

What Inhibits Cooperation With Competitors? Barriers of Coopetition in the High-Tech Sector

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Coopetition, that is simultaneous cooperation and competition between the same organizations, aims at bringing mutual benefit to both parties involved in the relationship. Thus, the question arises why not all companies coopete, while, from a theoretical point of view, they should. The aim of the paper is to identify the barriers of coopetition in the high-tech sector from the perspective of the areas of cooperation with competitors as well as the company's size and area of operations. Basing on the survey conducted by the PAPI method on a sample of 235 high-tech enterprises, it was stated that the barriers of coopetition change depending on the area of cooperation with competitors. The barriers of coopetition are the most frequent and numerous in the area of production/services as well as sales and distribution. However, the size and area of operations of high-tech companies do not influence the barriers' incidence rate.

Field of Research: Management.

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1. Introduction

Coopetition is, together with coexistence, competition and cooperation, one of the basic connections between competitors (Bengtsson and Kock, 1999). Despite the fact that it is still quite a new phenomenon, it is undoubtedly becoming an inherent element of the world's modern economy (Czakon, Fernandez, Minà, 2014). From a general perspective, coopetition implies simultaneous cooperation and competition between enterprises (Bengtsson and Kock, 2000) that, while preserving organizational independence, compete and cooperate repetitively (Zerbini and Castaldo, 2007). Thanks to cooperation, enterprises are able to integrate their actions in order to achieve intended mutual benefits and through simultaneous competitive actions, they realize their individual strategic goals (Zakrzewska-Bielawska, 2013a). The desire to achieve mutual benefits, including in particular the desire to consolidate resources, costs and risk in order to resist competition pressure more effectively (Gnyawali and Park, 2009), the desire to limit business uncertainty (Chirgui, 2005) as well as the desire to improve performance (Lin, Wang, Tsai and Hsu, 2010) are the main reasons for entering into coopetitive relationships. However, on the other hand, the inconsistency resulting from a paradoxical simultaneity of occurrence of cooperative and competitive behaviors between coopetitors generates different kinds of barriers which inhibit or block coopetition. The barriers are connected with specific hazards, which can be called "coopetition losses". They often include: the risk of knowledge and know-how leakage from the company (Levy, Loebbecke and Powell, 2003), coopetitors' opportunistic behaviors (Gnyawali, He and Madhavan, 2006), conflicts between competitors, asymmetry of arrangement, which can transform into the loss of organizational and decisional independence as a result of the actions of the

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stronger partner as well as low efficiency of processes and goals realized together (Ritala, 2012). Factors of this kind can discourage the enterprises from cooperating with competitors despite potential benefits.

Coopetition is particularly characteristic for the high-technology (high-tech) sector, operating in network-oriented and hypercompetitive conditions (Yanghoon and Hangbae, 2013; Pathak, Pokharel and Mahadevan, 2013). Gnyawali and Park (2011) and other earlier researchers (Chen and Li, 1999; Quintana-Garcia and Benavides-Velasco, 2004; Palmberg and Martikainen, 2006; Sampson, 2007; Ling, Jianlei and Quanhong, 2013) identified key factors favorable for coopetition in the high-tech sector, including: shrinking product life-cycle, convergence of many technologies as well as increasing investment expenditure, in particular on research and development (R&D) activity.

High-tech enterprises are innovative, technologically advanced and knowledge-based entities. They should also use modern information and communications technology (ICT), which constitutes the base of knowledge management system, simultaneously improving the process of innovation creation and supporting research and development activity (Zakrzewska-Bielawska, 2010). High product complexity, high level of technological advancement, high R&D expenditures as well as the heterogeneity and uniqueness of resources should stimulate high-tech enterprises to cooperate with competitors. Nevertheless, it is not always the case, as coopetition is also conditioned by some concerns and limits. However, there is lack of studies focusing on the barriers of coopetition precisely in this sector.

