based on labor productivity, personnel costs, and the country's share in the total number of the sector companies. Labor productivity is defined as the ratio of the production output value to the number of employees – it is expressed as euro per person employed. The personnel costs were divided by the number of employees (euro per person employed). The country's share in the total number of high-tech companies in the EU was then determined. The competitive position of the high-tech sector of a country on the community market was calculated by taking the international trade indices most often used in the literature of the subject: share in the intra-community exports and the trade coverage [Buckley et al., 1988, pp. 175–200]. According to the definition of competitiveness adopted in the paper, which is associated with the acquisition and keeping (while making profit) of a share on the domestic and foreign markets, the profitability index was also taken into account in calculations of the competitive position.

Individual partial indices of the competitive potential and position were used as the basis for the calculation of the synthetic competitiveness index. The model method was used to construct the synthetic index. The method consists of creating a model object (a state with the highest competitive potential and competitive position). The (Euclidean) distance of the other states from the model was calculated at the next stage.[3] Finally, the ranking was created and the states were assigned to groups of high, medium, low, and very low competitive potential and competitive position. The intervals were established with the arithmetic average and standard deviation. The following level intervals were adopted: high ($SW \geq \underline{x} + S$), medium

2 https://ec.europa.eu/eurostat/web/nace-rev2/overview

3 A detailed method of calculating the synthetic index was presented in a previous study [Juchniewicz and Łada, 2020, pp. 31–41].

($\underline{x}$ + S > SW ≥ $\underline{x}$), low ($\underline{x}$ > SW ≥ $\underline{x}$ − S), and very low (SW < $\underline{x}$ − S). The same procedure was used in the classification of the states in partial indices of the competitive potential and position. The analysis covered a period of 3 years (the latest data available in the Eurostat database as of January 21, 2022), namely 2016–2018. The mean value of the time periods under analysis was taken for calculations (the latest data were used if data were missing). The analysis covered (U) states. The data were obtained from the Eurostat database.

4 Results

The competitive potential describes a competing capability of the high-tech sector entities located in individual EU countries. The study findings (Table 1) show the following countries to have the highest synthetic competitive potential during the period under study: The Netherlands, Italy, France, Germany, Spain, and Poland. The high positions of these countries resulted from a large share of the countries' high-tech sector in the total number of high-tech companies in the EU. The companies operating in Germany (13.84%), France (12.34%), Italy (10.63%), Poland (10.21%), and the Netherlands (8.79%) accounted for nearly 56% of all high-tech companies during the period under study. It is also noteworthy that the high-tech sector comprises mainly (knowledge-based) service enterprises. Production companies in the states with the highest competitive potential accounted for 2%–6% of all high-tech companies. The high competitive potential of The Netherlands and France was significantly affected by labor productivity, which was, respectively: 267,116.07 euro/person employed (fourth place) and 258,511.54 euro/person employed (fifth place). One should pay attention to Poland when the next competitive potential index – labor costs – is considered. High-tech companies in this country bore the lowest personnel costs among the countries of a high competitive potential (third place). It had a significant impact on the synthetic competitive potential of Poland (sixth place).

Countries with medium competitive potential include the Czech Republic, Belgium, Sweden, Cyprus, Hungary, and Ireland. The labor productivity is high in all these countries. It exceeded €300,000/person employed (which is more than in countries with high competitive potential). The personnel costs per person employed are also high. Personnel costs depend, among other factors, on the number of employed, which, in turn, depends on the number of companies in individual sections. A large majority of employees (71%–88%) in countries with high and low competitive potential are employed in the knowledge-based service sector. Ireland, Belgium, and Sweden were among the countries with the highest costs in the EU (over €60,000/person employed). Malta, Slovakia, Portugal, Finland, Greece, Slovenia, Denmark, Austria, Estonia, and Romania have the lowest competitive potential.

The other countries were regarded as those with very low competitive potential. The highest labor productivity was observed in Luxembourg, whereas the low share of the country in the total number of companies (25th place) and very high personnel costs prevented it from taking a high position in the ranking. Low and very low competitiveness levels in the other countries in this group are a consequence of the small number of high-tech companies operating in these countries as well as a low level of the other partial indices.

