

A summary of a doctoral thesis
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“Coopetition on the electricity balancing market”
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This doctoral thesis provides a solution to the research problem indicating impact of coopetition on market efficiency. The results of literature review, as well as observation of real behavior of market players were a source of inspiration for formulating the research problem and conducting further empirical research.

Coopetition means cooperation among competitors in response to dynamic environment reflecting the real behavior of market players. Definition adopted to research by M. Bengtsson and S. Kock says that coopetition is cooperation among competitors where cooperation and competition can take place in different areas of business¹. There is also an assumption that coopetition is a strategy designed and implemented to achieve better results in the long term, thanks to the cooperation with the competitive company. In management science, this concept was implemented by American researchers A. Brandenburger and B. Nalebuff in their book "Co-opetition"² published in 1996. Coopetition is attractive field of cognitive considerations, particularly in the context of mutual benefits to be gained through cooperation of competitors also taking into account the effects of the whole market in which they operate.

The main goal of this doctoral thesis is to determine whether coopetition has a positive effect on market efficiency. Adopted inter-organizational perspective of market efficiency, where the ability to generate mutual benefits is a sign of effective activities, places this research in the field of management science, particularly in strategic management. Common benefits were operationalized by lower costs generated in the interactions and potentially

¹ M. Bengtsson, S. Kock: *Cooperation and competition in relationships between competitors in business networks*. "The Journal of Business & Industrial Marketing" 1999, Vol.14, No.3, s.178-191.

² A.M. Brandenburger, B.J. Nalebuff: *Co-opetition*. New York: Doubleday Currency 1996.

available to all participants. Explanations of these benefits, in turn, were sought in intentional shaping of corporate interactions. For the implementation of the main goal there were adopted specific objectives: cognitive, methodological, and practical. Cognitive goals were to systematize existing: theoretical bases, definitions and typologies of coopetition, as well as determine the impact of: the number of coopetitors, their homogeneity (similarity) and the frequency of their interactions to achieve market efficiency. Methodological goal was to develop research methods useful for identifying coopetition phenomenon and identify common benefits. Practical aims were focused on the identification of potential practical application strategies by market players and the development of recommendations for the market players in terms of establishing cooperative relationships in order to achieve and increase market efficiency.

A systematic literature review was conducted in order to systematize existing: theoretical background, definitions and typologies of coopetition. There have been gathered current scientific achievements in the field of knowledge of coopetition, followed by a detailed review of the literature. The first step in the research process was to create the literature database, followed by a frequency analysis, citation analysis and content analysis, providing to conclusions and suggestions for further research. To create the literature database there were used international electronic databases: ISI Web of Knowledge, EBSCO, Elsevier / Springer, Emerald, and Proquest. According to the predefined criteria, there were identified potentially significant scientific works which were further selected. As a result, the number of articles after the first selection was 523 items, and after a detailed analysis the number decreased to 96 articles.

Assessment of the current state of knowledge in the field of coopetition, carried out with bibliometric techniques in particular frequency analysis, citation analysis, as well as content analysis³ showed cognitive gap and set the current directions of research in this area. The results obtained through systematic review of literature became the basis for the development of research project assumptions, including defining main hypothesis and three additional hypotheses, indicating that coopetition and coopetitors influence market efficiency:

H1: Coopetition has a positive effect on market efficiency.

H1a: Increased number of coopetitors has a positive effect on market efficiency.

H1b: Increased homogeneity of coopetitors has a positive effect on market efficiency.

³ W. Czakon: *Metodyka systematycznego przeglądu literatury*. „Przegląd Organizacji” 2011, nr 3, s.57-61.

H1c: Increased frequency of coopetitors interactions has a positive effect on market efficiency.