That is why the aim of the paper is to identify the barriers of coopetition in the high-tech sector. The barriers are analyzed from the perspective of the company's size and area of operations as well as the areas of cooperation with competitors, including: research and development, supply, production/services, sales/distribution, marketing, IT, human resources and finances. From the perspective of these areas, barriers of coopetition have not yet been analyzed. The barriers of coopetition in the high-tech sector were determined basing on the surveys conducted using a questionnaire by the PAPI method in the years 2012 – 2013 on a sample of 235 enterprises operating both in Poland and in the global marketplace which entered into coopetitive relationships of a horizontal character (coopetitors were direct competitors fighting for the same final consumer). The research findings allowed to determine the barriers of coopetition in the high-tech sector in the country in which this sector is still developing, and the simultaneous cooperation and competition should support this development.

The characteristics, reasons and motivations of coopetition create a representation of the phenomenon, which has been described in the first part of the paper. In the following sections, the methodology of the survey is presented and the results obtained analyzed. The paper ends with conclusions and suggestions for future research.

2. Coopetition - Literature Review

Brandenburger and Nalebuff (1996) are considered to be the popularizers of the concept of coopetition. They assumed that competitive enterprises cooperate with each other in order to create a greater business value, the benefits from which are shared between them through direct competition. In such a way, they conduct a positive-sum market game, beneficial for both parties from the financial, technological or operational perspective (Luo, 2004). These benefits are called syncretic rent (Lado, Boyd and

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Hanlon, 1997). Thus, theoretical background of coopetition is based on game theory (Bengtsson and Kock, 2000; Okura, 2007), as well as transaction costs theory (Dowling, Roering, Carlin and Wisnieski, 1996). Nevertheless, the phenomenon of parallel competition and cooperation is also explained by the resource-based theory (Levy, Loebbecke and Powell, 2003; Tong and Reuer, 2010). Simultaneous cooperation and competition between enterprises makes it possible simultaneously to derive the benefits resulting from cooperation and the sharing of resources or creation of common resources, and to maintain competitive relations between the parties and to protect their exclusive, often unique, resources. Competitors can form coopetitive relations with similar resource configurations, thus achieving advantages of scale, but a more common motivation is the complementary nature of their resources and the possibility of gaining access to resources which are hard to obtain individually (Zakrzewska-Bielawska, 2013a). Moreover, in order to create the theoretical base of coopetition, researchers use the network approach (Gnywali, He and Madhavan, 2006; Czakon, 2009), as well as the interorganizational dynamics theory (Padula and Dagnino, 2007; Tidström, 2008). The multitude of theoretical approaches to coopetition as well as relatively short research history cause the dispersion of knowledge on this phenomenon and the impossibility to integrate the theoretical base of coopetition into one coherent knowledge repertory. That is why the phenomenon of coopetition has been explored in the recent years on a large scale. Since the publication of Brandenburger and Nalebuff's pioneer book (1996), the number of new, reviewed articles on coopetition in such worldwide databases as Ebsco, Elsevier/Springer, Emerald, Proquest and ISI Web of Knowledge has been increasing significantly. According to estimations, 300 articles in scientific journals and six books have been published so far. European centers, in particular Italy, France, Sweden and Finland, as well as North American ones, are the research leaders. Research on coopetition is also conducted in different sectors of economy. The most explored sectors are: high-tech (about 1/3 of all publications on coopetition) as well as the sector of healthcare and social assistance and industrial processing (Rogalski, 2013). In the existing publications, the researchers enumerate several characteristics (dimensions of coopetition), including: simultaneity of competitive and cooperative behaviors, mutual benefit for coopetitors, variability of the intensity of interorganizational dynamics and/or during the relationship period, difficulties connected with the processes of preparation, implementation and management of coopetition as well as typological complexity of the forms of coopetition (Rogalski, 2013). Nevertheless, the most important characteristic of coopetition is the simultaneity of occurrence of two antagonistic logics: trust and conflict. Trust encourages the solidarity with partners and limits excessive ambitions, connected in particular with goal setting (Fink and Kessler, 2010). Conflict, on the other hand, results from the competitive character of operations and is reflected in the conflict of interests, favorable for opportunistic behaviors and mutual aversion of the partners (Bengtsson and Kock, 2000; Ritala, 2012), constituting at the same time an important barrier of coopetition.