The competitive position at the sector level is closely related to the foreign trade balance. The study (Table 2) shows that the most competitive nations during the period under study were The Netherlands, Germany, Hungary, Belgium, and the Czech Republic. High trade coverage (3.59 in The Netherlands) and share in intra-community exports (Germany and the Netherlands generated nearly 50% of goods and services) were regarded as factors affecting the countries' positions in the ranking. Belgium was regarded as a country with the highest profitability index. Countries with a medium competitive position included: Austria, Slovenia, Poland, Italy, France, and Denmark. High profitability had an effect on the medium competitive position of such countries as Denmark (35.48%), Slovenia (31.73%), Italy (27.30%), and Poland (26.15%); the mean competitive position of the other countries was a consequence mainly of the high trade coverage index (Austria, 1.14) and share in exports (France, 10.57%). About 50% of the member states were regarded as those with a low competitive position. This group included: Croatia, Latvia, Slovakia, Romania, Malta, Lithuania, Spain, Bulgaria, Luxembourg, Cyprus, Estonia, Finland, and Portugal. Sweden

Table 1. The competitive potential of the advanced technology sector in EU

Country	Synthetic indicator of the competitive potential			Productivity of work (euro per person employed)		Personnel costs (euro per person employed)		Share of the number of high-technology enterprises in the total number of enterprises in the sector in the EU (%)	
	Value	Level	Ranking	Value	Ranking	Value	Ranking	Value	Ranking
Netherlands	0.50	High	1	267,116.07	4	52,271.62	18	8.79	5
Italy	0.48		2	190,481.67	11	46,099.24	17	10.63	3
France	0.42		3	258,511.54	5	67,086.71	24	12.34	2
Germany	0.41		4	159,209.21	13	52,848.48	19	13.84	1
Spain	0.36		5	138,538.17	14	41,621.12	16	7.76	6
Poland	0.36		6	81,052.41	22	16,212.09	3	10.21	4
Czechia	0.30	Average	7	127,922.22	15	23,181.64	9	4.39	8
Belgium	0.29		8	332 424.57	3	63,169.53	23	3.24	10
Sweden	0.27		9	241,153.06	8	67,354.35	25	5.07	7
Cyprus	0.26		10	254,009.55	6	32,697.64	15	0.16	26
Hungary	0.25		11	96,458.68	21	18,869.60	7	4.08	9
Ireland	0.25		12	372,131.76	2	60,527.89	22	1.40	17
Malta	0.23	Low	13	206,255.87	10	27,655.73	12	0.12	27
Slovakia	0.22		14	121,747.13	17	19,775.93	8	2.20	12
Portugal	0.19		15	117,965.48	18	28,724.93	13	1.68	15
Finland	0.19		16	229,035.93	9	57,072.47	20	0.97	19
Greece	0.18		17	99,235.38	20	25,486.31	11	2.12	13
Slovenia	0.17		18	126,937.16	16	31,115.49	14	0.97	20
Denmark	0.16		19	248,224.36	7	68,086.95	26	1.67	16
Austria	0.15		20	169,875.35	12	59,807.30	21	1.77	14
Estonia	0.14		21	105,783.60	19	24,096.46	10	0.50	24
Romania	0.13		22	55,331.01	26	16,005.85	2	2.33	11
Luxembourg	0.11	Very low	23	384,271.86	1	75,261.02	27	0.23	25
Croatia	0.11		24	74,797.74	23	18,554.10	6	0.68	23
Lithuania	0.09		25	59,528.37	24	17,461.43	5	0.80	21
Bulgaria	0.09		26	45,148.40	27	14,100.11	1	1.34	18
Latvia	0.08		27	56,651.70	25	16,402.46	4	0.71	22

Source: Own study based on sbs_na_sca_r2 (Eurostat).

and Greece were regarded as countries with a very low competitive position. Ireland was not included in the synthetic index due to the absence of data on profitability; however, its high position must be emphasized both in terms of the trade coverage (6th place) and share in intra-community exports (7th place).