Empirical research has been devoted to analyzing the impact of common strategies of market players on improvement of their cost position on the example of Polish electricity market. Selection of the research field, allowing to reflect effects of cooperative interactions was non-random. The subject of consideration in this paper was the electricity market - determined by the specificity of functioning, which is conditioned by the laws of physics, technical aspects, principles of economics and regulations. In addition, this market together with its critical segments, including in particular the balancing market is an interesting area for exploration because of its evolving nature in changeable legislative and regulatory environment. Key changes in the market functioning allowed to show, first, the evolution of the possibility of selection of coopetitor to cooperate, and, second, the common benefits of cooperation.

To show the effects of cooperation on shaping the market, the focus has been put on the participants engaged in an active trading activities within the wholesale energy market. The business effects of cooperation were shown on the example of actually functioning research sample, which consists of thirty-one stores – competitors, at the same time cooperating with one other in minimizing the balancing cost within the co-created balancing group. The research presents a summary of balancing costs of all participants of the market against the background of changeable environment. Analysis of the documentation, including regulations of the energy market, allowed to emerge critical changes in the functioning of the balancing market, which in turn translated into new cooperative opportunities for market participants. Based on the collected data on the actual power consumption of competitors and forecasts of their consumptions, there have been presented three settlement models applicable in accordance with the implemented changes of market functioning. Calculations, with certain assumptions, made it possible to obtain a comparison of total costs for analyzed three settlement models also taking into account the three reference prices, as it is calculated in business practice. Availability of data allowed to perform additional analysis showing total balancing costs taking into account frequency of interactions within the research sample. In the next step, there was performed the analysis of statistical significance of the results obtained with the use of quantitative methods of data analysis.

The paper layout is a reflection of fulfillment of the research objectives. It consists of five chapters. Two appendixes are an integral part of the paper. The first of these documents

confirms the coverage of this study honorary patronage of the Association of Energy Trading, while the second appendix contains a summary of data used in empirical research.

The first chapter introduces the idea of coopetition showing different ways of presentation in the literature. This chapter describes the concept in the light of interorganizational relations and market strategies. In addition, the chapter introduces the issue of common benefits.

The second chapter presents coopetition from the viewpoint of its importance in management science. This chapter presents the results of the literature systematic review, which was the basis for organizing and integrating previous scientific achievements in the context of research on coopetition. The analysis helped to organize the existing perception of the concept in terms of determining the theoretical background, definitions of the concept, its features, as well as its classification. Analysis of the literature allowed to develop a definition of this phenomenon in order to harmonize the subject of further consideration. For this reason, for the study there has been adopted horizontal coopetition, i.e. occurring between competitors, deliberate and emergent, i.e. resulting from the formal decisions of the market players, as well as being their current response to market changes. Additionally, coopetition has been analyzed at the network level, i.e. with respect to more than two participants. Assessment of the current state of knowledge in the field of coopetition showed a distinct lack of analyses on impact of coopetition on the joint results. Thus, this study directs research on this very aspect, and on the level of the market in which players operate.

The third chapter puts a step toward empirical research and characterizes the functioning of the electricity market in Poland, with particular emphasis on the balancing market segment. This chapter characterizes the legal framework and regulations, based on which market players operate. In addition, it describes the energy market segments and their participants indicating their relationships.

The fourth chapter has been devoted to methodological issues, and its primary goal is to develop the basic assumptions of the research project. This chapter presents the objectives and hypotheses, as well as the characteristics of the study sample selected in a targeted manner, which applied coopetition in the wider process of energy settlement in the balancing market. Additionally, the selection of the sample allowed to verify whether the number and homogeneity of competitors, as well as the frequency of their interactions influence the performance of their joint benefits, which in turn translate into results for the whole market in which they operate.

The fifth chapter presents the results of empirical research, which were used to test hypotheses, to verify the research model and draw theoretical-practical conclusions. This chapter, based on the results of the research fulfills a significant part of the research assumptions. The lack of coincidence of the results was confirmed in the statistical tests. Simulations were performed for different levels of coopetition, using the real data sample. The chapter defines the effects of coopetition occurring between market participants and the results of testing statistical hypotheses. This chapter contains detailed results of the simulations performed for several settlement scenarios and full range of feasible coopetitive trading strategies. The study therefore captures a three-stage transition from the individual cost settlement by coopetitive model with a constraint of geographical allocation of players, to the model of one balancing group.