The contact of cooperative and competitive behaviors is realized as a result of the using by coopetitors of two separate areas of relationships. Cooperative behaviors are connected with different area than competitive ones. Cooperation, in particular in the high-tech sector, is the most frequently established within research and development activities, supply, production, i.e. so called input activities, while sales, distribution, marketing activities, i.e. so called output activities, are included in the scope of competitive actions (Walley, 2007). In addition, coopetitive relations are studied on the micro-level, when the coopetitors are company-internal units, e.g. functional departments, strategic business units (Luo, Slotegraaf and Pan, 2006), meso-level, when

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coopetitors are companies in industries or clusters (Dagnino and Padula, 2002), macro-level, when coopetitors are clusters, industries, sectors of economy (Bouncken and Kraus, 2013) and on the global level, when coopetitors are national economies, integration groups (Luo, 2007). At the same time, the cooperative relations per se may be vertical (coopetitors are suppliers, clients in the supply chain), horizontal (coopetitors are direct competitors) and mixed (combination of vertical and horizontal relations) (Bengtsson and Kock, 2000; Kotzab and Teller, 2003; Czakon and Rogalski, 2014).

Irrespective of the character of cooperation, the relationships of this type aim at bringing mutual benefits to coopetitors. In the high-tech sector, the most frequently enumerated ones are: access to resources, reduction of costs (particularly transaction costs), strengthening of market position with respect to other rivals, taking a fuller advantage of market opportunities, expansion of scale of operations as well as acquisition of unique knowledge (Zakrzewska-Bielawska, 2013b). Nevertheless, the phenomenon of cooperation has also certain barriers. The research of Tidström (2009) identified the fear of cooperation with competitor and the concern of losing the company's autonomy. Other barriers of cooperative relationships are discrepancies in coopetitors' strategies, divergence of aims of the parties as well as the possibility of the rival to achieve a better market position (Walley, 2007).

Taking into account resource-based motivations of cooperation, the limit in this type of relationships is constituted by the lack of complementary nature of resources, which usually intensifies the competitive relationship between coopetitors and the danger of resource leakage, in particular the leakage of knowledge, what in turn generates the unwillingness to share this resource (Zakrzewska-Bielawska, 2013a). On the other hand, common and equal access to material and non-material resources does not constitute a favorable condition for establishing cooperation with competitors. More often, cooperation is motivated by the opportunity to gain access to rival's resources, difficult to obtain individually (Das and Teng, 2000). Similarly, common and equal access to all markets may limit the development of cooperation. If a company is able to enter the market on its own and the costs are acceptable, it will be less interested in cooperation with a competitor in order to achieve it, as every interdependence is subject to a certain risk (Dagnino and Rococo, 2009).

The development of the phenomenon of cooperation is also limited by opportunism and so called free riding (Oliver, 2004). Cooperation should be based on the assumption concerning reliability and goodwill in the area connected with cooperation. The special role is ascribed to expectations towards each of the partners concerning the highest possible efficiency of actions, honest intentions and the ability to realize common goals without the need of intensive controlling of coopetitors. Nevertheless, the practice shows that this assumption is not always respected by cooperating rivals who sometimes behave in an opportunistic way. This, on the other hand, raises the concern of losing the sources of competitive advantage (Ritala, 2012).

In spite of the fact that the basic motivation of cooperation is the reduction of costs, in particular transaction costs (Bigliardi, Domino and Galati, 2011), it should be noted that cooperation also implies certain costs for the partners, resulting from the necessity to devote time to shaping the cooperation and managing cooperative relationships. Moreover, in the high-tech sector, cooperation is often connected with the necessity of incurring high expenditures on R&D activities and the results of these works are always subject to risk. This concern of cost increase may also inhibit cooperative behaviors.

Robson and Bennet (2000) express their radical opinion on coopetition by pointing out that coopetition implies the decrease in financial results, including in particular the decrease in profitability.

Legal regulations determining the model of cooperation with competitors and prohibiting certain forms of coopetition may also constitute a certain barrier of coopetition. First of all, cooperation with competitors must be in line with the competition protection policy and must not constitute a risk to the proper functioning of the market. Thus, coopetitors cannot disregard the limits provided by the law on competition protection in order to avoid sanctions imposed by antitrust authorities, both national and international. The assessment of market behaviors of coopetitors, operating regardless of the region of the world, in terms of the prohibition of anticompetitive agreements (Sharma, 2008), may be a discouraging factor for coopetition.