Table 2. The competitive position of the advanced technology sector in EU

Country	Synthetic indicator of the competitive position		Coverage of imports by export (euro/euro)			Share of the high-technology sector export in the intra-EU export market (%)		Level of profitability (%)	
	Value	Level	Ranking	Value	Ranking	Value	Ranking	Value	Ranking
Netherlands	0.64		1	3.59	1	23.72	2	21.81	18
Germany	0.40		2	1.18	4	25.31	1	21.50	20
Hungary	0.37	High	3	1.28	3	3.14	10	34.26	3
Belgium	0.37		4	1.00	7	5.84	4	38.76	1
Czechia	0.35		5	1.38	2	5.27	5	24.82	10
Austria	0.27		6	1.14	5	3.29	8	22.34	16
Slovenia	0.25		7	0.78	12	0.31	19	31.73	4
Poland	0.25	Average	8	0.79	11	3.20	9	26.15	8
Italy	0.25		9	0.65	17	4.32	6	27.30	6
France	0.25		10	0.87	9	10.57	3	17.85	23
Denmark	0.25		11	0.59	19	1.10	14	35.48	2
Croatia	0.19		12	0.48	23	0.18	25	29.01	5
Latvia	0.19		13	0.67	15	0.19	24	24.68	11
Slovakia	0.19		14	0.72	13	1.65	13	21.68	19
Romania	0.18		15	0.68	14	1.08	15	22.57	15
Malta	0.18		16	0.52	21	0.05	27	26.45	7
Lithuania	0.18		17	0.66	16	0.31	18	22.77	14
Spain	0.16	Low	18	0.50	22	2.39	11	21.37	21
Bulgaria	0.16		19	0.48	24	0.22	23	24.19	12
Luxembourg	0.16		20	0.97	8	0.29	21	16.81	24
Cyprus	0.15		21	0.56	20	0.05	26	22.27	17
Estonia	0.15		22	0.81	10	0.29	20	18.25	22
Finland	0.14		23	0.28	27	0.41	16	25.86	9
Portugal	0.13		24	0.33	26	0.37	17	23.38	13
Sweden	0.10	Very low	25	0.63	18	2.01	12	14.65	26
Greece	0.08		26	0.39	25	0.26	22	16.47	25
Ireland	-	-	-	1.04	6	4.19	7	-	-

Source: Own study based on htec_trd_tot4 (Eurostat).

These considerations were summarized by determining the relationship between the competitive potential and competitive position (Table 3). The Netherlands and Germany are regarded as countries with the highest competitive potential and competitive position. The Czech Republic, Belgium, and Hungary are countries with a medium competitive potential and position. Malta, Slovakia, Portugal, Finland, Estonia, and Romania are countries with low competitive potential and position. The difference between the competitive potential and competitive position for the other countries is small – in most cases, a diagnosed level of the synthetic competitive potential was accompanied by a similar (or differing by only one degree) competitive position. Spain, with its high competitive potential and low competitive position, is an exception. This was caused mainly by the low trade coverage and low profitability of high-tech companies in this country.

Table 3. Competitive potential and the competitive position of the advanced technology sector

	Competitive position				
	Specification	**High**	**Average**	**Low**	**Very low**
Competitive potential	High	Netherlands, Germany	Italy, France, Poland	Spain	-
	Average	Czechia, Belgium, Hungary	-	Cyprus	Sweden
	Low	-	Slovenia, Denmark, Austria,	Malta, Slovakia, Portugal, Finland, Estonia, Romania	Greece
	Very low	-	-	Luxemburg, Croatia, Latvia, Bulgaria	-

Source: Own study based on Tables 1 and 2.