As a result of these analyses, there is no basis to reject the hypotheses: H1, H1a and H1c, which means that coopetition, as well as the number of coopetitors and the frequency of their interactions, have a positive impact on market efficiency. At the same time, this research has not contributed the hypothesis H1b, assuming that the homogeneity of coopetitors has a positive effect on market efficiency. In view of this, hypothesis H1b has been rejected. Statistical analysis entitled to conclude that the use of changes in the legal environment, allowing to use coopetition in a real market game through cooperation with competitors in the field of aggregation on the balancing market, gave quantifiable effects of reducing the balancing cost. In addition to the prospects of joint benefits achieved by the stores, there has been shown the benefits in the whole market in which they operate, which in turn means that the benefit achieve not only coopetitors directly involved in the interaction, but also other actors on the market.

The key finding of both theoretical and empirical research is that coopetition has a positive effect on market efficiency, which directly contributes to the solution of the research problem. By identifying the impact of coopetition, as well as the number, homogeneity and frequency of coopetitors interactions on market efficiency, there has been achieved the main goal of the paper. The study and its results allowed in addition to achieve the specific objectives of cognitive, methodological, and practical character.

Results presented in the paper are consistent with previous research on the effects of coopetition, showing the benefits achieved through the cooperation of competitors and at the same time broadening the spectrum of current research. This work contributes to expanding the concept of common benefits showing that they consist of lowering costs for many companies because of the complementarity of participants behaviors using their core

competencies and operational adjustment. The results show that coopetition is the best choice, because our competitors are facing the same problems, they have the same needs and related opportunities. It should be emphasized that the empirical perspective of this study is a brand new approach showing common benefits of coopetition. This paper fills the cognitive gap by identifying and quantifying the effects of competitors interactions.

In addition, based on the systematic literature review it can be concluded that the cooperation of competitors is the solution appearing in other countries, in different sectors of the economy, but research on electricity balancing market are pioneering in the world. This paper demonstrates the positive impact of coopetition for activities related to the settlement of purchases, which in this case is electricity. Managers' surveys, widely used and practiced within a limited research sample, have been turned to the presentation of the real data illustrating measurability of this strategy. Thus, a higher level of sophistication of research on coopetition has been achieved. In addition, the analysis showed that the interactions of competitors when creating rules of the market game and the process of cost settlement significantly affect the generation of mutual benefits, thereby affecting the efficiency of the market.

Empirical studies focusing on the comparative analysis of balancing costs in different variants of settlement models showed a method to identify and analyze cooperative relations in the energy market, as well as demonstrated their positive effects, which in turn indicates a commercially reasonable use of coopetition in practice. Measurable results showing the beneficial effect of group settlement, i.e. establishing cooperation even with one's competitor, should be a clue for all market players. Effects of research efforts have been also translated into a proposal of practical implications related to the operationalization of coopetition. Results of this study can be used both by other researchers, as well as business practices in order to: (1) identify coopetition, (2) determine its theoretical background, (3) classify coopetition, (4) choose coopetition as a strategy, (5) intensify interactions with competitors, (6) increase the strength and influence on market shaping.

This research does not exhaust the subject of presented issues. Research on the common benefits of competitors has been limited to one market chosen purposefully and also to one selected group of competitors. Therefore, it would be interesting to conduct further research appropriate for other groups of cooperating competitors in the energy market, as well as in other sectors of the economy. In addition, the study focuses on generating common benefits without a detailed analysis which of the participants appropriates the greatest benefit. This topic is also extremely interesting and creates the possibility of extending this research in

the area of indicating the individual benefits against the common results, or developing a method of measuring the intensity of coopetition.

Katowice, 18 August 2014