Finally, previous experience related to cooperation with competitors constitutes a factor determining the willingness to establish coopetitive relationships. If the experience is positive, it will act in favor of coopetition. However, if previous experience related to cooperation with rivals is negative, manifested in the lack of trust, opportunistic behaviors, lack of intended benefits etc. (Chin, Chan and Lam, 2008), it may constitute an important barrier for coopetition.

Although the problem of barriers of coopetition was discussed in many publications (eg Oliver, 2004; Walley 2007; Tidström 2009; Ritala 2012), there is still lack of comprehensive studies in this area. Existing researches analyzed the single barriers, and studies were conducted in different economic sectors. Therefore, there is the research gap resulting from still weak and no holistic diagnosis of barriers of coopetition, specially in the high-tech enterprises.

Moreover, barriers of coopetition may differ according to the size of the enterprise, and this problem has not previously been the subject of detailed analysis. The characteristics of small and medium technological enterprises, such as: high flexibility of actions, creativity, possibility to take advantage of an opportunity more quickly, complementary nature of resources, entrepreneurial spirit and active approach are favorable both for entering into cooperative (Matejun and Szczepańczyk, 2013; Adamik, 2008) as well as coopetitive relationships (Adamik, 2013; Kozłowski and Matejun, 2012). On the other hand, discrepancies in coopetitors' strategies, concern of the loss of autonomy as well as insufficient and inadequate resources may inhibit the coopetition of small enterprises (Czakoń, 2009) and at the same time encourage the cooperation and competition of medium and big enterprises, possessing bigger resources and a better market position (Zakrzewska-Bielawska, 2013a). Similarly, the area of operations of a company may encourage or inhibit coopetitive relationships of high-tech enterprises. Globalization, hyper-competition, network-oriented approach force high-tech enterprises to constantly introduce innovations (Yanghoon and Hangbae, 2013). It often requires important investments and it is a reasonable idea to share their costs and risk with partners, including also direct rivals. Moreover, enterprises operating in the high-tech sector, in particular "born global" firms, look for the sources of competitive advantage in resources and sales scale in numerous countries (Persinger, Emin and Vostina, 2011), that is why they enter into coopetitive relationships more often than the enterprises operating on the national market.

Taking into account the specific character of high-tech companies, different areas of cooperation as well as numerous barriers accompanying this phenomenon, the following hypotheses are proposed.

- H1:** Barriers of cooperation in the high-tech sector change according to the area of cooperation with competitors. They are the most frequent and numerous in the area of sales/distribution and the least frequent and numerous in the area of R&D.
- H2:** Barriers of cooperation in the high-tech sector are determined by the size of an enterprise. They are more frequent in medium and big enterprises than in small enterprises. In the SME sector, they result in particular from the concern of losing autonomy and the sources of competitive advantage, whereas in big enterprises from the divergence of aims of the parties and unwillingness to share the knowledge.
- H3:** Barriers of cooperation in the high-tech sector are determined by the company's area of operations. They are more frequent in the enterprises operating in national rather than global marketplace.

In order to verify the abovementioned hypotheses, the research was conducted on a sample of 235 cooperating high-tech enterprises, operating both in Poland and in the global marketplace. The following sections describe the methods of data collection and basic findings.

3. Methodology

In order to test the hypothesis, an empirical study was conducted from October 2012 to the end of January 2013 on a group of 235 entities operating in the high-tech sector. The selection criterion was entering into horizontal cooperative relationships (the meso-level, in which the participants are direct competitors) as well as business activity in the high-tech sector, determined using the sectorial approach (according to OECD) based on the Polish Classification of Businesses (PKD)¹. The research included a group of 402 high-tech enterprises, representative for Poland in view of their size and industry. The high-tech sector structure was determined on the basis of the data of the Central Statistical Office, and research operator was the "Polskie firmy" database and "Panorama firm". However, out of 402 enterprises surveyed, only 235 of them entered into cooperative relationships. That is why, further analyses were based exclusively on the data obtained from those 235 enterprises.² The survey was conducted using a questionnaire by the PAPI (Pen and Paper Interview) method, namely personal interviews conducted by a researcher. The research tool was a structured and standardized paper questionnaire. The respondents were owners (31.5%) and top managers of firms (68.5%).