These findings are confirmed by a correlation coefficient of 0.5837 between the variables under discussion. It indicates a statistically significant, but moderate, effect of the competitive potential on the competitive position of the high-tech sector in EU countries (Table 4). There were visible relationships between individual partial indices. The study shows that there is a correlation between the country's share in the total number of high-tech companies and an individual countries' share in exports (0.7410) and between the countries' share in exports and the synthetic competitive potential index (0.7027). There was no relationship (negative correlation) between the profitability index and: the synthetic index of competitive potential (–0.0344), personnel costs (–0.0726), and the country's share in the total number of companies (–0.1327).

Table 4. Pearson's linear correlation coefficient between the measures of potential and the competitive position of the advanced technology sector

Specification	**Synthetic indicator of the competitive position**	**Share of the high-technology sector export in the intra-EU export market**	**Coverage of imports by export**	**Level of profitability**
Synthetic indicator of the competitive potential	0.5837	0.7027	0.4927	-0.0344
Productivity of work	0.2224	0.2512	0.2657	0.0055
Personnel costs	0.1855	0.3360	0.1964	-0.0726
Share of the number of high-technology enterprises in the total number of enterprises in the sector in the EU	0.4903	0.7410	0.3592	-0.1327

Source: Own study based on Tables 1 and 2.

5 Discussion

These considerations indicate that there is a significant, but moderate, relationship between the competitive position and potential of the high-tech sector. Similar conclusions were drawn in a food industry study by Juchniewicz [2017, p. 47]. This is caused by the diversity of the indices taken for analysis in EU countries. For competitive potential, it was mainly EU countries' share in the total number of high-tech companies. All countries with a high index level had a similar position in the ranking of the overall competitive potential. Labor productivity was also important in building production potential. Ortega-Argilés et al. [2011, p. 14] found high-tech companies to be ahead of other sectors in terms of the effect of R&D activities on labor productivity. This was confirmed by studies of the Chinese market conducted by Li et al. [2017, p. 31]. The importance of labor productivity in building competitiveness is stressed not

only on the mesoeconomic (sectorial) but also on the macroeconomic level (national economies) [Roszko-Wójtowicz and Grzelak, 2020, pp. 657–688]. The relationship between labor costs and productivity has also been stressed. Ark et al. [2005, pp. 8–9] point out that countries with lower labor costs are also characterized by lower labor productivity, an observation that stands confirmed also for the high-tech sector. Paitaridis [2018, pp. 157–184] adds that relative labor costs are usually regarded as a determinant of price competitiveness. Therefore, the analyses show that regardless of the technological advancement of national economy sectors, countries with a lower economic development level use the cost-price advantages of having a lower cost of labor.

The competitive position of the high-tech sector is dominated by different countries' highly varied shares in exports of high-tech products to the community market, with relatively lower diversity of the other indices. These findings are consistent with the conclusions drawn by Juchniewicz and Łada [2020, pp. 31–41], who studied the competitive position of the high-tech sector during 2009–2017. Baesu et al. [2015, pp. 371–378] also point out that an increase in the high-tech sector share in exports also matters in their innovative activities. Śledziewska and Akhvlediani [2017, pp. 37–49] add that high-tech companies gain a comparative advantage in exporting products requiring large R&D outlays and large human capital. The importance of high-tech export was indicated by Love et al. [2010, pp. 983–1004], who regarded it as the main factor of economic growth.

6 Conclusions

The study has shown that there is a statistically moderate correlation between the competitive potential and competitive position. It is mainly a consequence of a moderate relationship between a country's share in the total number of high-tech companies and a synthetic index of a competitive position. Countries with high competitive potential and position were The Netherlands and Germany. Much lower competitiveness of the high-tech sector was observed in Luxembourg, Croatia, Bulgaria, and Lithuania. These countries had very low competitive potential and a low competitive position. Poland was characterized by a high competitive potential and an average competitive position. Following the example of countries with a high competitive position, it is recommended to take measures to increase the share of exports of technologically advanced products and services. The high-tech sector dealt with in this paper includes both high-tech industry and knowledge-based services. It had an impact on the study results and conclusions. Given the diversity of the sector in different EU countries in terms of the share of the production and service branches, it is justified to broaden the research taking into account their specificity.

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