Enterprises surveyed represented the following high-tech industries: manufacturers of pharmaceutical products (6.81%), manufacturers of computers, electronic and optical products (33.62%), telecommunication (13.19%), IT (22.98%), Research & Development activity (6.81%) as well as other industries in 16.60% (e.g. manufacturers of air and space crafts, biotechnology, nanotechnology etc.). These were the companies based in Poland that operate either in Poland (69.79%) or in the global marketplace (30.21%). Detailed characteristic of the entities is presented in Table 1.

They are in particular small entities, whereas in the case of companies operating in the global marketplace, the number of medium and big entities is higher. As far as the area of cooperation with competitors was concerned, it was the most frequent in production or

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services (68.94% of enterprises), sales and distribution (58.72%), supply (55.74%), as well as research and development activity (45.11%), i.e. within so called input activities.

However, taking into account the area of operations of the firms surveyed, certain differences are visible. Namely, firms operating in the global marketplace are more willing to cooperate with rivals in the R&D as well as sales and distribution sectors, while firms operating in the national market – in marketing and IT. The cooperation with rivals was established less frequently in such areas as: marketing (e.g. common activities in sales promotion, co-advertising, sponsoring or co-branding), IT (e.g. creating specialized IT systems supporting and facilitating management activities, cooperation in the area of development of information services), human resources (e.g. training process, staff leasing, outplacement) as well as finances (e.g. financing of various activities, including in particular investment, financing of purchases).

Table 1: Characteristic of the high-tech firms surveyed

Specification	All firms in total in % 235=100%	Companies, that operate in Poland in % 164=100%	Companies, that operate in the global marketplace in % 71=100%
Firm's size:			
- small (1 to 49 employees)	55.32	60.36	43.66
- medium (50 to 249 employees)	30.64	29.27	33.80
- big (over 249 employees)	14.04	10.37	22.54
Area of cooperation with competitors³:	45.11	41.46	53.52
- R&D	55.74	59.15	47.89
- Supply	68.94	70.12	66.20
- Production/Services	58.72	57.93	60.56
- Sales/Distribution	44.26	45.73	40.85
- Marketing	42.55	45.12	36.62
- IT	32.77	34.15	29.58
- Human Resources	34.89	34.76	35.21
- Finances			

Irrespective of the area of cooperation, the process is accompanied by specific barriers, which are going to be studied in the following sections of the paper. We analyzed the barriers identified through a literature review in relation to the size of company and areas of cooperation with competitors, taking into account the specificity of high-tech. Therefore, the obtained results have improved the previous studies.

In order to organize, group and analyze the obtained data, the following tools were used: incidence rates, Pearson's Chi-squared test for independence (used to examine the relationship between variables) as well as Phi-squared and Cramer's V coefficients (illustrating the strength of relationship).

4. Findings and Discussion

Firstly, respondents were asked to indicate the barriers of simultaneous cooperation and competition, taking into account the areas of cooperation with rivals. They were supplied

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with a list of potential barriers and asked to indicate all the barriers which, according to them, inhibit cooperation in various areas of the company's operations. Table 2 presents the results based on the answers obtained.

Respective barriers were indicated by less than a half of the firms surveyed. It shows that if a firm has decided to cooperate, it treats this fact as an opportunity to achieve mutual benefits and does not consider the barriers which could inhibit or even block the relationship of this kind. The most frequently indicated barriers are the following: possibility of losing competitive advantage (41.3% of the entities surveyed), concern of losing autonomy (38.7%), unwillingness to share the knowledge (38.3%) as well as divergence of the aims of the parties (37.0%), while the least frequently indicated ones were: lack of complementary nature of resources (24.7%), opportunism of the partner (24.7%) as well as regulations prohibiting cooperation (25.5%). Therefore, the barriers differed according to the area of cooperation with rivals.

Table 2: Barriers of cooperation in the opinion of the high-tech firms surveyed

No	Barriers of cooperation	Total	Research and development	Supply	Production/Services	Sales/Distribution	Marketing	IT	Human Resources	Finances
		in % (235=100%)								
1	fear of cooperation with competitor	33.6	5.1	6.4	12.8	10.2	6.8	3.8	5.1	4.7
2	concern of losing autonomy	38.7	5.5	9.4	15.7	14.9	7.2	8.1	5.1	7.7
3	discrepancies in strategies	34.0	6.8	6.4	13.2	12.8	8.5	5.5	2.6	3.4
4	divergence of the aims of the parties	37.0	5.5	7.7	11.9	12.8	8.9	5.5	2.1	6.8
5	possibility of the rival to achieve a better market position	31.5	3.8	6.4	15.3	14.5	4.7	4.3	5.1	4.3
6	lack of complementary nature of resources	24.7	2.6	4.7	7.2	6.0	2.1	2.1	5.5	5.5
7	unwillingness to share the knowledge	38.3	11.5	4.7	13.2	11.1	8.5	12.8	7.2	8.5
8	common and equal access to material and non-material resources	32.3	2.6	10.2	13.2	10.2	2.6	5.5	5.1	2.1
9	common and equal access to all markets	32.3	3.4	9.8	11.1	11.1	6.8	3.8	3.8	3.0
10	opportunism of the partner	24.7	1.3	4.7	8.5	7.7	4.3	3.0	3.0	2.6
11	loss of the sources of competitive advantage	41.3	6.8	5.1	16.6	15.3	6.4	4.7	5.1	6.0
12	increase in costs	32.3	3.0	7.7	10.2	6.8	7.2	7.2	2.6	6.8
13	regulations prohibiting cooperation	25.5	4.3	4.3	9.8	6.4	1.3	4.3	4.3	3.0
14	negative experience connected with cooperation with competitors	26.8	1.3	4.3	7.2	10.2	5.1	5.1	4.3	7.2

They were the most frequently indicated in the area of production/services as well as sales and distribution and the least frequently – in the area of human resources and research and development activity. In the high-tech sector, the pressure on innovation forces the entities of this type to make high investments in research and development. High costs of R&D, investment risk and a shrinking high-tech product life-cycle are strong

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premises for engaging in cooperation, also with rivals, in the area of creation of new technologies. That is why, the barriers of cooperation were relatively rarely indicated in this context. Lower incidence of barriers in the area of human resources is also influenced by this fact. High-tech firms are characterized by a high level of employment of scientific and technical staff and the professionals employed often possess the unique and complementary knowledge. Cooperation between them is favorable for the creation of, in particular technological, knowledge.

On the other hand, high-tech enterprises compete between each other for the position of technological leader and innovative leadership in the industry. Thus, the willingness to cooperate with competitors in the area of production/services and sales/distribution faces the barriers more frequently. However, it is necessary to note that in spite of the fact that the barriers of cooperation were the most frequently indicated in these areas, they are at the same time the most common areas of cooperation with competitors. This constitutes a certain paradox of cooperation, resulting from the variability of intensity of different interorganizational dynamics.

While considering the types of barriers in relation to the areas analyzed, it should be noted that their intensity is also subject to changes. In the area of R&D, the unwillingness to share the knowledge was the most frequently indicated barrier, whereas the least frequent ones were the opportunism of the partner and the negative experience connected with cooperation with competitors. In the area of supply, the basic barriers of cooperation were: common and equal access to resources, common and equal access to markets as well as the concern of losing autonomy. In the area of production/services as well as sales and distribution, the following were particularly indicated: possibility of losing the sources of competitive advantage, possibility of the rival to achieve a better market position as well as the concern of losing autonomy. In the area of marketing activities, the most common barriers were: divergence of the aims of the parties, discrepancies in strategies as well as the unwillingness to share the knowledge. The last barrier was the most frequently indicated also in the area of cooperation in the field of IT and human resources. However, in the area of finances, the respondents indicated the most frequently, apart from the unwillingness to share the knowledge, the concern of losing autonomy and negative experience connected with cooperation with competitors.

In order to verify if the differences in the frequency of indicating the barriers with respect to the area of cooperation with competitors are statistically relevant ($p < 0.05$), the Chi-squared test was performed. Out of 112 relationships identified (14 barriers and 8 areas), the vast majority of them (91 relationships) was relevant, what confirms the hypothesis H1 stating that the barriers of cooperation in the high-tech sector change according to the area of cooperation with competitors. Therefore, the relationships were characterized by a moderate strength (Phi-squared coefficient fluctuated around 0.2 to 0.4).

However, taking into account the coefficients of incidence of barriers according to the area of cooperation with rivals (table 2), the second part of hypothesis H1 should be developed, i.e.: "the barriers are the most frequent and numerous in the area of sales/distribution and production/service, whereas they are the least frequent and numerous in the area of R&D and human resources".

Taking into account the incidence of barriers according to the firm's size, measured by the number of people employed, it should be noted that in the high-tech firms surveyed,

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the barriers were more frequent in big and medium rather than small enterprises (table 3).

In small enterprises, the most frequently indicated barriers were the concern of losing autonomy (38.5%) and the concern of losing the sources of competitive advantage (37.7%), while the lack of complementary nature of resources was the least frequent (20.8%). In the group of medium enterprises, the key barrier of coopetition was the possibility of losing the sources of competitive advantage (44.4%). In turn, among big enterprises more than a half of respondents indicated as basic barriers of coopetition the unwillingness to share the knowledge and divergence of the aims of the parties. Opportunism of the partner was the least frequent barrier indicated by medium and big enterprises.

Table 3: Barriers of coopetition and size of the high-tech firms surveyed

No	Barriers of coopetition	Firm's size		
		small in % 130=100%	medium in % 72=100%	big in % 33=100%
1	fear of cooperation with competitor	30.0	37.5	39.4
2	concern of losing autonomy	38.5	37.5	42.4
3	discrepancies in strategies	33.8	30.6	42.4
4	divergence of the aims of the parties	30.0	41.7	54.5
5	possibility of the rival to achieve a better market position	28.5	36.1	33.3
6	lack of complementary nature of resources	20.8	29.2	30.3
7	unwillingness to share the knowledge	33.1	41.7	51.5
8	common and equal access to material and non-material resources	32.3	31.9	33.3
9	common and equal access to all markets	32.3	33.3	30.3
10	opportunism of the partner	24.6	25.0	24.2
11	loss of the sources of competitive advantage	37.7	44.4	48.5
12	increase in costs	33.1	31.9	30.3
13	regulations prohibiting coopetition	23.1	27.8	30.3
14	negative experience connected with cooperation with competitors	25.4	30.6	24.2

While performing the Chi-squared test for independence, only one relationship was statistically relevant ($p < 0.05$), with a relatively low Cramer's V coefficient (0.17). Thus, it is impossible to unambiguously confirm the hypothesis H2 stating that the barriers of coopetition in the high-tech sector are determined by the size of an enterprise and are more frequent in medium and big enterprises than in small enterprises. Therefore, basing on the incidence rates (table 3), it is possible to confirm its second part, namely that in the SME sector, the barriers of coopetition result in particular from the concern of losing autonomy and the sources of competitive advantage, whereas in big enterprises from the divergence of aims of the parties and unwillingness to share the knowledge.

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Barriers of cooperation differ also according to the area of operations of the high-tech firms. They are less frequent in the companies operating in the global marketplace than in those that operate nationally (table 4).

In the enterprises operating in the global marketplace, cooperation is the most frequently inhibited by the fear of cooperation with competitor, concern of losing the sources of competitive advantage as well as the unwillingness to share the knowledge, whereas among the enterprises operating in Poland, the most frequently indicated barriers of cooperation were: concern of losing autonomy and, as it was the case with the firms operating globally, the concern of losing the sources of competitive advantage. The least frequently indicated barriers of cooperation were the opportunism of the partner as far as global firms are concerned and the lack of complementary nature of resources for those operating nationally.

Table 4: Barriers of cooperation and area of operations of the high-tech firms surveyed

No	Barriers of cooperation	Area of operations	
		Companies, that operate in Poland in % 164=100%	Companies, that operate in the global marketplace in % 71=100%
1	fear of cooperation with competitor	31.1	39.4
2	concern of losing autonomy	42.1	31.0
3	discrepancies in strategies	36.6	28.2
4	divergence of the aims of the parties	38.4	33.8
5	possibility of the rival to achieve a better market position	32.9	28.2
6	lack of complementary nature of resources	25.6	22.5
7	unwillingness to share the knowledge	38.4	38.0
8	common and equal access to resources	35.4	25.4
9	common and equal access to markets	36.0	23.9
10	opportunism of the partner	27.4	18.3
11	loss of the sources of competitive advantage	42.1	39.4
12	increase in costs	37.8	19.7
13	regulations prohibiting cooperation	27.4	21.1
14	negative experience connected with cooperation with competitors	29.3	21.1

In this case, the Chi-squared test also showed single statistically relevant relationships ($p < 0.05$), with a relatively low Phi-squared coefficient. Thus, in spite of varied incidence rates of subsequent barriers for local and global firms, in view of the results obtained it is difficult to unambiguously confirm the hypothesis H3.

5. Conclusions

Simultaneous cooperation and competition between rivals brings numerous benefits which are significantly more important for entrepreneurs than the barriers accompanying this phenomenon (Gnyawali and Park, 2009). In the modern and innovative high-tech

sector, the strategy of coopetition becomes a chance for the further development of enterprises. That is why, the firms of this type establish the cooperation with rivals in various areas, in particular in the area of primary activities of Porter's value chain (1985). Despite the fact that the cooperation with competitors usually takes place in the area of production/services, as well as sales/distribution, paradoxically, the barriers of coopetition identified in these domains are the most frequent and numerous. They are the least frequent in the area of R&D, what results from the specific character of high-tech firms, characterized by intensive research and development activity, often expensive and subject to risk. In view of the research performed, it can be unambiguously stated that the barriers of coopetition change according to the area of cooperation with competitors. However, it hasn't been confirmed that the size and area of operations of a company influence the incidence of subsequent barriers in cooperative relationships, even though the literature review shows that small technological enterprises, in view of their flexibility (Adamik 2013), as well as globally operating ones, taking into account their openness (Yanghoon and Hangbae, 2013), should more frequently use coopetition to gain competitive advantage.

The identification of barriers of parallel competition and cooperation based on the quantitative survey performed enriches the range of academic achievements devoted to the phenomenon of coopetition, which was the most frequently analyzed basing on the case study method (Rogalski, 2013). Firstly, it presents the results of quantitative research on a representative sample due to size and industry high-tech companies. Secondly, it presents barriers of coopetition in a holistic way, taking into account a variety of their sources. Thirdly, it indicates the most common barriers in various areas of the value chain. Fourthly, it takes into account the sector differentiator, i.e. specificity of high-tech companies.

However, the identification includes several methodological limits. Firstly, the incidence of subsequent barriers was determined basing on the opinions of respondents, which are subjective by nature. Secondly, the results obtained relate to the high-tech enterprises based in Poland, i.e. within a single country, even if some of them also operate in the global marketplace. Thus, an interesting direction of further research work can be the identification of the barriers of coopetition from the perspective of various countries, including cultural differences as well as technological advancement of high-tech firms in a given country. Academic research can also relate to the identification of the barriers of coopetition according to the stage of development of an enterprise, as well as the stage of development of relationships with competitors. Another interesting research trend can also relate to the identification of the barriers of coopetition according to the number of competitors, their characteristics as well as duration of relationship. Current state of knowledge on coopetition is not sufficient and the phenomenon of simultaneous cooperation and competition itself, in view of its heterogenic and orthogonal nature, still remains of interest for modern researchers.

Endnotes

- ¹ The article presents partial results of the research realized under the research project of the Ministry of Science and Higher Education No N N115 006040, entitled "Determinants and dynamics of coopetition in the development of high-tech enterprises".
- ² The Polish business classification system PKD corresponds to the European statistical business classification NACE Rev. 2, introduced by Regulation (EC) No. 1893/2006 of the European Parliament and Council (NACE Rev.2. 2009).

³ Respondents were asked to indicate all the areas of cooperation with competitors (in some cases only one area was indicated, in other – several areas), that is why percentage values do not add up to 100%.

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